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WELCOME TO THE FINAL ISSUE OF THE COLLEGE'S ASIA PACIFIC JOURNAL OF HEALTH MANAGEMENT FOR 2023.

Dr Neale Fong FCHSM

President of Australasian College of Health Service Management

STRATEGIC PLAN

The College Board has finalized the Strategic Plan for 2024-2027 and for more detail please visit www.achsm.org.au. Our key strategic outcomes for the coming period:

Leadership

The ACHSM is recognised as the peak membership, advocacy, and professional learning organisation for leaders of health, aged care and social services in Australia, New Zealand, Hong Kong and surrounding nations.

Relevance and representation

Policymakers seek out ACHSM representatives to provide a critical perspective on the development and implementation of reforms in health, aged care and social services.

Collaboration and Integration

The role of ACHSM in facilitating and building linkages across the healthcare system is acknowledged.

Member Value and Growth

The composition needs and preferences of the membership is reflected in the ACHSM's value-proposition, advocacy and learning program.

As the year draws to a close for many of us it is often a time of reflection and thanks. We are a privileged workforce in healthcare as we get to not only apply our training in scientific and technical capabilities, but the compassionate care that our patients and their families need in times of ill-health.

For some this year will have brought many challenges, both professional and personal, and I hope that as you reflect you will take time to acknowledge your resilience in the face of these challenges.

2024 is going to be another massive year for all of us in healthcare, and I relish the opportunity of interacting with many of you throughout the coming year. Finally, special thanks to Mark Avery our editor and Yaping Liu who helps put this journal together so professionally.

I wish you and your loved ones a safe and happy Festive Season.

Dr Neale Fong
College President

LEADING FOR SUSTAINABLE HEALTH SYSTEMS

Dr Mark Avery

Editor-in-Chief, Asia Pacific Journal of Health Management

A sustainable health system is a foundation of any growing and developing society. A broad perspective of health is needed across acute, aged and social care systems. A focus on sustained well-being of its citizens provides happiness, safety and longevity in individuals and fosters economic development and growth. Emerging and managing healthcare sustainability involves multifaceted aspects of what constitutes a sustainable health system. Not surprisingly they align to the key elements or foundation components such as accessibility, affordability, quality of care, preventive measures, and the role of technology.

Leaders play are pivotal in healthcare sustainability, yet their impact can be diluted. While some leaders champion innovative practices and resource optimisation, there is need to address systemic issues. Authentic and effective governance, adequate financial stewardship, and strategic foresight affects sustainable healthcare models. Leaders need to beyond significant short-term gains, emphasising long-term ecological and economic viability. Collaboration, transparency, and a commitment to evidence-based policies are essential. Without visionary leadership, healthcare sustainability remains elusive and fragmented. This perpetuates the challenges that compromise the well-being of both the system and its beneficiaries. We have the systems that we have built and we will get the systems that we build.

A critically important beginning and future for a sustainable health system involves ubiquitous accessibility. Access to health care should be fair and equitable. The aim is to ensure that individuals and families, regardless of socioeconomic, geographic location, or demographics have the means to receive needed health promotion and care. This involves creating a system network of health care provision encompassing urban and rural areas as well as reaching marginalised communities and those who are underserved.

Affordability at system and individual levels involves economic balance. Restrictive or damaging financial impediments should not prevent individuals from seeking and receiving the care needed. A sustainable health system has structural features that can reduce the economic burden on consumers. These can include subsidised healthcare services, social and private insurance coverage, and cost-effective preventative and treatment policies. Financing and funding starts from social determinants of health, recognising that many factors like education, housing, and employment impact an individual's or a family's overall well-being.

Sustainability extends beyond accessibility and affordability to the quality of care provided. A robust health system emphasises evidence-based practices, continuous training for healthcare professionals, and the implementation of the latest medical technologies (technology seen in its broadest definition). Quality assurance mechanisms, such as accreditation programs and regular evaluation, are essential to maintain and improve standards, whilst a quality improvement agenda enables reflection and development. Patient-centred care, emphasising communication and shared decision-making, enhances the overall quality of healthcare services.

A sustainable health system is proactive, placing a strong emphasis on preventive measures to reduce the burden of illness. Contemporary health care needs concerted rebalancing between preventative and promotion activities with that of curative and rehabilitation. Public health initiatives, education campaigns, and vaccination programs are vital components of a comprehensive strategy. By promoting healthy behaviours and addressing risk factors, the health system can minimise the prevalence of diseases, leading to a healthier population and reducing demand on healthcare resources.

In the 21st century, technology plays a pivotal role in the sustainability of health systems. Technology in its broadest sense involves medication management, models of care, information and communications and biomedical development and application. Electronic health records, telemedicine, and health information systems optimise procedures, improve communication among healthcare professionals, enhance quality and safety as well as enabling the smooth interchange of information. Artificial intelligence and data analytics contribute to early diagnosis, personalised treatment plans, and the efficient allocation of resources. Integrating technology not only improves healthcare delivery but also fosters innovation and adaptability. These requiring a system that is open to innovation translation and change to face evolving health challenges.

Building a sustainable health system involves active community engagement. Communities should be involved in stewardship, decision-making processes, health promotion initiatives, and the design of healthcare services. Cultivating a sense of ownership and responsibility within communities enhances the effectiveness of health interventions and promotes a culture of health-conscious living.

Sustainability of health systems is an international concern. Sharing best practice, pooling resources, and addressing global health threats contributes to building resilient health systems that can withstand challenges such as preventative, curative and rehabilitative health status. Recently there has been and is considerable learning from the COVID-19 pandemic related to technology and system management and the realisation of how different systems and actors addressed what are common community engagement issues.

Sustainable health systems are not universally identical but tailored to each country's unique values, needs, resources, and challenges. Cultural norms, economic conditions, as well as existing systems and infrastructure influence the design and effectiveness of healthcare models. The core principles of accessibility, affordability, and quality remain crucial but flexibility and adaptability are key to address diverse health landscapes. Global collaboration and shared knowledge contributes to refining and enhancing individual nations' health systems. Such engagement fosters a collective effort towards achieving sustainable and equitable healthcare on a global scale.

The work of the researchers and authors in this and all the editions of this journal contribute to that knowledge development and sharing of expertise.

Mark Avery
Editor-in-Chief

AN EDUCATION FRAMEWORK IN A HEALTH ORGANISATION; GOVERNANCE AND IMPLEMENTATION

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ABSTRACT

OBJECTIVE:

To describe the development, implementation and governance of a structured education framework in a large Local Health District (LHD) in New South Wales, Australia.

OUTCOMES:

The Education Framework was developed to provide structure and governance to pre-existing education, and to meet the needs of both the individual and the organisation. The Framework provided guidance to educators on how to assess need, design and evaluate education to ensure alignment to organisational strategy.

CONCLUSIONS:

The LHD Education Framework supports a governance approach for education and assists educators, staff and managers to understand and navigate the LHD Education Environment. It supports staff to develop a road map for education that can be applied across the organisation or to individuals. It guides the development, structure and evaluation of all educational programs and activities (including Medicine, Nursing and Midwifery, Allied Health and Corporate) enabling those providing education to demonstrate alignment to organisational priorities. Within the "Excellence" Evidence Based Leadership Model, education is a key accelerator in aligning processes and for driving organisational performance.

KEYWORDS

education framework, Local Health District, implementation, governance

INTRODUCTION

The OECD report into the Future of Education and Skills Education 2030 stated that "education can equip learners with agency and a sense of purpose, and the competencies they need to shape their own lives and contribute to the lives of others" [1, p2]. The learner requires an individual environment that stimulates and informs according to their learning needs.

However, Jeyakumar et al [2] showed that health care organisations should be equipped with the essential tools to deal with the turbulence that embodies digital ecosystems and research into all facets of education that prepare health providers, teams, and the organisation as a whole, for the rapidly changing nature of clinical environments. Holley [3] noted that when knowledge is kept strictly defined in disciplinary compartments, making potentially rich connections between various epistemological ideas that cross these various areas is

difficult. So too is the ability to solve complex problems that require more than one area of expertise.

In Australia where the health system is changing rapidly, staff productivity is linked to well-being which in turn is linked to staff who are prepared and supported to deliver clinical and non-clinical skills in a professional, competent and knowledgeable manner. It is in this context that education should be accessible, relevant, well designed and deliver learning outcomes that assist the clinical staff in their goal of 'Excellence Every Patient Every Time' [4].

Achieving these goals requires the system, in which the clinicians learn, to be governed; in other words, to have leadership structures and mechanisms that support the direction of the organisation, identify strategies, communicate expectations and monitor compliance. It is in this context that an Education Framework was developed and implemented to align education with the goals and objectives of the organisation whilst assisting the individual in their learning.

BACKGROUND

In 2012 the NSW Local Health District (LHD) recognised that there were over 200 policies stipulating 'mandatory education' with this education being of variable quality, often overlapped and/or containing duplicated content. It was mostly developed locally with no oversight of the standard of education design. Further, it was mostly 'profession specific' offering few opportunities for multi/intra-disciplinary team learning that fosters complex problem solving. The goals of learning were often opaque to the learner and had limited alignment with the needs of the organisation. The LHD had no capacity to track and monitor an individual clinician or staff member's educational progress. Consequently, staff expressed frustration and were unwilling to participate.

To address these issues the LHD formed a Strategic Education Committee to review current education and develop a more consistent strategic approach. The committee's premise was that 'education' is when adults engage in systematic and sustained self-educating activities in order to gain new forms of knowledge, skills and expertise. To ensure appropriate accountability the LHD required governance over such education. This would assist educators, clinicians and managers to understand and navigate the education environment. Education

could then be aligned to the organisational direction and respond to emerging challenges. For the staff this would deliver an individual road map which was responsive to their own career trajectory and assist with the requirements under the Health Practitioner Regulation National Law [5] for individuals to obtain and maintain registration.

To achieve these goals the LHD developed an Education Framework that enabled learning to align with the strategic priorities and operational initiatives of the LHD, and facilitated staff to develop an individual educational dashboard that supported their career goals.

THE LHD EDUCATION FRAMEWORK
There are three principles which underpin the LHD Education Framework:

- Promoting a Culture of Lifelong Learning:
  - The LHD recognises the need to lead, inspire, supervise and encourage individual professional growth through collaboration and engagement of the workforce and to plan, develop, implement, and evaluate education that grows and retains competent staff with the right cultural fit.

- Our People, Partners and Systems:
  - Organisational performance and patient outcomes are achieved when the workforce is motivated, supported and guided by evidence-based best practice and research to provide contemporary care.

- Education Quality and Access:
  - The LHD promotes evidence-based education opportunities and resources which are accessible to all staff, to achieve professional and individual achievement and development.

Governance of the Education Framework

To hold educators accountable to deliver according to these principles, a number of educational components were specified. These were articulated in the Education Framework (Figure 1) including alignment to strategic priorities, needs analysis informing resource allocation, education design fit for purpose, participant assessment and programme evaluation that enable evidenced-based education. The organisational oversight of this lies with the LHD Strategic Education Committee which was convened by the Chief Executive to 'determine education strategy that will attract, develop and retain competent, capable staff with the right cultural fit' for the LHD and advise the

Chief Executive on requirements/strategies to promote, support and optimise education.
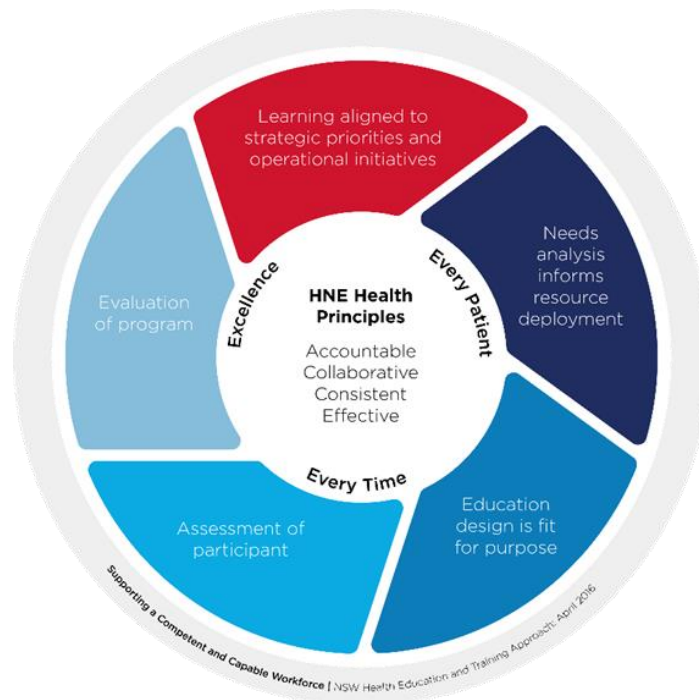
Purpose of Educational activities from the staff perspective

The Education Framework stratifies education into one of four categories aligned to purpose (Figure 2):

- Mandatory Training must be undertaken by NSW Health staff and contractors to meet policy and regulatory standards. To be deemed as mandatory, training must be required by either legislation, the National Safety and Quality Health Service Standards or a NSW Health Policy Directive

- CE Directive Education is training that is endorsed by the Chief Executive to mitigate local risks.

- Discipline/Role Specific Education is the individual's responsibility to maintain currency of practice and/or registration.

- Professional Development is education to improve practice and further career.

FIGURE 2: PURPOSE OF EDUCATION
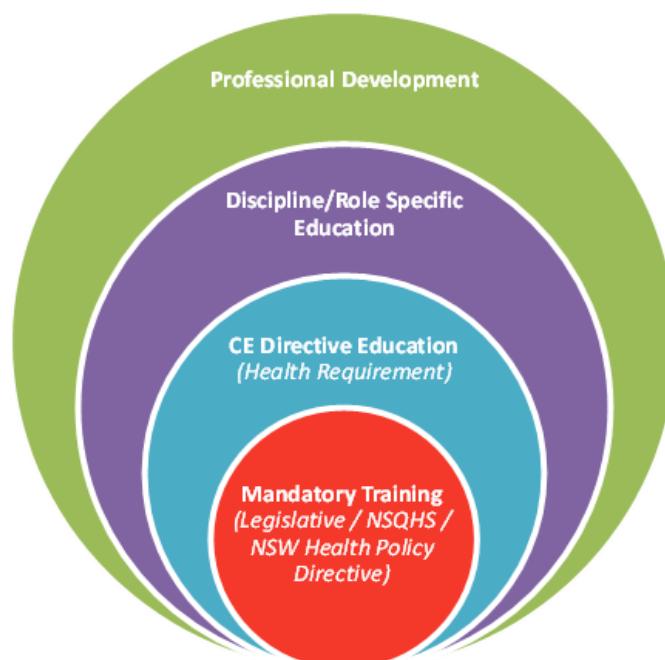
Monitoring of educational activity

A key principle of good governance is that activity should be measurable and monitored. To this end NSW Health have developed 'My Health Learning' (MHL) [6], an eLearning system providing high quality, self-managed online learning for NSW Health staff. This provides access to mandatory training and professional development through a comprehensive range of online and face-to-face education opportunities. In addition, any LHD educational program can be registered with My Health Learning after complying with the educational elements within the Education Framework. This enables the LHD to monitor compliance at an individual, departmental, facility/service or organisational level.

COMPONENTS OF THE EDUCATION FRAMEWORK

Learning aligned to strategic priorities and operational initiatives

Local Health Districts within NSW Health are bound by numerous state/local plans and are required to meet an annual Service Agreement that is a central component of the NSW Health Performance Framework [7]. Organisations are required to demonstrate alignment, between the education supported and provided, to these plans and agreements.

Needs analysis informs resource deployment

Needs analysis can be performed at three levels: the organisational level, the team/department level or at the individual level. This is informed by the annual performance development review [PDR] for all staff. This process supports staff on their journey to 'Excellence, Every Patient, Every Time' [4]. The staff can further their career contributing to organisational performance in line with organisational strategic directions. During the PDR, agreement is reached on expectations and future directions whilst clarifying goals or opportunities. Educational requirements and expectations are set at this meeting. This ensures that the manager is across the educational plans [time and/or travel requirements] for their team members as well as monitoring the individual's successful completion of their goals. The utilisation of the Educational Framework provides both the clinician and the manager with clarity around the purpose of education.

Education is designed fit for purpose

A significant risk prior to developing the Educational Framework was the lack of capacity to monitor staff participation. In order to provide staff and managers with guidance on the utilisation of this Education Framework, a policy compliance document was created. This clarifies that the following elements are required for any locally designed education initiative:

1. Aim and Objectives
2. Course Content
3. Intended Learning Outcomes
4. Teaching Strategies & Learning Activities
5. Assessment
6. Learner Attributes & Capabilities
7. Recognition of Prior Learning
8. Evaluation / Reflection
9. Application to practice / CPD
10. Accessibility
11. Resource Review Checklist

This process encourages and supports educators to develop education in collaboration with relevant stakeholders and other educators, share resources, reduce duplication and waste and ultimately improve the quality of education being developed and delivered. Planned and coordinated education develops the right people, with the right skills, at the right time.

Included within the Education Framework is guidance for staff around generating high standard learning outcomes that are practical and measurable. These must be included as part of the educational design to be registered with My Health Learning (MHL).

On successful demonstration of these elements an application can be made for registration of education with MHL which generates activity completions and compliance against each code. The result is a comprehensive view of education delivered within the LHD.

Assessment of the Participant

Learning outcomes identify what the learner will know and be able to do by the end of the learning session. Learning outcomes refer to observable and measurable change in knowledge, skills and behaviours. Learning outcomes typically have three parts:

- Verb - What must the participant perform (one behaviour equals one verb)?

- Standard - How well must it be performed?

- Condition - How will it be performed?

The framework includes a hierarchy of assessment that guides the formality and structure of the assessment based on whether the assessment is being undertaken to assess

workplace performance, workplace practice or as part of a qualification/certification.

Evaluation of the Program

Program evaluation identifies whether an education program has been appropriately designed to meet its objectives, requires modifications to improve the quality of the learning, has demonstrated the impact of resource investments through relevant performance measures and highlights areas for improvement that education alone cannot address.

The impact of the education program can be assessed at a number of levels including learner satisfaction or reaction, whether learning has taken place, knowledge, skills and attitude/behaviours acquired, if education is translated into practice as evidenced by a change or modification in professional performance or behaviour, including improvements in teams, systems and processes and improved patient outcomes.

APPLICATION OF THE EDUCATION FRAMEWORK

To support educators in the design and development of high quality, standardised LHD-wide education, a number of tools and educational resources are now available. These include:

- Education Working Groups Terms of Reference Template
- Specific Measurable, Achievable, Relevant and Time-bound [SMART] Aim and Objectives
- Naming your education
- Writing Learning Outcomes
- A Session Plan
- Delivery Methods and Strategies
- Making Learning Stick (The Ebbinghaus Forgetting Curve)

- Assessment Framework
- Recognition of Prior Learning
- Evaluation Toolkit
- Reflection on Learning
- Keep, Stop, Start template
- Communities of Practice (Guide)
- What is a Community of Practice (information sheet)
- Mentoring and Coaching
- Simulation training
- APHRA CPD-portfolio-template
- External Learning Events
- Poster design
- Skype for Business – Facilitating Education
- Microsoft teams - Facilitating Education.
- Educator Resource Review Checklist and Action Plan

Learning Pathways

A successful feature has been the subsequent development of learning and development pathways for a recognised domain with specified categories of educational activities. These aim to build capacity in the defined domain and identify competencies or capabilities that are required for that domain. All available educational resources are aligned according to whether the clinician/staff member self-assesses as either at the foundational, intermediate, and adept or advanced level based on the NSW Health Capability Framework [6]. These pathways are multi/intra-disciplinary but allows the relevant professional to identify their own learning needs in each specified domain. Palliative Care is an example (see Figure 3).

FIGURE 3: CATEGORIES OF EDUCATION IN THE DOMAIN OF PALLIATIVE CARE

Palliative care an overview

Management of common symptoms

Pharmacology essentials

ACP and EOL discussions and planning

MDT and service navigation

Last days of life death and dying

Psychosocial grief and loss

Specialist services

Aboriginal and Torres Strait Islander supportive care

Paediatric palliative care

Palliative care and the law

Critical reasoning quality and research

Learning and Development Pathways provide the staff member and the manager with options to identify appropriate learning opportunities according to the educational needs of the staff and service. With rapidly improving connectivity, which has occurred as a consequence of COVID-19, educational sessions are recorded and available throughout the LHD. This has had threefold success; firstly, it has increased accessibility to staff throughout the LHD, secondly through participation gaps in knowledge or understanding were identified that have stimulated further education development, lastly as these education activities have defined MHL codes reporting of activity can occur. In other words, 'blue printing' has occurred which ensures that the relevant education is comprehensively covered, thus enriching the experience and opportunities in this domain.

Self-assessment individual education dashboard

The LHD are currently piloting and developing an individual self-assessment dashboard. This electronic tool aims to allows the staff to select the relevant educational resource according to their self-assessment of whether they are wishing to gain knowledge [foundational level where staff are unaware of the content] or are aware and wish to understand the information [intermediate level] or wish to apply the content [adept/advanced level]. Once the relevant educational resources are selected, the staff member can print out the anticipated learning goals accompanied by information about whether the course is on-line or face to face and the time required. This allows the staff member to plan for attendance in partnership with their manager. On completion of the relevant courses this is recorded in My Health Learning which can be used for both registration to practice and career planning purposes.

CONCLUSION

The LHD Education Framework supports a governance approach for education and assists educators, staff and managers to understand and navigate the LHD Education Environment. It supports staff to develop a road map for education that can be applied across the organisation or to individuals. It guides the development, structure and evaluation of all educational programs and activities (including Medicine, Nursing and Midwifery, Allied Health and Corporate) enabling those providing education to demonstrate alignment to organisational priorities. Within the "Excellence" Evidence Based Leadership Model education is a key accelerator in aligning processes and for driving organisational performance.

This framework is applicable to all staff and provides a reference point for training, by supporting the staff in mapping their career pathway, identifying gaps and opportunities for learning. It references learning and development opportunities within LHD and within NSW Health, including the Health, Education and Training Institute (HETI) and the Clinical Excellence Commission (CEC). Staff now undertake education that is directed towards mandatory requirements, specific workplace roles or for professional development thus aligning the individual's career goals with the organisation.

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RESEARCH NOTES

THE INFLUENCE OF SOCIAL AND INDIVIDUAL FACTORS ON MEDICINE USE IN OLDER ADULTS

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ABSTRACT

OBJECTIVE:

To quantitatively explore the social and individual factors (including beliefs, experiences, and health literacy) that may affect medicine use in older adults.

DESIGN:

A descriptive research approach with quantitative-based methods was used. Individual structured interviews were completed for each participant where they were questioned on any health conditions, medicines, and healthcare utilisation. The following validated questionnaires were implemented in the interview; Beliefs about Medicines Questionnaire, Health Literacy Questionnaire, EQ-5D-5L scale, Barthel Activities of Daily Living Index, Perceived Sensitivity to Medicines Scale, Patients Attitudes Towards Deprescribing, Medication Related Burden Quality of Life, and Adherence to Refills and Medication Scale. Descriptive statistics were calculated using SPSS software.

SETTING:

People ≥65 years living in the community in Australia.

MAIN OUTCOME MEASURES:

Suboptimal prescribing, including polypharmacy, potentially inappropriate medicines use, and adherence.

RESULTS:

Twenty-four participants completed the study and reported a mean BMQ necessity score of 11/25, mean specific concerns score of 19/25, mean general overuse score of 12/20 and suggest general harm score of 16/20. Most participants believed that medicines do more harm than good and physicians are overprescribing medicines. The highest scoring HLQ domain was 'Navigating the healthcare system', while the lowest scoring domains were 'social support' and 'having sufficient information to manage my health'. Additionally, individual experience was found to be an important factor in participants' medication attitudes and participants who trusted their prescriber were more likely to adhere to their medication regimen.

CONCLUSION:

The influence of beliefs, experiences, and health literacy on medicine use in older adults remains unclear, and future studies will investigate the effects of these factors on a larger sample size.

INTRODUCTION

Older adults with multiple chronic conditions are at risk of harm from suboptimal prescribing. Suboptimal prescribing is prescribing medicines in a way that is less than optimal and therapeutically inappropriate. It is an umbrella term that includes polypharmacy, underprescribing and the use of potentially inappropriate medicines (PIMs). 275,000 medicine-related hospital admissions annually cost the Australian government an estimated $1.4 billion (AUD) [1]. Suboptimal prescribing of medicines has been associated with poorer clinical outcomes [2].

Socioeconomic disadvantage, beliefs, and health literacy can contribute to nonadherence or suboptimal prescribing. In 2006, approximately 43% of Australians aged between 60 and 74 had health literacy skills considered 'less than adequate' [4], putting them at greater risk of poor health outcomes. The medical experience is both social and personal, and negative experiences can arise from adverse drug events, medicine-related burdens, and dissatisfaction with the healthcare system [3-5]. People bring and develop their own experiences, beliefs and understanding of their medicines, influencing their views of healthcare and medicine utilisation.

Although studies have highlighted the significance of beliefs, experiences, and health literacy on medication use, current findings among older adults are conflicting and limited. When utilizing the Beliefs about Medicines Questionnaire (BMQ), it was observed that patients with higher necessity scores demonstrated higher adherence, whereas higher concerns were associated with lower adherence [5, 6]. Furthermore, beliefs were identified as the most influential predictor of adherence, surpassing sociodemographic factors [6]. However, while certain literature suggests that younger patients exhibit lower levels of adherence compared to their older counterparts [6] [7], recent studies have found contradictory results [8]. Beliefs can also be influenced by individuals' experiences. Current literature emphasizes the significance of the patient-prescriber relationship and its impact on medication use. Previous findings indicate that better, higher-quality experiences with healthcare providers are associated with improved adherence [4, 9, 10]. It is important to note that

although literature exists on this topic, participants are typically 18 years or older [4, 9, 10]. Similarly, while evidence suggests that adequate health literacy is linked to higher adherence among older adults [11, 12], the proportion of participants aged 65 years or older is not consistently reported, making it difficult to generalize these findings to this population [11-13]. Additionally, contradictory findings indicate that health literacy levels may not be associated with self-reported or objectively measured adherence [13]. Considering the aforementioned observations, contemporary literature has not yet fully integrated these factors and examined their influence on medication use among older adults. The existing research focuses primarily on adherence as the primary outcome, with limited attention to exploring how social and individual factors may impact other aspects of inappropriate medication use (polypharmacy and potentially inappropriate medications).

Understanding and identifying the underlying reasons for potentially suboptimal prescribing is important in reducing the risk of medicine-related harm. While some findings were consistent with one another, other studies reflected otherwise. Current research does not address how a range of social factors can potentially influence medicine use in older adults. Therefore, this exploratory study aimed to quantitatively explore the social and individual factors (including beliefs, experiences, and health literacy) that may affect medicine use in older adults aged 65 years and older.

RESEARCH QUESTION

Do beliefs, experiences and health literacy influence medicine use in Older Adults?

MATERIALS AND METHODS

STUDY DESIGN AND SETTING

This cross-sectional exploratory study was conducted between May and October 2020 in Australia, and participants were recruited via convenience sampling. All participants were asked to provide verbal or written consent prior to their interview. Descriptive research with quantitative based methods was the approach used for this study.

ELIGIBILITY CRITERIA AND RECRUITMENT

Participants aged 65 years or above with the capacity to provide informed consent were eligible to participate. Participants were recruited via brochures distributed through community pharmacies and general practices, word-of-mouth, and advertisements in public locations.

DATA COLLECTION

Individual structured interviews were completed for each participant. Interviews were conducted face-to-face or online via virtual platforms, including Zoom and Microsoft Teams. Prior to interviews, all researchers involved in conducting the interview received centralised training on the interviewing process.

During the interview, sections 1-5 queried participants on existing health conditions, medicines, their indicated use, and utilisation of healthcare systems such as community pharmacies and hospitals (refer to Appendix a). Sections 6-13 incorporated use of validated questionnaires.

1. The interview consisted of thirteen sections:
2. Participant details and demographics
3. Self-reported Health Conditions
4. Medication Management
5. Adverse Drug Reactions or Drug Allergies
6. Healthcare Utilisation
7. EQ-5D-5L slides and 5-item Questionnaire [14]
8. 10-item Barthel Activities of Daily Living index [15]
9. The Perceived Sensitivity to Medicines Scale (PSM) [16]
10. Beliefs about Medicines Questionnaire (BMQ) [17].
11. Health Literacy Questionnaire (HLQ) [18]
12. Medication Related Burden Quality of Life scale (MRB-QoL) [19]
13. Patients Attitudes Towards Deprescribing scale (PATD) [20].
14. Adherence to Refills and Medication Scale (ARMS) [21]

To ensure comprehensive coverage of beliefs, experiences, health literacy, and adherence during the interviews, utilization of multiple validated questionnaires was necessary. To address participants' beliefs and attitudes, the BMQ and PATD were employed. To capture experiences, PSM and MRB-QoL questionnaires were utilized. Health literacy was assessed using the HLQ, and adherence evaluated using the ARMS. Additionally, to gauge participants' quality of life and their ability to perform daily activities, the EQ-5D-5L slider and questionnaire were incorporated, along with the Barthel Activities of Daily Living index. The selection of these validated questionnaires was based on their established credibility, internal consistency, and wide usage in existing literature. All chosen tools exhibited a Cronbach alpha internal consistency score exceeding 0.6, further supporting their reliability. In addition, each validated tool was used in its entirety, no questions were omitted or excluded.

Data collected through each individual interview was stored using REDCap software and then exported to SPSS to obtain descriptive statistics for analysis.

DEFINITIONS

Prescribing in older adults was measured by the prevalence of polypharmacy, PIMs, and underprescribing. Polypharmacy and hyperpolypharmacy were defined as the use of five or more; and ten or more medicines, respectively [2]. PIMs were assessed using the Beers 2015 and the Screening Tool of Older Person'' Prescriptions (STOPP) criteria [22, 23]. Section E (Renal Systems criteria) of the STOPP criteria was excluded as participant renal function was unknown. Underprescribing was measured using the Screening Tool to Alert Doctors to Right Treatment criteria [23].

DATA ANALYSIS

Descriptive statistics such as means, standard deviations and percentages were calculated using the Statistical Package for Social Sciences (SPSS) software version 16.0. An excel spreadsheet was also used to summarise the data. Descriptive statistics were calculated for both demographic data, as well as data obtained from each validated questionnaire. Due to the small sample size, no further statistical analysis could be completed.

ETHICS

Ethics was approved by the Monash University Human Research Ethics Committee (#21902) and registered at the RMIT University College Human Ethics Advisory Network (#25397).

RESULTS

DEMOGRAPHICS

A total of 24 participants (n=12, 50% male) aged between 65 and 88 years of age (M=73, SD=6.6) (Table 1) from Melbourne, Brisbane and Cairns. The most common self-reported conditions were arthritis and rheumatism. Most participants (n=17, 71%) reported using only one pharmacy. Half (n=14, 58%) the participants did not self-report any difficulties opening medicines packaging. Of the participants (n=10, 42%) who reported difficulty when opening their medicines (agreed or strongly agreed), most (n=7, 70%) were also diagnosed with arthritis.

TABLE 1. DEMOGRAPHICS, HEALTH CONDITIONS AND HEALTHCARE UTILISATION OF RECRUITED PARTICIPANTS (N=24)

	Mean $\pm$ SD
Age (years)	73 $\pm$ 6.6
Sex, n (%)	
Male	12 (50)
Female	12 (50)
Country of Birth, n (%)	
Australia	16 (67)
Overseas	8 (33)
Education, n (%)	
Primary school or equivalent	1 (4)
Secondary school or equivalent	8 (33)
Tertiary level or equivalent	15 (63)
Blood Pressure*	
Systolic	127.1 $\pm$ 16.3
Diastolic	80.1 $\pm$ 4.5
Height **	169.6 $\pm$ 6.7
Weight ***	76.3 $\pm$ 12.6
Self-reported conditions, n (%)	
Arthritis/Rheumatism	13 (54)
Pain/Discomfort	10 (42)
Back pain	10 (42)
Dexterity issues	10 (42)

Allergy	9 (38)
Mobility issues	6 (25)
Hypertension	6 (25)
Heart Disease	4 (17)
Diabetes	4 (17)
Thyroid Condition	3 (13)
Other****	23 (96)
Eyesight, n (%)	
Normal	5 (21)
Poor eyesight (no glasses)	1 (4)
Uses glasses	16 (67)
Not mentioned	2 (8)
Hearing, n (%)	
Normal	15 (63)
Poor hearing (no hearing aid)	3 (13)
Uses hearing aid	2 (8)
Not mentioned	4 (17)
Falls, n (%)	10 (42)
Fractures, n (%)	12 (50)
Healthcare Utilisation and Medicine Use	
Number of General Practitioners	1 ± 0.5
Number of Specialists	1 ± 1.4
Hospitalisation (annual)	0.5 ± 0.9
Single pharmacy use, n (%)	17 (71)
Multiple pharmacy use, n (%)	7 (29)
Adverse drug event, n (%)	14 (58)
Number of medicines*****	4 ± 2.9
Polypharmacy, n (%)	4 (25)
Hyperpolypharmacy, n (%)	1 (6)
Participants prescribed a PIM, n (%)	1 (6)
Underprescribing, n (%)	2 (13)
Dose administration aids, n (%)	7 (29)

* n = 10, 10 participants did not have their blood pressure measured.   ****Conditions reported by two or fewer participants

** n = 20, four participants could not report their height.   ***** n = 16, eight participants could not report their medicines

*** n=22, 2 participants could not report their weight.

SUBOPTIMAL PRESCRIBING

Two-thirds of the participants (n=16, 67%) could report their medicines. A current medicines list could not be obtained for the other eight participants. Of the 16 participants for whom a medicines list was obtained, the mean number of medicines used was four (SD=2.9) medicines. Polypharmacy and hyperpolypharmacy were observed in five participants (polypharmacy n=4, 25% and hyperpolypharmacy n=1, 6%). Of participants using polypharmacy or hyperpolypharmacy (n=5), low necessity (M=11.8, SD=6.1) and high concern (M=19.6, SD=4.2) scores

with high to moderate adherence scores (M=13.4, SD=1.7) were found.

Of all 24 participants, two were recognised to be using an individual PIM. Under prescribing was identified in two participants with known osteoporosis. Participants recorded a mean medicine adherence ARMS score of 12.7 (SD=1.8) ranging from 9 to 16 (Table 2). Most participants (n=18, 75%) reported always taking their regular medicine regardless of how they felt. About half the participants (n=13, 54%) stated they sometimes forgot to take their medicines.

TABLE 2. MEAN SCORES RECORDED BY PARTICIPANTS PER EACH VALIDATED TOOL.

Validated Questionnaire	Mean ± SD
EQ 5D 5L slide (/100) *	79.9 ± 12.4
EQ 5 item questionnaire (/1) *	0.7 ± 0.3
Barthel Activities of Daily Living Index (/100)*	92.7 ± 6.3
Beliefs about Medicines Questionnaire (BMQ)	
Specific Necessity (/25)	11.1 ± 3.8
Specific Concerns (/25)	18.8 ± 3.3
General Overuse (/20)	12.2 ± 3.7
General Harm (/20)	15.7 ± 2.4
Perceived sensitivity to medicines (/25) *	12.6 ± 4.6
Adherence to Refills and Medication Scale (ARMS) **	12.7 ± 1.8
Medication Related Burden Quality of Life scale (MRB-QoL)	
Routine & Regimen complexity (/55)	42.3 ± 14.2
Psychological burden (/30)	19.3 ± 8.8
Functional & Role Limitation (/35)	24.6 ± 9.4
Therapeutic relationship (/15)	12.4 ± 3.0
Social Burden (/20)	16.3 ± 5.4
Health Literacy Questionnaire (HLQ)	
Feeling understood & supported by healthcare providers (/20)*	18.0 ± 2.3
Having sufficient information to manage my health (/16)*	13.2 ± 2.8
Actively managing my health (/20)	14.6 ± 2.6
Social support for health (/20)	13.4 ± 8.2
Appraisal of health information (/20)	13.9 ± 4.0

Ability to actively engage with healthcare providers (/25)	22.0 ± 5.8
Navigating the healthcare system (/30)	26.1 ± 3.9
Ability to find good health information (/25)	23.1 ± 2.2
Understand health information well enough to know what to do (/25)	22.2 ± 6.2

* n = 22, Two participants could not provide answers to questions.

** n = 21, Three participants could not provide answers to questions.

*** High adherence (ARMS score <12), medium adherence (ARMS score between 12 and 23) and low adherence (ARMS score >23).

For the BMQ, participants had a mean necessity score of 11.1 (SD=3.8), with a maximum of 22 and a minimum score of 5. These low BMQ-specific necessity scores suggest that participants in this study did not view their medicines as necessary. However, participants also recorded a mean BMQ-specific concern score of 18.8 (SD=3.3), signifying that while participants did not consider their medicines as necessary, they still did present concerns about their medicines. Overall, the study participants indicated a belief that medicines do more harm than good and that medicines are being overprescribed.

Majority of participants found navigating the healthcare system to be quite easy or very easy, however, 13% (n=3) of participants reported some degree of difficulty in finding health services they are entitled to and working out what the best healthcare option is for them. All participants with high adherence scores also reported being treated with respect and dignity. Using the HLQ, participants were assessed as highly satisfied with their experience and relationship with their doctor, with 71% (n=17) of participants reporting that they felt that their needs were accounted for by their doctor.

All participants, including those exposed to suboptimal prescribing, recorded moderate to high adherence levels. Almost all (23/24 participants) disagreed or strongly disagreed with the statement "My doctor/s talk about my medicine/s as if I am not there" using the MRB-QoL. While 83% of participants agreed that they were comfortable with the number of medicines they had been taking, 54% of participants also agreed that they would be willing to stop one or more of their regular medicines if their doctor said it was possible (Table 3).

TABLE 3. PARTICIPANTS ATTITUDES TOWARDS DEPRESCRIBING (PATD) AS RECORDED ON THE PATD QUESTIONNAIRE, N (%) (N=24)

	Strongly Agree	Agree	Unsure	Disagree	Strongly disagree
I feel that I am taking a large number of medications.	1 (4)	4 (17)	2 (8)	9 (38)	8 (33)
I am comfortable with the number of medications that I am taking.	4 (17)	20 (83)	0 (0)	0 (0)	0 (0)
I believe that all my medications are necessary.	7 (29)	10 (42)	3 (12)	4 (17)	0 (0)
If my doctor said it was possible, I would be willing to stop one or more of my regular medications.	10 (42)	13 (54)	0 (0)	0 (0)	1 (4)
I would like to reduce the number of medications that I am taking.	5 (21)	10 (42)	3 (12)	6 (25)	0 (0)
I feel that I may be taking one or more medications that I no longer need. *	0 (0)	3 (12)	4 (17)	10 (42)	5 (21)
I would accept taking more medications for my health conditions.	6 (25)	16 (67)	1 (4)	0 (0)	1 (4)
I have a good understanding of the reasons I was prescribed each of my medications.	10 (42)	12 (50)	2 (8)	0 (0)	0 (0)
Having to pay for fewer medications would play a role in my willingness to stop one or more of my medications. **	1 (4)	1 (4)	1 (4)	9 (38)	11 (46)
I believe one or more of my medications is giving me side effects. **	1 (4)	2 (8)	4 (17)	8 (33)	8 (33)

* n= 22, Two participants could not answer the question.

** n = 23, One participant could not answer the question.

DISCUSSION

This study explored how beliefs, experiences, and health literacy may influence medicines use in people aged 65 years or above living in Australia. Although the mean number of medicines used by participants was below the cut point for polypharmacy, participants still believed that medicines were being overprescribed. In addition, while adherence is a growing issue in older adults, no participant presented with low medicine adherence. Therefore, while participants may have general beliefs that medicines may do more harm than good and are concerned about medicines, it was found that these beliefs do not influence adherence.

The BMQ results showed that participants in this study did not view their medicines as necessary but still have concerns about them. Most participants believed that medicines do more harm than good and that physicians are overprescribing medicines. Previous studies have shown that participants with high necessity and low concern exhibit higher adherence [5, 6]. However, in this study, participants with moderate to high adherence levels had low necessity and high concern scores. Similarly, participants with polypharmacy also had similar beliefs. All participants recorded moderate to high adherence levels. These findings suggest that participants' general beliefs about medicines may not necessarily influence their medicine use. Additionally, although the mean number of medicines reported by participants was four, they still believed that medicines are being overprescribed. This suggests that participants viewed four medicines as too many, even though polypharmacy is defined as the use of five or more medicines used concurrently.

Previous research has shown that trust in healthcare providers and a positive therapeutic relationship can improve medicine use. This study found that participants who trusted their prescriber and felt that their needs were being met were more likely to adhere to their medication regimen. Additionally, individual experience was found to be an important factor in participants' attitudes towards their medications. These findings are consistent with previous research and suggest that building trust and a positive therapeutic relationship with healthcare providers can improve medicine use and clinical outcomes [9, 10].

This study found that there may be a link between education level and medication adherence. Previous studies have found that education and healthcare barriers are associated with medication adherence. For example, a study of 140 African American men with HIV found that higher education levels were associated with higher adherence [24]. This study also suggests that people may face challenges understanding information and participating in decision-making. Previous research has shown that seeing the right healthcare provider and finding the best possible healthcare can improve medication use [25]. Health literacy allows people greater access to information and make informed choices, ultimately improving clinical outcomes.

IMPLICATIONS FOR PRACTICE

Understanding the factors influencing medication use is important for improving clinical outcomes and safety. This study found that experiences, such as therapeutic relationships, can influence medication use. However, beliefs about medications may not always influence medication use. More research is needed to understand the influence of these factors. Clinicians should be mindful of patients' beliefs, experiences and attitudes when interacting with patients.

FUTURE RESEARCH

While beliefs, experiences, and health literacy are important factors for health professionals to consider, more research is needed to understand their true association on medication use in older adults. Future studies should analyse the correlation between these factors and medication use and incorporate a larger sample size to provide more generalisable results.

STRENGTHS AND LIMITATIONS

This study demonstrated several strengths. Firstly, participants were recruited from three Australian cities: Melbourne, Brisbane, and Cairns, enhancing the geographical diversity of the sample. The interviews were well-structured, and interviewers received centralized training prior to data collection, ensuring consistency and reliability in the interview. Furthermore, participants were given the flexibility to choose between conducting the interview in their own homes or online, with the option of having a caregiver or family member present. This approach aimed to enhance participant comfort, reduce anxiety, and promote more accurate responses.

However, the study also had certain limitations. Firstly, the use of self-reported questionnaires introduces potential sources of error, including response bias, dishonesty, or overestimation of medication adherence. Secondly, the

small sample size of 24 participants may limit the generalizability of the findings to the broader population of Australians aged 65 years and older. It is important to note that this study was conducted as an exploratory study, hence the small sample size. It is anticipated that the current sample size will constitute approximately 10-15% of the intended sample size to be recruited in the future study. While this may not be completely representative of this population, we aim to explore the influence of these factors in a larger, more representative sample. Thirdly, Due to the small sample size, no further statistical analysis could be completed. Lastly, application of the STOPP criteria was not fully possible due to the lack of available estimates of participant renal function. Finally, the 24 participants exhibited inconsistencies in reporting their medications and levels of independence, which may have impacted the accuracy and representativeness of the findings.

CONCLUSIONS

The study found that older adults may feel they are taking too many medications, even if they are taking fewer than five regular medications. Social support, accessible guidelines, and strong relationships with healthcare professionals may help improve medication use in older adults. Future studies with larger cohorts are needed to better understand the effects of beliefs, experiences, and health literacy on medication use in older adults.

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DECLARATIONS OF INTEREST:

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APPENDIX: SUPPLEMENTARY MATERIAL

SUPPLEMENTARY TABLE 1. ADHERENCE SCORES RELATIVE TO PARTICIPANT AGE, SEX, EDUCATION AND COUNTRY OF BIRTH (N=24)

Variables	Total (n=24) n (%)	Adherence (ARMS[a] score), n (%)		
		High (n<12)	Moderate (12-23)	Low (n>23)
Age, years (range 65-88)				
65-74	15 (63)	7 (47)	8 (53)	0 (0)
≥75	9 (38)	3 (33)	6 (67)	0 (0)
Sex				
Male	12 (50)	3 (25)	9 (75)	0 (0)
Female	12 (50)	6 (50)	6 (50)	0 (0)
Country of Birth				
Australia	16 (67)	3 (19)	13 (81)	0 (0)
Overseas	8 (33)	4 (50)	4 (50)	0 (0)
Education				
Primary school or equivalent	1 (4)	1 (100)	0 (0)	0 (0)
Secondary school or equivalent	8 (33)	2 (25)	6 (75)	0 (0)
Tertiary level or equivalent	15 (63)	7 (47)	8 (53)	0 (0)

[a] Participants were divided by adherence level as high adherence (ARMS score <12; n=10, 41.7%), medium adherence (ARMS score between 12 and 23, n=14, 58.3%) and low adherence (ARMS score >23; n=0, 0.0%).

SUPPLEMENTARY TABLE 2. SYMPTOMS ATTRIBUTED TO MEDICINES SIDE EFFECTS

	Frequency (mean $\pm$ SD)	Severity (mean $\pm$ SD)
Nausea	0.2 ± 0.6	0.1 ± 0.3
Constipation	0.4 ± 0.8	0.3 ± 0.7
Diarrhoea	0.5 ± 0.7	0.3 ± 0.6
Abdominal Pain	0.2 ± 0.5	0.1 ± 0.3
Dry mouth	0.6 ± 1.2	0.2 ± 0.6
Dizziness	0.2 ± 0.5	0.2 ± 0.6
Headache	0.1 ± 0.4	0.1 ± 0.4
Insomnia	0.3 ± 0.8	0.04 ± 0.2
Skin rash or itch	0.1 ± 0.3	0.1 ± 0.4
Cough	0.2 ± 0.6	0.04 ± 0.2
Ankle swelling	0.04 ± 0.2	0.0 ± 0.0
Dry eyes	0.25 ± 0.7	0.1 ± 0.4
Other	0.0 ± 0.0	0.0 ± 0.0
Total	3.2 ± 7.3	1.6 ± 4.7

IMPROVING THE QUALITY AND SUSTAINABILITY OF HOME-BASED ACUTE CARE MODELS USING VIRTUAL CARE TECHNOLOGY

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ABSTRACT

IMPORTANCE
COVID-19 has facilitated the rise of a new service model that combines Hospital in the Home (HITH) service provision with technology to create 'virtual hospitals', but evidence on the impact of this new model in terms of cost and clinical outcomes, compared to usual (HITH) care, is currently lacking.

OBJECTIVE
To assess the clinical and financial impacts of virtual care technology on HITH models of care.

DESIGN
Quasi-experimental study comparing outcomes of a control group receiving 'usual' home-based acute care and a virtual care cohort using remote monitoring technology while also receiving usual HITH care.

SETTING AND PARTICIPANTS
Adult (aged 18+ years) and paediatric (aged 0-17 years) patients admitted to the Mackay Hospital in the Home (MHITH) program between 1 August 2020 and 30 June 2021.

INTERVENTION
Virtual care technology.

MAIN OUTCOMES AND MEASURES
Readmissions within 28 days, unplanned emergency department (ED) presentations, transfers-in to facility-based hospital beds, and average length of stay.

RESULTS

During the study period, 151 adult and 26 paediatric patients utilised virtual care technology for the majority, or all, of their home-based acute care. Use of such technology was associated with a statistically significant reduction in risk of hospital readmission within 28 days—from 43% to 21%. The risk of hospital readmission within 28 days for the same diagnosis-related group (DRG) dropped from 18% to 4%, and the length of stay for the top three DRGs by volume decreased from a mean of 7.2 days to 4.0 days, saving an average of $3,698 per admission. Use of technology was also associated with reduced rates of unplanned ED presentations and transfers-in to traditional hospital beds compared to usual care for adults.

CONCLUSIONS

Our findings confirm there are clinical, economic and consumer benefits associated with embedding virtual care technology in HITH service models that warrant consideration in health systems facing capacity constraints and rising costs.

KEYWORDS

hospital in the home, virtual care, remote patient monitoring, virtual hospital, emergency department presentations, hospital readmission, length of stay

INTRODUCTION

Despite evidence that hospital in the home (HITH) is a safe, satisfying, and cost-effective alternative to in-hospital care for suitable patients, [1,2] uptake of the model in Australia has historically been limited. Between 2011 and 2017, HITH care comprised, on-average, just 3.7% of all hospital admissions in Australia [3]. However, as the COVID-19 pandemic continues to place unprecedented strain on healthcare systems worldwide, Australian hospitals have been forced to rapidly scale bed-alternate models such as HITH to meet skyrocketing demand for acute care and avoid system collapse [4,5]. In Queensland, public patients who are admitted to HITH programs receive care and treatment comparable to the services offered in a traditional hospital setting [6]. Regular monitoring of vital signs and other clinical observations is an essential component of caring for patients who are admitted with acute conditions in order to assess treatment effects, detect complications, and identify early signs of clinical deterioration [7]. In a traditional inpatient setting, clinical observations are recorded by nurses as part of an admission assessment; these are recorded at the commencement of each shift and at a frequency determined by the patient's clinical status, with four hourly observations considered 'routine' [8,9,10]. However, the current face-to-face service delivery approach for HITH, which involves visiting a patient at home once or twice daily, inherently constrains the collection of routine clinical observation data to once every 12 to 24 hours and creates

an insurmountable barrier to the HITH objective of providing care equivalence.

Standard 8 of the National Safety and Quality Standards in Healthcare states that:
"measurement of physiological observations plays a significant role in detecting clinical deterioration. Abnormal observations may occur at any time during a patient's admission. Multiple studies and adverse events have shown that patients in acute care settings often go for prolonged periods without having appropriate physiological observations measured. When this occurs it can mean that clinical deterioration may not be recognised, and treatment may be delayed" [7 p.7].

Infrequent and delayed collection of clinical observation data has been identified as a potential contributing factor to increased average length of stay for HITH patients because of late identification of deterioration and/or delayed recognition of stabilisation to support discharge [11]. Historically, there has been no practical solution to this problem; however, recent advances in remote patient monitoring technology provide renewed hope that a panacea does in fact exist.

Trials and research into remote patient monitoring (RPM) programs, both nationally and internationally, have delivered results that indicate positive outcomes for patients and the health care system more broadly. These benefits include lower mortality rates [12,13,14] reduced

average length of stay [15], reduced hospital admission and re-admission rates, reduced emergency department utilization [16,17] improved symptom recognition and control, improved patient satisfaction [18], and cost savings [19]. Despite evidence suggesting that HITH is an optimal use case for RPM, the technology has not been routinely deployed in HITH programs throughout Australia. However, the onset of the global pandemic appears to have ignited clinical interest in remote patient monitoring technology [20]. It has also facilitated the rise of a new service model that combines HITH service provision with RPM and secure videoconferencing technology to create a new care delivery paradigm known as the 'virtual hospital'. Although the 'virtual hospital' concept has become popularised in healthcare transformation and thought leadership circles [21], studies that examine the impact of technology on HITH costs, clinical outcomes, and patient experience are limited [22]. Our aim was to assess the clinical impacts and potential financial benefits of virtual care technology on home-based acute care models in Mackay Hospital and Health Service, which provides adult and paediatric HITH services to a population of around 180,000 people in a range of regional, community, and rural settings in Queensland.

METHODS

In this quasi-experimental study, adult (18+ years) and paediatric patients (0-17 years) referred to the Mackay Base Hospital HITH program from 1 August 2020 to 31 June 2021 were approached for recruitment to the virtual care technology intervention at the point of admission, either in the hospital or during the initial home visit. Members of the HITH clinical team screened for suitability against pre-defined criteria (Table 1). They discussed the potential risks and benefits of using technology as an adjunct to usual HITH care before asking patients to sign a hard copy consent form and an equipment loan agreement. Patients who did not meet the inclusion criteria or who did not consent to participate were allocated to the control group (total n= 142, consisting of 134 adults and 8 paediatric patients) and reasons for non-enrolment were documented by the clinical team (Tables 2 and 3).

Two different deployment models were implemented to allocate and manage the 'loan pool' of hardware needed to remotely monitor the group of patients who consented to participate. Patients who did not own a suitable mobile device were provided with a complete monitoring kit consisting of an Android phone, pre-loaded with the Telstra Health MyCareManager remote patient monitoring mobile app, and three Therapeutic Goods Administration (TGA)-approved Bluetooth-connected medical devices: a thermometer, a blood pressure monitor, and a pulse oximeter. Patients who owned a suitable mobile device, and who were willing to use it, were supported at the point of enrolment to download the MyCareManager app from the AppStore or Google Playstore and pair the TGA-approved medical devices to their own mobile phone or tablet. Additional Bluetooth-enabled medical devices, such as glucometers and weight scales, were added to the kit based on clinical need and paired to the patient's mobile device. At the time of the trial there were no TGA-approved, Bluetooth-enabled pulse oximeters available for paediatric patients in Australia. Instead, these patients were loaned paediatric-specific, non-Bluetooth, TGA-approved medical devices, and their carers received instruction on how to manually enter data into the MyCareManager App.

Following set-up, the HITH team provided a brief induction on correct use of the software and devices, followed by a technical competency assessment of the patient and/or carer. After completion of these processes the patient was considered 'enrolled' in the technology and remote monitoring commenced. Both the control group receiving 'usual HITH care' and the intervention group using virtual care technology received once daily home visits, plus phone calls as required. In addition to this, patients allocated to the virtual care technology group were assigned daily tasks to complete in the app, including health surveys and assessments customised to their diagnosis, taking vital sign readings using medical devices, and participating in video consultations and coaching sessions with the HITH clinical team.

Data transmitted via the app was automatically triaged according to rule-based algorithms, and alerts were generated in the clinician portal to trigger proactive investigation and intervention by the HITH clinical team for any 'missed tasks' as well as any results returned outside of the reference ranges set by the HITH clinical team. At the end of the monitoring period, a patient experience survey was sent to all patients/carers who were officially enrolled in the program. In total, 151 adult and 26 paediatric patients were enrolled in the technology intervention over the study period. Further detail on patient numbers and baseline characteristics for both groups are outlined in Table 4. Clinician experience of virtual care delivery was

also assessed at completion of the study via a clinician survey as well as stakeholder interviews.

Existing admitted and non-admitted hospital data collections were linked, de-identified, and retrospectively analysed to identify differences between groups with regards to case mix as well as all-cause and same-diagnosis related grouping (DRG) readmission rates within 28 days. Differences in emergency department (ED) presentations during HITH admissions, transfers-in to a traditional hospital bed during the HITH episode of care, and avoidable readmissions (in accordance with Australian Commission on Safety and Quality in Health Care definitions of 'Avoidable Hospital Readmissions') [23] were also analysed. Validated methodologies were used to determine the cumulative incidence of events between groups and quantify relative differences in risk [24]. In addition to hospital statistical collections, HITH clinical teams recorded data in close-to-real time on events that were avoided through the use of technology, including home visits, ED presentations, and ambulance callouts. These avoided events were added to the total count of observed differences in hospital events reported in hospital data collections.

For the economic analysis, we calculated the theoretical savings associated with differences in the rate of events between groups that are known to contribute to healthcare costs, including readmissions within 28 days, ED presentations, transfers-in, and average length of stay (ALOS). Bed-day savings associated with ALOS differences were derived by calculating the variance in LOS between the intervention and comparator cohorts, multiplied by the number of separations in the intervention cohort. Each avoided hospitalisation event was assigned an average cost using 2020–2021 cost data supplied to the Independent Health and Aged Care Pricing Authority [25], with specific adjustments to reflect evidence suggesting that HITH separations are, on-average, 22% cheaper than facility-based separations for the same DRG [26]. Cost savings were then calculated based on differences in the incidence of events reported in hospital data collections between the two groups. Savings associated with avoided transfers-in to a traditional hospital bed were costed at 22% of the average cost of a hospital admission across all DRGs in the intervention group. A similar method was used to derive the average cost of an ED presentation using urgency related grouping cost and activity data. However, without the 22% cost adjustment given, there is no evidence to suggest that HITH patients who present to ED

during an admission result in lower ED presentation costs. To correct for differences in admission profiles between groups, ALOS changes were analysed across the combined three highest volume DRGs common to both groups. Avoided ambulance callouts were costed using actual cost data supplied by the Department of Health and were calculated using an average of costs between basic transfers and paramedic transfers, as detailed in Table 5. Cost savings associated with avoided home visits were derived using the formula outlined in Table 6. Statistical significance in outcomes between groups were calculated using unpaired confidence intervals.

RESULTS

During the study period, there were a total of 319 separations from the Mackay Base Hospital HITH program. Of these separations, 285 (89%) were for adult patients, and the remaining 34 (11%) were for paediatric patients. In total, 53% (n=151) of all adult separations and 76% (n=26) of all paediatric separations utilised virtual care technology during the trial period. Adult patients who used technology were more likely to be younger (average age 55 years compared to 67 years in the 'usual care' group) and require treatment for higher complexity conditions (37% of admissions coded as major complexity DRGs vs. 31% in the usual care group), as detailed in Table 4.

While small sample size combined with the positively skewed uptake of technology in the paediatric group resulted in inadequate statistical power to reliably detect any effects of the intervention, trends were positive for paediatric patients using virtual care technology. An 8% reduction in all-cause readmission risk within 28 days [95% CI 5%-13%, n=34] was reported for the paediatric virtual care technology group compared to those receiving usual HITH care and a 69% reduction in the risk of readmission for same-DRG within 28 days (Table 7).

The results for adults were more definitive, with a statistically significant reduction of 22% [95% CI 21%-23%] in all-cause readmission risk within 28 days for adult virtual care admissions compared to usual HITH care as well as a statistically significant reduction of 13.9% [95% CI 13.5%-14.4%] in same-DRG readmission risk within 28 days. In addition to this, there was a statistically significant reduction in average HITH LOS for the top three DRGs by volume (average HITH LOS reduced by 3.20 days from 7.20 to 4.00 days [95% CI 1.05 - 5.35, n=74]) for patients using

virtual care technology, compared to those receiving usual HITH care.

The benefits associated with avoided readmissions, avoided ambulance callouts, avoided home visits, and avoided ED presentations, in combination with LOS reductions, were identified for the group using virtual care technology. The results showed an estimated savings value of $548,879 over the study period, which equates to an average cost savings of $3,101 per admission. As a result, HITH episodes that utilised virtual care technology were determined to be, on-average, 23% less expensive than usual HITH care, with the majority of savings attributable to reductions in costs associated with readmissions and LOS.

Other non-financial benefits were also identified via patient experience surveys which were sent to all patients and/or their carers within 24 hours of discharge. The survey consisted of twenty-four questions covering the broad themes of: satisfaction with the virtual hospital service, adequacy of support to self-manage recovery at home, reliability and user friendliness of remote patient monitoring technology, future preference for home monitoring, financial impacts of remote patient monitoring technology, workforce participation during admission, and caregiver support during home-based hospitalisation. Results are summarised in Table 8.

In total, 133 out of the 177 (75%) patients onboarded to the virtual monitoring intervention responded to the patient experience survey. Patient and carer satisfaction with the 'virtual hospital' model was exceptionally high, with 97% of respondents indicating they were 'happy' or 'very happy' with the care provided by Mackay Hospital in the Home Virtual Care Service. Furthermore, 96% of participants reported being 'very comfortable' or 'comfortable' with the remote monitoring of their health observations and 97% identified that they felt 'very confident' or 'fairly confident' to self-manage their condition at home using the MyCareManager mobile application.

This high level of comfort and empowerment appears largely attributable to the comprehensive training and support offered by the Mackay HITH team. Patients and/or their caregivers in the intervention groups underwent in-person training and competency assessments on the mobile application and connected Bluetooth devices before going home. Furthermore, HITH staff offered both on-demand and scheduled telephone and video support, as needed, during their admission. This approach proved

highly effective in bolstering self-efficacy, as evidenced by the fact that 99% of patients and/or their carers reported feeling adequately supported to self-manage their medical condition at home.

In terms of usability, 94% of participants reported that the MyCareManager application was 'easy' or 'very easy' to use, while an equal proportion rated the Bluetooth equipment as user-friendly. Most patients (83%) reported no difficulties in using the Bluetooth equipment, however, a small fraction occasionally encountered Bluetooth connectivity disruptions (9%). Similarly, 85% reported no internet connectivity issues, with occasional issues reported by 12% of participants. The videoconferencing experience garnered positive feedback, with 91% rating it as 'excellent' or 'good'. These findings provide important evidence regarding the feasibility and acceptability of deploying virtual monitoring technology, even in rural and regional areas of Australia where mobile connectivity is reduced or compromised compared with the capital cities [27].

Qualitative feedback from parents of paediatric patients who lived in rural or remote areas indicated particularly high satisfaction with the model of care. Its primary benefits included allowing patients and their caregivers to return home much earlier than with conventional hospital stays and the familiarity and comfort of home care alleviated much of the typical stress and anxiety associated with hospitalisation, as evidenced by the following comments:

- "Cannot rate this service high enough. My child was so much happier being treated at home it made a massive difference in his recovery. Nurses were lovely."
- "The service was fantastic. It allowed our son to come home whilst still being on IV antibiotics when he otherwise would have had another 3 days in hospital."
- "A really great service and peace of mind as we live on cattle property not close to hospital."

The survey data yielded new insights concerning the perceived impacts and benefits of home-based admission on workforce participation. 45% of survey respondents reported having a designated caregiver while admitted to the virtual hospital. Among these caregivers, 30% reported needing to take time off from their own work responsibilities to attend to care for their friend or relative while they recovered at home. Specifically, 18% of caregivers took 1-10 hours off, another 18% took 10-20 hours off, and 64% took more than 20 hours off from their employment. While these figures may seem alarming, it is worth noting that 52% of

caregivers reported that they would have taken the same amount of time off if the patient had been admitted to a traditional hospital bed and a further 7% indicated they would have needed more time off if the patient had been admitted to a hospital bed as opposed to receiving treatment at home.

Survey respondents highlighted other financial advantages linked to the virtual hospital model. Approximately seven percent of patients and/or carers reported that they were able to continue to actively participate in paid employment whilst recovering at home. Among these, 30% reported engaging in work for 1-10 hours, while an equal percentage worked for between 10-20 hours and 40% were able to engage in more than 20 hours of paid employment during their HITH admission.

Finally, 99% of survey respondents reported that they did not encounter any unexpected out-of-pocket expenses related to the use of remote patient monitoring technology, such as additional data purchases. Only one patient reported incurring unexpected costs but these were relatively minor, with an estimated range between $0-30.

The study also captured clinician feedback on the virtual care model through a 22-question survey (Table 9). This survey focused on key areas including: the significance of remote patient monitoring data in clinical practice, confidence in the virtual hospital model, usability and perceived value of remote patient monitoring technology, safety considerations, and the influence of remote patient monitoring technology on their clinical approach and decision-making.

Overall clinician satisfaction with remote patient monitoring technology was high, with 77% of respondents reporting being 'mostly' or 'very satisfied' with their overall experience. 92% of clinical end-users who responded to the survey agreed that remote patient monitoring technology and telehealth consultations had demonstrably improved the management of HITH patients. More specifically, 77% reported that having frequent access to biometric and health survey data was important or very important for overall management of remotely monitored patients.

Clinicians were also asked to quantify the impacts of remote patient technology on operational efficiency. 85% of clinicians reported finding it 'easy' to onboard new patients to remote patient monitoring technology and 50%

believed that there had been no unexpected time costs associated with the use the remote monitoring technology on their clinical practice. However, 17% expressed uncertainty about the impact, while 33% identified the technology as having a negative time-cost. This mix of positive and negative effects is consistent with findings from similar studies examining the impact of new technologies, such as electronic medical records, on clinician workload [28]. These studies have pinpointed the initial learning curve as a significant, yet typically transient, challenge affecting both patient care and workflow for some clinicians. Although not explicitly measured in this study, it's plausible to deduce that the workforce disruptions caused by the frequent furloughing and substitution of hospital staff during the peak of the pandemic [29] when our clinician survey was conducted might have impacted their familiarity with the technology. This, in turn, may have influenced perceptions regarding impacts on operational efficiency.

Crucially, clinical end-users did not report any incidents or cases of patient harm associated with the use of remote patient monitoring technology in HITH cohorts. This feedback is consistent with data obtained from the hospital incident management system, which was cross-referenced for completeness and found to contain no reports of clinical incidents associated with remote patient monitoring technology. Together these datasets provide important evidence for the safe integration of remote patient monitoring technology into HITH care models at Mackay Hospital and Health Service.

One of the most surprising findings from the clinician survey related to the perceived impact of the introduction remote patient monitoring on the behaviour of referring clinicians. Half of survey respondents reported that, following an awareness campaign to promote the introduction of remote patient monitoring technology in the HITH service, they had noticed a positive change in the likelihood of other hospital-based clinicians to refer a patient to the HITH service.

A recent study on clinician perceptions of patient safety in home healthcare by Shahrestanaki et al sheds light on why this change may have occurred [30]. Their research revealed that many clinicians view the home environment as considerably more dangerous and less predictable compared to traditional hospital settings, offering fewer opportunities for monitoring and managing the risk of deterioration. Furthermore, they identified that if clinicians perceive that processes for safe care of a patient at home

are not implemented properly, it can cause collective loss for all those involved including: patients and caregivers (preventable injuries/complications, stress, anxiety and out-of-pocket expenses), clinicians (stress, anxiety, complaints) and home care providers (lawsuits and increased cost of care). However, the presence of strategies to proactively monitor patients and identify and mitigate risks were seen as key to maintaining perceptions of a safe model of care. Although not able to be verified, it is possible that the introduction of remote patient monitoring technology, with its inherent capability to monitor symptoms and vital signs of patients at home, may have improved referring practitioner perceptions of the overall safety of the Hospital in the Home service model.

DISCUSSION

Although a small pilot, this study demonstrates potentially large financial and non-financial benefits that could arise from embedding virtual care technology in HITH service models at scale. It also provides further evidence that technology-enabled 'virtual hospital' models appear to outperform usual HITH care in terms of reducing re-admissions, emergency department visits, and length of stay. The role that virtual care technology plays in delivering cost savings from the prevention of high-cost health events appears to be unique because of its dual influence on both patient and provider-related causes of preventable readmissions and ED presentations.

Providing HITH clinicians with more frequent access to quantitative observational data and qualitative symptom data appears to improve clinical decision-making in response to underlying trends and, in doing so, tackles the leading causes of provider-related preventable readmissions in the literature: poor resolution of the main problem during the index admission and unstable therapy at discharge [31]. By design, virtual care technologies incorporate a range of features that natively address patient-related factors in preventable readmissions and ED presentations, such as sub-optimal care plan adherence, poor health literacy, and self-management capability [32,33], through targeted nudging and real-time, continuous facilitation of feedback loops with established links to behaviour change [34].

Beyond empowering and educating patients, virtual hospital models appear to generate wider societal and health benefits stemming from increased workforce participation for both patients and their carers. Research indicates that participating in the labor force not only leads to economic benefits but also promotes higher levels of social inclusion. This, in turn, has been associated with lower mortality and morbidity, along with an enhanced quality of life [35]. These effects have important implications, not only for recovery and re-admission in the context of acute illness for HITH patients, but in the development of strategies to reduce caregiver strain associated with hospitalisation in traditional settings.

CONCLUSIONS

Our findings suggest that there are clinical, economic and consumer benefits that arise from embedding virtual care technology in HITH service models that warrant consideration in health systems facing capacity constraints and rising costs. However, larger studies are needed to confirm whether these benefits are repeatable, particularly in paediatric populations receiving home-based acute care.

AUTHOR CONTRIBUTIONS:

Brown, Cavanagh, Dorricott, Irving and LaRiviere had full access to all the data in the study and take joint responsibility for the integrity of the data and the accuracy of the data analysis.

CONFLICT OF INTEREST DISCLOSURES:

Mackay Hospital and Health Service has a licensing agreement with Telstra Health to utilise MyCareManager Virtual Health Monitoring technology. James Brown, Brian Dorricott, and Vickie Irving are employed by Telstra Health. Cathie LaRiviere and Judi Cavanagh are employed by Mackay Hospital and Health Service and have no disclosures.

ETHICS REVIEW:

Central Queensland Hospital and Health Service Human Research Committee (HREC) evaluated this quality initiatives (Project ID: 92467 17.01.2023) and determined that the proposal did not necessitate a comprehensive HREC review. The decision was based on the project's classification as non-research, involving existing data that exclusively comprises non-identifiable information about human subjects. Central Queensland Hospital and Health Service HREC noted the intent to publish.

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FIGURES AND TABLES

TABLE 1 – ELIGIBILITY & PATIENT EXCLUSION CRITERIA

Eligibility
All HITH patients meeting the following criteria were offered participation in virtual care technology: • Has provided written consent to participate in the program.   • Is admitted to the HITH Service and resides within the designated geographic catchment (40km/40 min drive from Mackay Base Hospital).   • Is physically able to apply and use virtual care equipment or has a carer who is physically able and consenting.   • Is deemed competent (by the Virtual Health Program Officer) in the use of the virtual care mobile application.   • Acknowledges (via written consent) that the clinician triage dashboard is only actively monitored at set intervals during business hours (0800-1630hrs), and after-hours ad-hoc vital signs will not be reviewed/acted upon, unless the patient contacts the Mackay HITH Coordinator with clinical concerns.   **Exclusion Criteria**   • Non-English-speaking patient who does not have an English-speaking family member/carer in residence to assist with using virtual care technology.   • Patient assessed as not competent to use virtual care software application and/or connected medical devices.   • Patient with cognitive impairment(s) and who does not have a competent/willing carer.   • Patient with visual impairment and who does not have a competent/willing carer.   • Patient who does not have access to the internet in their usual place of residence or whose access is unreliable.

HITH = Hospital In The Home.

Of the 354 patients admitted to the HITH program during the study period, 58.2% (n=206) were enrolled in virtual care technology. The 148 that were not enrolled were deemed to be not appropriate due to a range of factors, including patient confidence/competence/willingness to utilise technology, suitability, feasibility (brief admission), health service resourcing constraints, technology availability, or other factors, as outlined in Table 3.

TABLE 2 – UPTAKE OF VIRTUAL CARE TECHNOLOGY

Measure	Total
Accepted to HITH	354
Onboarded to virtual care technology	206
% of patients using virtual care technology	58.2
No. of adult patients onboarded to virtual care technology	177
No. of adult patients suspended but recommended virtual care technology	6
No. of paediatric patients onboarded to virtual care technology	26
No. of paediatric patients suspended but recommended virtual care technology	8
No. of virtual care technology admissions excluded from analysis*	26

HITH = hospital in the home.

TABLE 3 – REASONS FOR NON-ENROLMENT IN VIRTUAL CARE TECHNOLOGY

Reason for non-enrolment	Proportion (of those not onboarded)
Logistical factors (administrative)	28%
Excluded – no suitable device	14%
No clinical indication for virtual care technology	12%
Patient did not consent	11%
Excluded – patient not comfortable with technology	10%
Excluded – patient impairment/disability	9%
Other	8%
Excluded – home situation	3%
Excluded – internet reception	3%

*A further reduction of the cohort size was performed because

(a) there were a number of admissions that were identified as having commenced the program *after* the cut-off period of 30 June 2021.

(b) two HITH admissions were for dialysis and were subsequently excluded.

(c) 15 virtual care technology admissions were excluded from the analysis after clinical review of the 'withdrawal' list with Mackay Hospital staff as it was identified that they had withdrawn consent to participate after being onboarded or did not actually use the technology during the HITH admission after being onboarded.

TABLE 4 – PATIENT POPULATION AND CHARACTERISTICS

Key statistics	Virtual care technology HITH admissions	HITH 'usual care' admissions
Total admissions	177 (55%)	142 (45%)
Adult	151	134
Paediatric	26	8
Gender (count)		
Male	93 (53%)	90 (63%)
Female	84 (47%)	52 (37%)
Average age (years)		
Adult	55	67
Paediatric	6	6
Case mix		
DRG types	88	76
Major complexity DRGs	37.1%	30.6%
Intermediate complexity DRGs	49.7%	51.5%
Minor complexity DRGs	11.3%	16.4%
z-code DRGs	2.0%	1.5%

DRG = diagnosis-related group; HITH = hospital in the home

TABLE 5 – AVOIDED AMBULANCE CALLOUT COSTS

Cost data	Cost ($)
Avg cost per callout – *basic transfer (no paramedic)* ^	$130
Avg cost per callout – *paramedic transfer* ^	$830
Average cost per callout	$480

^Source: BROLGA. Data supplied by Healthcare Improvement Unit, Queensland Health June 2020.

TABLE 6 – AVOIDED HOME VISIT COSTS

Where a home visit is avoided, the clinician will not only experience a time saving/efficiency benefit for the consultation but also for the time taken to travel to and from the patient's home. The methodology for calculating travel time savings is presented below.

A) Clinician travel time savings

Clinician travel time savings methodology
Travel time savings = average travel time x number of trips (avoided/substituted) x value of time
Average travel time = (average distance from hospital x 2) / average travel speed = 50 minutes
Average travel speed = 60km/hr (urban roads/motorways)
Average distance from hospital = 15 km (30 km return) - Based on 1 week sample data collected by HITH clinical team
RN Level 6 Qld 2020 hourly wage rate $46.88
Value of clinician travel time = 50 mins = 0.83 x RN level 6 hourly wage = $38.90

B) Vehicle operating cost savings

Vehicle operating cost savings are another benefit associated with avoided home visits. Where a patient's incident is resolved through an alternative response that does not require travel by either the clinician or the patient, the costs associated with operating a vehicle such as fuel, oil, tyres, and repairs and maintenance are reduced compared to the baseline.

Vehicle operating cost savings methodology
• Total vehicle operating cost savings = average travel distance x avoided trips x VOC per km
• VOC = $0.42 per km (assuming an average travel speed of 60 km per hour) based on ATAP Guidelines PV2 Road Parameter Values (2016), inflated to 2020 prices.
• Average distance = 16 km (32 km return)
• Average VOC per home visit = $13.44
• **Total home visit cost** = value of clinician travel time + average VOC per home visit **= $38.90 + $13.44 = $52.79**

VOC = vehicle operating cost.

TABLE 7 – INCIDENCE OF ADULT AND PAEDIATRIC HOSPITAL EVENTS

Key statistics from pilot	MCM pilot participants	HITH 'usual care' patients
Adult admissions		
HITH all cause readmissions	31 (21%)	57 (43%)
HITH same-DRG readmissions (subtotal)	6 (4%)	24 (18%)
% Reduction in all-cause risk of readmission within 28 days	51.7%	-
% Reduction in same-DRG risk of readmission within 28 days	77.8%	-
# of avoided readmits associated with reduction in all-cause risk of readmission	33	-

Key statistics from pilot	MCM pilot participants	HITH 'usual care' patients
Paediatric admissions		
HITH all cause readmissions	3 (12%)	1 (13%)
HITH same-DRG readmissions (subtotal)	1 (4%)	1 (13%)
% Reduction in all-cause risk of readmission within 28 days	7.7%	-
% Reduction in same-DRG risk of readmission within 28 days	69.2%	-
# of avoided readmits within 28 days	<1	-
All admissions		
Avoidable readmissions – ACSQHC defined*	0	0
Emergency department presentations		
% reduction in risk of transfer-in from home ward to inpatient ward compared to usual HITH care	11.3%	
# of avoided transfers-in from home to inpatient ward	<1	
# ED presentations during HITH admission	5 out of 151 (3.3%)	5 out of 134 (3.7%)
% reduction in ED presentations during HITH admission	11.3 %	
# of avoided ED presentations during HITH admission	<1	

DRG = diagnosis-related group; ED = emergency department; HITH = hospital in the home.

TABLE 8 – PATIENT EXPERIENCE DATA

Key patient experience findings					
Overall, how satisfied were you with the care from the Mackay Base Hospital in the Home Virtual Care Service	very satisfied (91%)	mostly satisfied (6%)	neutral (0%)	not very satisfied (1%)	very unsatisfied (2%)
How did you find the MyCareManager (MCM) application to use?	very easy (61%)	easy (33%)	neutral (4%)	difficult (1%)	very difficult (1%)
Overall, how did you find the equipment to use?	very easy (66%)	easy (28%)	neutral (4%)	difficult (2%)	very difficult (0%)
Other patient experience findings					
Comfort having observations remotely monitored: 96% very comfortable or comfortable					
Confidence to self-manage condition at home using MCM: 97% very confident or fairly confident					
Any difficulties using equipment: 83% no difficulties					
Support to self-manage condition at home using MCM: 99% very supported or fairly supported					
Preference to be monitored at home in future: 80% definitely or probably would; 12% do not have a particular preference					
Videoconferencing experience: 91% excellent or good					
Bluetooth connectivity: 70% of patients had no issues with Bluetooth; 9% sometimes or occasionally had connectivity issues; 12% did not use Bluetooth equipment					
Internet connectivity: 85% of patients had no issues with connectivity; 12% sometimes or occasionally had connectivity issues					
Workforce participation during HITH RPM: 7% patients participated in the paid workforce during HITH admission while using the remote patient monitoring technology					

Key patient experience findings
• 30% of these patients worked 1-10 hours during their HITH admission
• 30% of these patients worked 10-20 hours during their HITH admission
• 40% of these patients worked more than 20 hours during their HITH admission
Financial Impacts of HITH RPM: 99% patients did not experience unexpected out-of-pocket costs associated with using the remote patient monitoring (e.g. purchasing extra data).
• 1 patient reported experiencing unexpected costs associated with RPM ranging between $0-30
HITH impacts on Caregiving:
• 45% RPM patients reported having a carer during HITH admission
• 30% of carers had to take time off work to care for the patient during HITH admission
• 18% carers took 1-10 hours off work
• 18% carers took 10-20 hours off work
• 64% carers took more than 20 hours off work
• 52% carers would have taken the same amount of time off if the patient had been admitted to traditional hospital bed
• 18% would have taken less time off if the patient had been admitted to hospital
• 7% would have taken more time off if the patient had been admitted to hospital

MCM = MyCareManager.

There was a 75% response rate (n=133/177) to the patient experience survey.

TABLE 9 – CLINICIAN EXPERIENCE DATA

Key clinical experience findings				
'Please rate the impact that having access to _____ had on the interaction you had with HITH patients during home visits'.				
Quantitative (biometric) data	77% very positive impact	15% somewhat of a positive impact	0% Somewhat negative, very negative, & no impact	8% N/A – I did not do any home visits
Qualitative (health survey / symptom) data	62% very positive impact	31% somewhat of a positive impact	0% Somewhat negative, very negative, & no impact	8% N/A – I did not do any home visits
Other clinician experience findings				
• **92%** believed that MyCareManager and Telehealth consultations has **enabled improvement in** the management of HITH patients.				
• **85%** of those that onboarded patients, found it '**easy' to onboard new patients** onto the platform				
• **77%** found it moderately or very **important to have access to data** (both frequent biometric and health survey) for the overall management of HITH patients				
• **77%** were mostly or very **satisfied with the overall experience** using the care model				
• **50%** observed a positive change in the likelihood of clinicians to refer a patient to the HITH service. The remainder were unsure or observed no change.				
• **50%** believed there have been no unexpected time costs to use the remote monitoring technology (17% unsure)				

HITH = hospital in the home; MCM = MyCareManager.

Survey included 22 questions covering broad themes: importance and impact of data, confidence in model of care, level of ease, value of MCM, incident management & behavioural change. Responses (n=14) to clinician surveys from 11 nurses, 1 allied health practitioner, and 2 medical officers.

RESEARCH ARTICLE

STRATEGIC MANAGEMENT AND PLANNING FOR HEALTH CARE ORGANIZATIONS IN GEORGIA

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ABSTRACT

BACKGROUND:

In order to better adapt to the constantly changing global and local environment, the main priority of the healthcare system is the stable functioning of the hospital sector, for which it is necessary to constantly execute efficient strategic management processes. The purpose of the research is to study the barriers to effective implementation of strategic plans in healthcare organizations in Tbilisi (Georgia).

METHODS:

As part of this quantitative research, a survey of 23 senior managers of 10 large hospitals in Tbilisi was conducted using a pre-structured questionnaire.

RESEARCH RESULTS:

None of the hospitals employed external consultants for strategic planning. A relatively small number of hospitals had representatives attend strategic planning lectures and training (13%), and only one of the hospitals surveyed had a strategic planning committee (4.3%), with the majority of surveyed hospitals (87%) had a documented strategic plan. Strategic planning was primarily engaged by the management board (69.6%), with doctors participating to a lesser extent (30.4%). Only one-third (34.8%) of hospitals develop their budget according to the strategic plan. Resources (43.5%), allocation of budget funds (47.8%), and identification and acquisition of additional financial resources (47.8%) are not done in accordance with the goals and priorities of the strategic plan. The majority of hospitals are less likely to compare the results of the evaluation of goal achievement indicators with those of other hospitals (52.2%), Only a few of them report the values of actions taken to accomplish the strategic plan's goals to the hospital (43.5%), Most of the hospitals rarely do benchmarking of other hospitals' goal-achieving measures to assure the effectiveness of strategic projects (78.3%).

DISCUSSION:

Only a small number of healthcare organisations have a strategic management process that as a consequence affects their status and success in the healthcare market. Hospitals may develop a strategic plan, but its implementation is poorly monitored and not based on scientifically solid methods. Due to inappropriate competence, a lack of knowledge, and a misperception of strategic importance, physicians' strategic planning skills are at a low level. In order to master such skills, it is necessary to conduct systematic training.

CONCLUSION:

It is reasonable for the State to impose a legislative requirement that the health care organisations must produce a written strategic plan and employ a strategic management manager. It is essential to provide educational training on hospital strategic management processes.

KEYWORDS

INTRODUCTION

Strategic planning is a set of activities that enable an organization in identifying its intended future and developing actions that will lead to it [1]. An organization creates a document that serves as a guide for the company over an extended period of time and outlines its strategies for getting from the current situation to the desired future one. Strategic planning involves taking long-term measures and helps the organization to anticipate and avoid expected risks [2]. A well-planned strategic plan can anticipate environmental changes and allocate resources appropriately [3]. Strategic management integrates the organization's common goals and values, improves the financial condition, and simplifies decision-making, reforms, and innovations.

The strategic planning process consists of four main stages: assessing external circumstances (political, economic, sociocultural, technological, and legal), evaluating its internal setting (as for example using SWOT analysis), determining its strategic goals and objectives; putting the strategic plan into action; evaluating its intermediate and final results; and making changes and corrections. The strategic modification process is ongoing and always being updated [4].

Health care organisations operate in dynamic global and local environments that are affected by demographic, economic, political, legislative, technological, and other societal developments. These changes have led to a complicated and unstable competitive environment. In order to better adapt to the continually evolving environment, the key priority of the healthcare system is the smooth operation and stable condition of the hospital sector, which will respond to the daily complex challenges. It is essential to consistently put into practice efficient strategic management processes in hospitals in order to build a stable and profitable environment [5].

In some countries, according to legislation, health care organisations are required to have a written strategic plan for accreditation, as well as they are obliged to create a strategic planning department, which defines the medium and long-term strategy of the organization. In Turkey, the health system has achieved impressive results through a health care reform program based on strategic planning [6].

Studies indicate that hospitals develop a strategic plan due to the requirement of the established regulatory rule in the country, only for a limited number of hospitals, the development of a strategic plan was a motivation to achieve organizational success [7]. According to research, there is a strategic plan in hospitals, however it cannot be defined in detail by people in charge [8]. Due to the external environment risks, which are mostly of a political-legal and financial nature, health care organisation's strategic management processes lag behind those in other business sectors [9].

Political factors have a huge influence on the strategic management process, particularly, unpredictable strict regulations of the state represent a significant threat. However, researchers claim that the stability of hospitals, which necessitates the efforts of all stakeholders, should be the state's top priority [10, 11, 12].

There are numerous problems with hospital strategic management in different countries around the world. Due to ongoing reforms in the hospital sector in Georgia, healthcare organizations have made many changes in their management methods. In order to adapt to the changing environment of the medical market, it became necessary to strengthen the strategic planning processes. In this regard, this is the first study in Georgia about the challenges of strategic planning in medical organizations. The purpose of the research is to study the barriers to effective implementation of strategic plans in healthcare organizations in Georgia. This will help to improve understanding of strategic planning as a critical issue in healthcare management.

METHODOLOGY

A quantitative study was conducted using a questionnaire survey method. A total of 13 large hospitals of Tbilisi (capital city of Georgia with a population of 1.5 million) were

contacted in the initial stage of this project, and 10 agreed to participate. Hospitals were chosen based on their size, location, bed count and ownership. Of the studied hospitals, 18 (78%) were of general services profile, and 5 (22%) were specialized. The number of beds, in half of the hospitals participating in the study (49%) was between 100 and 200; the majority of hospitals (74%) had more than 200 workers.

Hard copy surveys were distributed to 41 middle and high-level managers from selected hospitals and 23 responded to our survey (56.1% response rate). Key staff of the hospitals participated in the study, including the general director, financial director, technical director, head of quality management service, director of public relations, clinical director, head of research and development of the hospital, as well as heads of various departments (surgery, gynecology, obstetrics, pediatrics). They were chosen as respondents since they are in charge of developing the organization's strategy. The surveys were conducted from 01.11.22 to 10.12.22.

The research tool utilized was a pre-structured questionnaire prepared based on a literature review, expert opinions and was adapted to the reality of Georgia. Before taking up the research, the questionnaire was pre-piloted. Content and form validity were confirmed by six experts in strategic planning. After piloting minor adjustments were made to the questionnaire which comprises of five parts: characteristics of hospitals, strategic plan development and implementation process in hospitals, budget distribution in hospitals according to strategic priorities, project implementation process in hospitals according to the strategic plan, an evaluation of how well hospitals performed in terms of their strategic goal.

The data are collected by going to each healthcare organisation in person and filled the questionnaires by interviewing each respondent. Budget distribution, project implementation process in hospitals and hospitals performance evaluation are rated with a 3-point system: weak, medium and good.

The study was approved by the Research Ethics Committee of Caucasus University (CAU No. 012/22). The survey was conducted following the principle of informed consent. Respondents were provided with information about the study. There was also an examination of hospital documents on request and by doing so the responses have been validated.

LIMITATIONS

This study had some potential limitations that may affect the results. The study was limited to hospitals of ten hospitals in a single city (Tbilisi, Georgia). Therefore, generalizability of the results is a limitation of this study. Future studies may widen their samples and include other healthcare organizations from country, thereby allowing researchers to extend applicability to other settings.

RESEARCH RESULTS

Most of the managers interviewed (60.9%, n= 14) hold a master's degree. The majority of managers (65.2%, n= 15) had a background in business administration. Table 1 shows further hospital demographic data. [Do not delete section break]

TABLE 1: CHARACTERISTICS OF HOSPITALS IN THIS STUDY

Characteristics of hospitals		N	%
Type of the hospital	General	18	78%
	specialized	5	22%
Number of beds	Less than 100	3	13%
	100-200	11	49%
	More than 200	9	38%
Number of employees	Less than 200	6	26%
	More than 200	17	74%
Managers' level of education	Bachelor	5	21.7%
	Master	14	60.9%
	Doctor	4	17.4%

| The field of managers' education | Healthcare management | 8 | 34.8% |
| | Business Administration | 15 | 65.2% |

For strategic planning, none of the hospitals used external consultants. Very few hospitals had staff that participated in lectures and training on strategic planning (n=3, 13%); only one inpatient hospital had a strategic planning committee (n=1, 4.3%); and most of the inpatient facilities interviewed (n=18, 78.3%) had a documented strategic plan. The management board (n=16, 69.6%) was mostly involved in strategic planning and doctors were partially involved (n=7, 30.4%).

In the initial phase, this study examined how the hospital budget is determined in accordance with strategic priorities. Only a third of hospitals (n=8, 34.8%) base their budgets on priorities and strategic objectives, according to the survey. Almost half of the hospitals reported that the hospital budget is not reviewed according to the hospital's strategic goals. In one third of hospitals (n=7, 30.4%) the budget is developed according to the strategic plan. However, the distribution of resources (n=10, 43.5%) and budget funds (n=11, 47.8%), as well as the identification and acquisition of new financial resources (n=11, 47.8%) are not in accordance with the goals and priorities of the strategic plan (Table 3).

TABLE 2: STRATEGIC PLAN DEVELOPMENT AND IMPLEMENTATION PROCESS IN HOSPITALS IN THIS STUDY

		N	%
Strategic management consultant	Yes	0	0%
	No	23	100%
Strategic management committee	Yes	1	4.3%
	No	22	95.7%
A documented strategic plan	Yes	18	78.3%
	No	5	21.7%
Participation in strategic planning lectures and training	Yes	3	13%
	No	20	87%
Involvement in strategic planning	Governing Board	16	69.6%
	Personnel	7	30.4%

TABLE 3. BUDGET DISTRIBUTION IN HOSPITALS IN THIS STUDY ACCORDING TO STRATEGIC PRIORITIES

	weak	medium	good
	n/%	n/%	n/%
The budget is set based on priorities and strategic goals	10 (43.5%)	5 (21.7%)	8 (34.8%)
The budget is updated in accordance with strategic goals.	12 (52.2%)	6 (26.1%)	5 (21.7%)
The budget is developed according to the strategic plan	11 (47.8%)	5 (21.7%)	7 (30.4%)
Resources are allocated according to the strategic goals	10 (43.5%)	9 (39.1%)	4 (17.4%)
Allocation of budget funds according to the priorities set by the strategic plan	11 (47.8%)	5 (21.7%)	7 (30.4%)
New financial resources are identified and acquired to accomplish strategic goals	11 (47.8%)	3 (13%)	9 (39.1)

This study then investigated the extent to which hospitals operate according to a predetermined strategic plan. Most hospitals integrate project implementation and goals with the hospital's strategic plan. However, the annual evaluation of managers and the establishment of an annual reward system are not done according to the level of achievement of strategic goals.

In terms of reviewing the strategic plan, the survey discovered that most hospitals regularly evaluate the results of programs centered on strategic goals using pre-defined target achievement indicators. In addition, hospitals evaluate target performance rates throughout certain time periods. However, the majority of hospitals are less likely to compare the results of the evaluation of the performance indicators with those of other hospitals (n=12, 52.2%), regularly report the values of the measures to achieve the strategic plan goals to the hospital (n=10, 43.5%) and to the public and stakeholders (n=17, 73.9%). They are also less likely to benchmark other hospitals' performance measures to ensure the effectiveness of strategic projects (n=18, 78.3%).

TABLE 4. PROJECT IMPLEMENTATION PROCESS IN HOSPITALS IN THIS STUDY ACCORDING TO THE STRATEGIC PLAN

	weak	medium	good
	n/%	n/%	n/%
Projects are carried out according to the strategic plan	3 (13%)	4 (17.4%)	16 (69.6%)
The set goals are in line with the hospital's strategic plan	3 (13%)	5 (21.7%)	15 (65.2%)
Managers are evaluated on an annual basis depending on their achievement of strategic goals.	16 (69.6%)	4 (17.4%)	3 (13%)
An annual reward system is established based on the level of employee participation in the implementation of strategic goals	18 (78.3%)	2 (8.7%)	3 (13%)
Annual evaluation of the performance of the hospital manager according to the level of achievement of strategic goals	17 (73.9%)	2 (8.7%)	4 (17.4%)

TABLE 5: AN EVALUATION OF HOW WELL HOSPITALS IN THIS STUDY PERFORMED IN TERMS OF THEIR STRATEGIC GOAL

	weak	medium	good
	n/%	n/%	n/%
Evaluation of the results of projects related to the strategic plan using indicators of goal achievement	2 (8.7%)	5 (21.7%)	16 (69.6%)
Use of target achievement indicators at both hospital and department level	3 (13%)	6 (26.1%)	14 (60.9%)
Considering the balance between them when developing indicators of goal achievement	4 (17.4%)	6 (26.1%)	13 (56.5%)
Regular evaluation of indicators of goal achievement	5 (21.7%)	6 (26.1%)	12 (52.2%)
Analysis of target achievement indicators throughout certain time periods	6 (26.1%)	7 (30.4%)	10 (43.5%)
Comparison of the results of the examination of the target accomplishment indicators with prior evaluations	8 (34.8%)	6 (26.1%)	9 (39.1%)
Comparing the results of the evaluation of the indicators of the achievement of the goals with the predetermined standard	9 (39.1%)	4 (17.4%)	10 (43.5%)
A comparison of the results of the evaluation of the achievement of the objectives with the results of other hospitals	12 (52.2%)	4 (17.4%)	7 (30.4%)

After assessing and comparing the results of the evaluation of measures to accomplish the goal, developing and implementing appropriate interventions	9 (39.1%)	8 (34.8%)	6 (26.1%)
Regularly report to the hospital the values of measures to achieve the goals of the strategic plan	10 (43.5%)	7 (30.4%)	6 (26.1%)
Regularly reporting to the public and stakeholders the value of measures to achieve strategic plan goals	17 (73.9%)	3 (13%)	3 (13%)
Benchmarking measures of other hospitals goal achievement in order to ensure the effectiveness of strategic projects	18 (78.3%)	3 (13%)	2 (8.7%)

DISCUSSION

The process of developing and implementing a strategic plan in 23 prominent hospitals of Georgia was examined in this study. According to this research, the governing board is the most involved in strategic planning, while physicians are relatively less involved. Involving physicians in the strategic management process is critical to developing an effective strategy. It plays a decisive role in the success of a healthcare organization as physicians are directly involved in the provision of medical services. Involving physicians in the strategic planning process increases support for the strategic plan, making it easier to implement, also it increases the motivation of physicians to provide useful recommendations on all issues directly related to physicians. This level of involvement of physicians can contribute to a better understanding of the perspective of physicians by leaders of healthcare organizations. Involving physicians will promote the acceptance of difficult decisions and will also increase the focus of the medical organization on high-risk services, as doctors better understand the requirements for improving medical services [13].

Research shows, that very few hospitals participate in strategic planning lectures and trainings. A lack of strategy understanding limits the proper implementation of a strategic plan. Training has become an important component of ongoing changes, employee evaluation and career development in any organization [14]. In addition, training is an essential mechanism for managers to improve their management skills and learn new skills. Strategic planning training has a positive impact on hospital leaders' ability to develop their hospital's mission and vision, strategic goals, and action plan [15]. In recent years, the demand for educational trainings, especially for managers, has increased in healthcare organizations. Some hospitals devote significant resources to the education of facility managers. The positive effect of training justifies the implementation of additional investments in education. Health facility managers in Georgia can work without formal management education. In such cases, conducting special training for managers on management issues will maximize the effective management of the health care organization.

Despite the fact that the vast majority of hospitals (n=18, 87%) had a documented strategic plan, the significant number of hospitals rarely develop or modify hospital budgets in accordance with the strategic plan, goals and priorities. Furthermore, the allocation of resources and budget funds, as well as the identification and acquisition of new financial resources, are not in accordance with the strategic plan's goals and priorities. This indicates that strategic planning has not yet found its place in the healthcare system. Strategic management is only being implemented by a tiny percentage of hospitals, which has an impact on their success and position in the healthcare industry.

Although hospital managers are in charge of achieving strategic goals, their performance is not annually assessed. Additionally, the annual reward system of hospitals does not take into account the level of participation of employees in the implementation of strategic goals.

According to this research, most hospitals regularly evaluate the outcomes of projects that focus on achieving strategic goals using pre-established goal achievement indicators. Hospitals also analyze target achievement rates at specified time periods or as needed. However, the evaluation results are not properly analyzed. The results of the examination of the goal-achievement indicators are rarely compared to those of previous analyses, predetermined standards, or outcomes obtained in other hospitals [16]. Additionally, neither the hospital nor the

community or other stakeholders are regularly informed of the costs of the measures taken to accomplish the goals of the strategic plan. Less emphasis is put on benchmarking measures to achieve the goals of other hospitals in order to ensure the effectiveness of strategic projects.

According to research, establishing quality management standards and tools (such as The Joint Commission International, KTQ-Accreditation or ISO 9001) in hospitals enhances the development of strategies, which raises the hospital's evaluation status as well. As a result, adequate integration of quality management standards into strategic planning is required [19].

Based on this research it can be seen that, hospitals in Georgia just create a strategic plan and fail to put it into action. Other research with similar findings concluded that while health care organizations create good strategic plans, the control of their execution is very poor and not based on scientific principles [17].

This study shows that hospitals should use the most up-to-date science-based methodologies and tools to implement and evaluate their strategic goals more successfully than they currently do.

In most of the studied hospitals, aspects such as clearly defining the hospital's mission, purpose and values, employee qualifications, training and development, defining customer needs and offering high-quality services are considered to be the most important points of management. Strategic management issues, on the other hand, receive less attention.

In general, ideally, the strategic planning process involves all managerial and operational levels of the organization. This study shows that top managers and heads of various departments participate in the strategic management process, but other stakeholders, such as doctors, have a low level of participation. Studies confirm that the skills of doctors in strategic planning are at a low level, which can be attributed to improper competence, a lack of knowledge, wrong perception of strategic importance [12, 20]. Organisational development focused on strategic planning should be considered by these services.

Hospitals in Georgia are not required to develop a strategic plan. However, it is evident that many benefits can be gained by hospitals who engage in this level of planning. In this regard, health care organizations in some countries are obliged to develop a strategic plan. For example, the Iranian Ministry of Health requires hospitals to have a written strategic plan in order to support the attainment of hospital accreditation. According to Turkish State law, all government organizations must have a strategic planning department and a strategic plan, the execution of which is monitored in accordance with predetermined guidelines [18]. In Georgia, neither the State's or the Ministry of Health's role is defined in this regard. Internationally it is common practice for healthcare organisations to have organisational strategy at health service and hospital level. Australia, New Zealand and the United Kingdom are good examples of this.

CONCLUSION

The significance of strategic management for the continuing development of health care organizations is expanding as a result of the increased competitiveness in the medical industry. It is recommended that the State pass legislation that the hospitals and medical organizations must develop documented strategic plans and employ strategic management managers. In this regard, there is a similar practice of state intervention in Georgia. For instance, the legislation mandates that inpatient healthcare organisations have a quality management system and that the facility have a clinical manager who is in charge of the inpatient service. Conducting educational training about the strategic management process with inpatient facilities is crucial. It is essential to provide educational training on the strategic management process in hospitals.

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RESEARCH ARTICLE

EMERGENCY DEPARTMENT NURSES' CLINICAL COMPETENCE AND ITS RELATED FACTORS: A CROSS-SECTIONAL STUDY

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ABSTRACT

OBJECTIVES

This study aimed to assess perceived clinical competence levels of emergency department nurses in Iran and to identify association with the demographic variables.

METHODS

In this cross-sectional study, all 131 employed nurses from emergency departments of four educational hospitals were included in the study using a census method. Data collection tools included a demographic information form and the "Nurse Competence Scale". Data were analyzed using descriptive and analytical statistics.

RESULTS

The mean age of the nurses was 32.41± 6.35 years. 14 nurses were male and 117 nurses were female, the average work experience of the nurses was 8.48±5.98 years. The mean score of nurses' clinical competence score of the nurses was 68.68 ± 3.24 out of 100, which was a "good level". Among the subscales of clinical competence, the highest mean score was related to "managing situation" and lowest to "ensuring quality". There was no statistically significant difference of clinical competence by gender, age, and academic degree. However, the level of clinical competence differed significantly depending on work experience.

CONCLUSIONS

The emergency department nurses at Mazandaran University of Medical Sciences, Iran, reported a good level of clinical competence across all categories. Hospital managers' awareness of the level clinical competence of emergency department nurses helps them design educational programs and effective training session to improve the quality of nursing services. Moreover, it is necessary to upgrade nursing education programs at all levels of nursing education in to improve graduating nurses' clinical competences.

KEYWORDS

clinical competence, nurses, emergency department

INTRODUCTION

Emergency department (ED) nurses are at the front line of providing care for patients. They are in charge of the accurate assessment, management, interpretation of clinical data, interventions, and ensuring patient safety. [1] Emergency departments frequently encounter patients who are confronting a potential life-threatening circumstance, and the effectiveness of the healthcare providers' clinical expertise is a significant concern. The capability of nurses to provide emergency care plays a crucial role in ensuring the safety of patients. [2] Emergency nursing care presents a distinctive feature in Iran, which is recognized as one of the countries with the highest incidence of earthquakes worldwide. The prevalence of trauma is a major factor in mortality and disability, with injuries accounting for 14.4% of all deaths. [3] In recent decades, competency has been a major issue for all healthcare providers, and its description and development has been a challenge. [4] Competence is a collection of knowledge, skills, attitudes, values and skills that increase efficiency and effectiveness in professional work environments. [5] Competence refers to one's capacity to carry out a particular professional task with proficiency and productivity. This implies that the caregiver has the ability to apply their skills in a manner that is suitable for the specific area and can meet the needs of the clients. [6] Nursing managers within the healthcare have made significant strides in recognizing clinical competency and promoting it among nurses. [7] Given the need for quality patient care by nurses and the close association between nurse competence and the success of healthcare organizations, the clinical competence of nurses is a priority issue in all healthcare settings. [8] The implementation of competency assessment criteria is expected to result in significant increase in the knowledge and awareness of the nursing staff regarding their level of competency. Such assessments will aid in the identification of any inadequacies in their theoretical knowledge or practical skills. [9] The competencies required of emergency room nurses are unique due to the nature of the emergency room environment. In the emergency room, caregivers are faced with rapidly changing and unexpected situations, critical patients and time pressures. [3] Assessing the competency of practicing nurses is critical to identify areas for professional development and educational needs, and to ensure that nurses' competencies are best utilized in patient care. [10] Developing, maintaining and assessing nursing skills are among the greatest challenges in the

nursing profession. [11] Our knowledge of the status of clinical qualification and level of nursing skill is very low and not many studies have been conducted in this area in Iran. [12] The study results showed that the competence of ED nurses to provide care in critical situations is not at an optimal level and was below average in all competences. [13, 14] However, the results of other research have demonstrated that the clinical competency of nurses is desirable. [9, 12]

Accordingly, this study aimed to assess the perceived level of clinical competence of ED nurses in Iran.

METHODS

RESEARCH DESIGN AND SETTING

The present study was a cross-sectional descriptive study examining the clinical competence of ED nurses from the Mazandaran University of Medical Sciences (MUMS) in Sari, Iran, in 2018.

STUDY POPULATION

The statistical population of this study consisted of all 131 employed ED nurses from four MUMS-affiliated educational government hospitals. The sample was collected using the census method and all employed nurses in the four emergency departments were included in the study. The response rate to the questionnaires was determined to be 100%.

STUDY INSTRUMENT AND DATA COLLECTION

Data collection was performed using a demographic information form and the Nurse Competence Scale (NCS). The demographic information includes questions about age, gender, education level, work experience, and marital status. The NCS was developed based on theory "from beginner to skilled banner". [15] It was provided by Meretoja and colleagues, (2004) and proved to be highly reliable and valid. [10] The instrument measures 73 nursing skills in seven different categories, including: "Helping roles" (7 skills), "Teaching-coaching" (16 skills), and "Diagnostic function" (7 skills), "managing situation" (8 skills), "Therapeutic interventions" (10 skills), "Ensuring quality" (6 skills) and finally the field of "Work role" (19 skills). The questionnaire was completed by the nurses using the self-assessment method and they were asked to give themselves a minimum score of zero and a maximum of one hundred for each skill. In addition, participating nurses were asked to use a 4-point Likert scale to determine the frequency of use of skills related to clinical competence,

including inapplicable, seldom used, occasionally used, and frequently used skills, rated from 0 to 3 respectively. In Iran, NCS was first translated by Bahreyni and Colleagues (2010). Subsequently, the validity of the questionnaire was confirmed based on the opinions of experienced experts and nursing teachers. The reliability of the questionnaire was assessed and the Cronbach's alpha value in the seven domains was determined to be between 0.70 and 0.85, indicating the desired internal consistency of the domains and the high reliability of the tool. The nurses' clinical competency level score was divided into four levels: low (0-25), relatively good (26-50), good (51-75), very good (76-100). [16]

DATA COLLECTION

The first author attended the hospitals affiliated with MUMS to collect data. She received a list of the nurses working in each hospital's Ed from the nursing office. The employed nurses were then contacted during their shift schedule. After explaining the aims of the study, they were asked to participate in the study. They were then handed the questionnaires to fill out and later collected by the first author.

DATA ANALYSIS

Data were analyzed with SPSS software (version 22.0; SPSS Inc., Chicago, IL, USA) using descriptive statistics (mean, standard deviation, frequency, and percentage) and inferential statistics (the independent sample t-test, one-way analysis of variance and spearman correlation coefficient). Spearman's correlation coefficient was used to assess the relationship between clinical competency subscales and total clinical competency scores. A P-value less than 0.05 was considered statistically significant.

ETHICAL CONSIDERATIONS

The present study was approved by the Ethics Committee of Mazandaran University of Medical Sciences (Ethical code: IR.MAZUMS.REC.1397.91). The study aims were explained to all participants and written informed consent was obtained. Participants were also assured that their information would be treated confidentially.

RESULTS

The ED nurses' mean age was 32.41 ± 6.35 years, with 14 male and 117 female nurses. Their average work experience was 8.48 ± 5.98 years. 93.89% of the nurses had a BSc. degree (n=123). The nurses had an average work experience of 8.48 ± 5.98 years, and 70.99% were married. There was no statistically significant discrepancy observed in the clinical competence assessments of nurses, as per their age, gender, or academic degree. ($P \geq 0.05$, Table 1). However, a significant relationship has been found between general work experience and clinical competence (r=0. 176, p=0.044). The scores of the seven categories of clinical competence were self-assessed by the Ed nurses. As described, the mean scores of categories were, helping role 70.42 ± 3.58, teaching-coaching 70.58 ± 3.78, diagnostic function 69.16 ± 4.50, managing situation 74.63 ± 3.40, therapeutic intervention 67.54 ± 3.59, ensuring quality 55.38 ± 7.05, and work role 73.04 ± 3.31. This results in an average total score of 68.68 ± 3.24. The highest mean score of clinical competence related to managing situation and the lowest to ensuring quality.

TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF ED NURSES AND COMPARISON OF CLINICAL COMPETENCE

Demographic variables		Number (%)	Competency level Mean (SD)	t/f	P
Gender	female	117(89.3)	68.29(2.99)	t=-0.473	0.636
	male	14(10.7)	68.72(3.28)		
Age (year)	20-26	34(26.0)	67.53(3.51)	F=3.04	0.051
	27-33	47(35.8)	68.94(2.49)		
	34≥	50(38.2)	69.21(3.53)		
Level of education	Associate degree	5(3.8)	67.53(3.51)	F=1.39	0.251
	Bachelor of Science	123(93.9)	68.94(2.49)		

	Master degree	3(2.3)	69.21(3.53)		
Marital status	single	38(29.0)	67.72(3.41)	T=-2.19	0.03
	married	93(71.0)	69.07(3.10)		

The total mean score of nurses' clinical competence was 68.68±3.24 out of 100, which was at a "good" level. Most ED Nurses sh owed that their' frequency of all clinical competences categories were at "good" level. (Table 2)

TABLE 2: ED NURSES' LEVEL OF CLINICAL COMPETENCES AND FREQUENCY OF USING COMPETENCES IN PRACTICE

	Score clinical competence	Frequency of level of competence (%)			
Categories	Mean (±SD)	Low (0-25)	Relatively good (26-50)	Good (51-75)	Very good (76-100)
Helping role	70.42±3.58	0.0	0.0	90.84	9.16
Teaching-coaching	70.58±3.78	0.0	0.0	96.18	3.82
Diagnostic function	69.16±4.50	0.0	0.0	96.95	3.05
Managing situation	74.63±3.40	0.0	0.0	67.93	32.07
Therapeutic intervention	67.54±3.59	0.0	0.0	99.24	0.76
Ensuring quality	55.38±7.05	0.0	16.80	82.44	0.76
Work role	73.04±3.31	0.0	0.0	87.02	12.98
Total of clinical competence	68.68±3.24	0.0	0.0	96.94	3.06

DISCUSSION

In accordance with other research findings by Bahreyni (2010) and Farajis (2019), the number of female nurses (n=117) in this particular sample exceeded their male counterparts (n=14) (5, 16). Most nurses in the study were married. Findings from Kalantary et al.'s (2016) research on ICU nurses competency level in educational hospitals revealed that 73.7% were married. [17] Moreover, in a study, it has been shown that 77% of nurses were married (18), which are consistent with the results of this study. In relation to educational level, the majority of nurses had a bachelor's degree, a finding that aligns with prior research results. [5, 16]

In this study, nurses expressed their highest clinical competence in relation to managing situation, which is inconsistent with the results of the study by Habibzadeh and colleagues (2012), in which the work role area received the highest score. [19] However, it agrees with what the study found in Bahreyni et al.'s research, Meretoja and others as well as Istomina and colleagues. [10, 16, 18] The variation observed in the research findings might be attributed to dissimilar study populations and contextual settings. Other factors that could impact nurses' competency, such as the hospital setting, level of patient acuity, and staffing levels, may also differ across studies. The ED nurses in the current research study reported a satisfactory level of proficiency in all of the seven clinical competency areas which aligns with the findings of Istomina and colleagues' study. [18] In the Bahreyni and colleagues' (2010) study, only the category of managing situation were rated as "very good". [16] The results are reasonable in educational hospitals where nurses need quick reaction skills due to short patient stays, complex situations, and high-risk patients. The study participants demonstrated a minimal level of proficiency in the area of ensuring quality. Bahreyni et al. (2010) reported the lowest score of this category and the same as in the study of Istomina et al., which are congruent with the findings of the current study. [16] However, another research finding in the study conducted by Bahreyni and colleagues, (2010) and Meretoja et al. (2003) indicate that teaching-coaching category demonstrated the lowest scores. [10, 16] This is in contrast to the present study. The sample size and characteristics of the nurses included in

each study may vary, leading to differences in findings. These inconsistencies make it necessary to conduct further studies on the subject. Based on cross-sectional research, nurses reported being competent at a satisfactory level [16, 20]; with an average qualification falling between 61.15 and 79.54 in seven categories [16], which are in the line with present study results.

The present study found no correlation between demographic characteristics and clinical competence, except for work experience. The current study confirms Takase's (2013) research that states nursing competence and clinical experience are correlated. [21] In line with the present study's findings, there was no significant correlation between the competency of nurses and factors such as gender, age, and education level, as reported by Faraji and others in their 2019 study. [5]

STUDY LIMITATIONS:

The study was conducted in a single Mazandaran University of Medical sciences setting, which may limit the generalizability of the findings to other healthcare settings. Second, the study relied on self-reported data from the nurses, which may be subject to recall bias.

CONCLUSION

The present study revealed that the ED nurses at Mazandaran University of Medical Sciences demonstrated a satisfactory level of clinical competency across all categories. Hospital managers' understanding of the clinical competency of ED nurses can aid in the development of impactful educational programs and training sessions aimed at enhancing the overall quality of nursing care. Offering continuous education and training can assist nurses in keeping themselves abreast of the most recent emergency department methodologies, technologies, and strategies. Various educational activities such as workshops, seminars, conferences, and e-learning courses may be part of these programs. In addition to offering educational activities, hospital managers can also implement a competency-based performance evaluation system for ED nurses. Such a system can identify areas where nurses require improvement and provide targeted training to address those needs. Regular assessments can also help track the progress of the nurses' clinical competence and ensure that they provide high-quality care. It is important to note that training programs and competency evaluations should be tailored to meet the specific needs and challenges of the ED setting. Hospital managers should work closely with ED nurses to ensure that the training programs and evaluations align with their professional development goals and the needs of the patients they serve. In conclusion, this study highlights the significance of continuous education and training programs for ED nurses. Hospital managers should invest in such programs and evaluations to ensure that nurses have the necessary knowledge and skills to provide high-quality care in the emergency department.

CONFLICT OF INTEREST:

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

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RESEARCH ARTICLE

THE RELATIONSHIP OF SOCIAL CAPITAL WITH JOB SATISFACTION AND THE QUALITY OF NURSING CARE IN CRITICAL CARE NURSES

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ABSTRACT

INTRODUCTION AND OBJECTIVE:
Social capital is an important factor influencing job satisfaction and the quality of nursing care provided by nurses. This study aimed to examine the relationship between social capital, job satisfaction, and quality of nursing care among critical care nurses working in critical care wards (CCWs).

METHODS:
A descriptive-analytical study was carried out in 2018, with nurses working in the critical care wards (CCWs) of Mazandarn University hospitals located in Sari, Iran. The study included 195 participants who completed a demographic questionnaire, Nahapiet and Ghoshal's Social Capital Questionnaire, Spector's Job Satisfaction Survey, and the Quality Patient Care Scale. The collected data were analyzed using both descriptive (Percentages, means, and standard deviations) and analytical statistics (Analysis of variance, Pearson's correlation coefficient and Univariate regression analysis).

RESULTS:
The study's findings demonstrated a significant and positive correlation between social capital and both job satisfaction (p=0.001) and the quality of nursing care (p=0.001). Social capital was identified as an independent variable that accounts for 20% of the changes in job satisfaction and 41% of the changes in the quality of nursing care.

CONCLUSION:
This study highlights the importance of social capital in promoting job satisfaction and improving the quality of nursing care among CCW nurses. The findings demonstrate that social capital is a key factor that can significantly impact the quality of care provided to patients. Therefore, nursing managers must recognize the value of social capital and take active steps to promote it within their organizations.

KEYWORDS

Social capital, job satisfaction, quality of nursing care, critical care.

INTRODUCTION

The increasing demand for nursing services, coupled with heavy workloads and nursing staff shortages, has had a significant negative impact on the quality of nursing care [1]. Additionally, service recipients are now demanding higher-quality care at lower costs, exacerbating the strain on nursing staff [2]. Providing high quality nursing care is the extent to which the nursing care provided meets the expectations and needs of the patients, as well as the standards and criteria of the profession and the organization [3]. Qasemi and colleagues (2014) in their research reported that the quality of nursing care in Iran is as 55% overall, 79.2% in intensive care units (ICUs) and 53.5% in internal and surgical wards [4]. A study has shown that the quality of nursing care and patients' satisfaction are poor, particularly in countries like Ireland and Greece [5].

As nurses' motivation and job satisfaction can impact the quality of care they provide, a lack of motivation and job satisfaction can have adverse effects on care provision [6]. Job satisfaction is a multi-dimensional construct that involves a positive attitude towards one's job and a sense of pleasure derived from it. It is a dynamic and complex concept that encompasses various factors, including personal values, perceptions, and judgments [7]. Based on a research finding, a significant number of registered nurses expressed job dissatisfaction, possibly stemming from inadequate support and action within the workplace [8]. According to Faramarzpour's study, job satisfaction among nurses was reported as moderate, with the lowest levels found among those working in ICUs [9]. Abella's research on the hospital wards and critical care units showed that nurses' job satisfaction was average in general [10].

Social capital can serve as an essential strategy to improve nurses' job satisfaction and performance, thereby enhancing the quality of nursing care [11]. Social capital is a concept in organizational management that can have a significant impact on the quality of services and outputs. It includes factors such as knowledge transfer, teamwork improvement, organizational commitment, and improved service quality [12]. A study found that social capital has a positive effect on both job satisfaction and the quality of nursing care [11]. The relationship between job satisfaction and social capital among healthcare personnel was found to be significant in another study [13]. According to Laschinger et al. (2014), there is a relationship between social capital and nurses' perceptions of the quality of nursing care [14].

Nurses play a crucial role in healthcare teams and can significantly improve the quality of care provided to patients. In particular, nurses working in critical care settings such as ICUs provide comprehensive care to critically ill patients. However, there is a lack of research on the relationship between social capital, job satisfaction, and the quality of nursing care among CCW nurses. Given the importance of social capital in enhancing the efficiency of nursing services, this study aimed to investigate the relationship between social capital and job satisfaction as well as the quality of nursing care among nurses working in CCWs.

METHODS

DESIGN

The descriptive-analytical study conducted in 2018 included 195 nurses who were working in CCWs. The primary objective of the study was to examine the correlation between social capital, job satisfaction, and the quality of nursing care provided by CCW nurses.

PARTICIPANTS

Nurses were recruited from three hemodialysis wards, eight cardiac care units (CCUs), and 14 ICUs (including pediatric, neonatal, trauma, cardiac surgery, neurosurgery, general, and burns ICUs) in five hospitals affiliated with Mazandaran University of Medical Sciences in Sari city, Iran. The study employed a simple stratified random sampling method to select the participants. Using the sample correlation coefficient equation and values obtained from an article by Shin et al., [15], the required sample size was estimated to be 195 nurses, taking into account a 10% chance of sample loss. The number of CCW nurses in each hospital was obtained from the nursing offices of all five hospitals. To create a representative sample, approximately 50% of all the nurses employed in each ward were selected to participate in the study. Given that there was a total of 450 nurses working in these hospitals, this resulted in a final sample size of 195 nurses.

$$n = \frac{\left[Z_{1-\frac{\alpha}{2}} + Z_{1-\beta} \right]^2}{\left[\frac{1}{2} \ln \frac{1+r}{1-r} \right]^2} + 3$$

The inclusion criteria for the study were having a Bachelor's or higher degree in nursing and at least one year of clinical experience in ICUs. The exclusion criteria included unwillingness to participate in the study and incomplete questionnaires.

DATA COLLECTION

The data collection tools utilized in this study included four components:

1- Demographic characteristics questionnaire, which inquired about variables such as age, gender, marital status, level of education, work experience, work shift, and type of employment.

2- The standard social capital questionnaire developed by Nahapiet and Ghoshal, consisting of 28 items that measure social capital across structural (eight items), cognitive (eight items), and communication (12 items) dimensions [16]. Each item in the questionnaire is scored based on a Likert scale (1=strongly disagree, 2=disagree, 3=no comments, 4=agree, and 5=strongly agree). The total score ranges from 28 to 140. A score of 28-47.9 indicates low, 48-93.9 moderate and above 94 high social capitals. The content validity of the questionnaire was assessed by Kazemzadeh et al. in 2013, and its reliability was confirmed with a Cronbach's alpha of 0.85 [17]. The validity and reliability of the questionnaire were also confirmed in other studies [18, 19].

3- The Job Satisfaction Survey (JSS) developed by Spector is a tool used to evaluate employees' attitudes toward their job [20]. The JSS consists of 36 items across nine domains, including Pay, Promotion, Supervision, Fringe Benefits, Contingent Rewards, Operating Procedures, Coworkers, Nature of Work, and Communication. Each item is scored on a 6-point Likert scale, with responses ranging from 1 (strongly disagree) to 6 (strongly agree). A score of 36-95.9 indicates low job satisfaction, 96-156.9 moderate job satisfaction, and 157-216 high job satisfaction. In 2015, Gholami et al. standardized the JSS for use in Iranian society and reported strong concurrent validity with correlation coefficients ranging from 0.6 to 0.8 for each sub-domain when compared to the job descriptive index. They also assessed the reliability of the JSS using Cronbach's alpha and reported coefficients ranging from 0.57 to 0.86 for each sub-domain, with an overall coefficient of 0.86 for total reliability, indicating good reliability of the survey [15].

4- The Quality Patient Care Scale (QualPaCS) is a highly reliable tool for measuring the quality of care [21]. The QualPaCS is a scale that consists of 68 items assessing the quality of nursing care from the perspective of nurses across three dimensions: psychosocial, communication, and physical. Each item is scored on a 4-point Likert scale (4=always, 3=often, 2=sometimes, and 1=never), with 32 items in the psychosocial dimension, 22 in the physical dimension, and 14 in the communication dimension. The total score range is from 68 to 272, where a score of 68-136 is considered undesirable, 137-204 is fairly desirable, and 205-272 is desirable. The validity and reliability of the QualPaCS have been confirmed by various studies. Vahidi et al. reported a Cronbach's alpha of 0.93, indicating high reliability, while Neishabory et al. reported a Cronbach's alpha of 0.80 for the tool [22, 23]. In this study, the questionnaires' reliability was calculated using Cronbach's alpha coefficients of 0.716 for job satisfaction, 0.918 for social capital, and 0.978 for nursing care quality, indicating high levels of reliability for all three measures. The researcher distributed the questionnaires to nursing personnel in the wards and collected them during the same work shift. Data were collected over a period of two months and then analyzed using IBM SPSS-22 software.

ETHICAL CONSIDERATIONS

The Ethics Committee of Mazandaran University of Medical Sciences approved the present study (REC.MAZUMS.1396.10214). All participants provided informed consent, were guaranteed anonymity, and assured of the confidentiality of their data.

DATA ANALYSIS

The data were analyzed using IBM SPSS (Version 22) software. Descriptive statistics, including percentages, means, and standard deviations, were used to describe the participants' demographic characteristics, social capital, job satisfaction, and quality of nursing care. To determine the relationship between variables, Analysis of Variance (ANOVA), Pearson's correlation coefficient and Univariate regression analysis were used, with a significance level of $\alpha=0.05$.

RESULTS

The study included 195 nurses, 75.9% of whom were female, and 24.1% were male. Among the participants, 70.8% were married. The mean age of participants was 32.93±7.478 years, and their mean work experience was 9.95±6.840 years, with a mean ICU work experience of 8.57±6.439

years. More than half of the participants (56.48%) had official (permanent) or semi-official (temporary renewable) contracts (Table 1).

TABLE 1. THE DEMOGRAPHIC CHARACTERISTICS OF THE CCW NURSES

Variables		Number (%)
Gender	Male	47 (24.1)
	Female	148(75.9)
Age (year)	22-32	109 (55.9)
	33-43	71 (36.4)
	>44	15 (7.7)
Marital Status	Single	57 (29.9)
	Married	138 (70.1)
Education	B.Sc.	171 (87.7)
	M.Sc.	24 (12.3)
Ward	Dialysis	21 (10.8)
	ICU	100 (51.3)
	CCU	74 (37.9)
Work Shift	Fixed	150 (76.9)
	Rotating	45 (23.1)
Employment Type	Official	50 (25.6)
	Semi-official	59 (30.2)
	Contractual	55 (28.3)
	Training	31 (15.9)
Work Experience (year)	<5	69 (35.5)
	6-10	49 (25.1)
	11-15	35 (17.9)
	>16	42 (21.5)
ICU Work Experience (year)	<5	87 (44.6)
	6-10	47 (24.1)
	11-15	27 (13.9)
	>16	34 (17.4)
Organizational Position	Head nurse	23 (11.8)
	Deputy head nurse	18 (9.2)
	Clinical nurse	154 (79)

The average score for the quality of nursing care was 233.58±31.26 among CCWs. Approximately 83.6% of the nurses reported a satisfactory level of nursing care quality, with the highest scores in the psychosocial dimension and the lowest scores in the communication dimension (Table 2).

The ICU nurses had an overall mean job satisfaction score of 118.67±20.633, with the majority (84.6%) reporting moderate job satisfaction. Among the different dimensions of job satisfaction, coworkers had the highest value (19.19±2.23) while pay had the lowest value (8.65±6.04).

Additionally, most of the nurses (77.4%) reported having high social capital with an overall mean score of 108.93±22.87. The communication dimension had the highest value (48.24±12.13) while the cognitive dimension had the lowest value (30.25±6.73) (Table 3).

The ICU nurses reported higher scores for social capital and quality of nursing care, while the CCU nurses had higher job satisfaction scores. Furthermore, the type of ICU was found to have an impact on social capital, job satisfaction, and the quality of nursing care (Table 4)

TABLE 2. DISTRIBUTION AND MEAN SCORES OF NURSING CARE QUALITY AMONG CCW NURSES

Variable	Mean and SD	Undesirable Number (%)	Fairly Desirable Number (%)	Desirable Number (%)
Quality of nursing care	233.31±58.26	3 (1.5)	29 (14.9)	163 (83.6)
Psychosocial dimension	105.18±79.46	8 (4.1)	49 (25.1)	138 (70.8)
Communication dimension	53.12±42.36	3 (2.3)	83 (47.3)	109 (50.4)
Physical dimension	74.14±61.85	13 (6.7)	56 (29.2)	126 (64.1)
Confidence interval=95%				

TABLE 3. MEAN SCORES OF SOCIAL CAPITAL AND JOB SATISFACTION AMONG CCW NURSES

Variable	Mean and SD	Low Number (%)	Moderate Number (%)	High Number (%)
Job satisfaction	118.67±20.633	19 (9.7%)	165 (8.6%)	11 (5.6%)
Social capital	108.93±22.87	6 (3.1%)	38 (19.5%)	151 (77.4%)

TABLE 4. COMPARISON OF MEAN SCORES OF SOCIAL CAPITAL, JOB SATISFACTION, AND QUALITY OF NURSING CARE IN CCW NURSES

Ward	Social Capital	Job Satisfaction	Quality of Nursing Care
	Mean±SD	Mean±SD	Mean±SD
ICU	114.03±20.212	114.25±15.268	240.78±28.695
CCU	109.84±19.501	128.24±22.839	230.16±25.581
Dialysis	82.05±28.177	106.00±21.596	211.38±46.81
P-Value*	0.001	0.001	0.002
Tukey's or Honestly Significant Difference			

The results of the Analysis of Variance (ANOVA) indicated that nurses with 11-15 years of work experience had a slightly higher mean score for social capital (115.84±21.95), but this difference was not statistically significant (P=0.057), suggesting that work experience did not have a significant relationship with social capital (p=0.096). Moreover, social capital was not found to be significantly correlated with gender (P=0.723), marital status (P=0.219), education (P=0.954), or type of employment (P=0.308). No significant impact of these variables on social capital was found. However, social capital was found to have a significant relationship with ICU work experience (P=0.029), organizational position (P=0.001), and work shift (P=0.002). Pearson's correlation coefficient revealed a statistically significant positive relationship between job satisfaction and social capital, job satisfaction and quality of nursing care, and social capital and quality of nursing care (P=0.001). Univariate regression analysis of the predictor variables indicated that social capital could explain approximately 41% of the variation in quality of nursing care as an independent variable. Additionally, job satisfaction could explain 13% of the variation in quality of nursing care as an independent variable. In a separate model, social capital could explain 20% of the variation in job satisfaction as an independent variable.

DISCUSSION

The study findings revealed a statistically significant positive relationship between social capital and both job satisfaction and quality of nursing care. Social capital was found to explain 41% of the variation in quality of nursing care and 20% of the variation in job satisfaction. Additionally, job satisfaction could explain 13% of the variation in quality of nursing care as an independent variable. A study conducted by Shin et al. (2017) on nurses in South Korea also reported a significant relationship between social capital and job satisfaction and quality of

nursing care. The authors suggest that various activities and interventions aimed at promoting social capital could enhance the quality of care provided by nurses [24]. Another study conducted on nurses found that higher social investment and greater social capital were associated with higher satisfaction with the effectiveness of the unit. The study also revealed that social capital not only had a direct positive effect on the quality of care, but also indirectly influenced nurses' perceptions of the quality of care. This emphasizes the crucial role that nurses play in ensuring the quality of patient care [25]. Care is the fundamental aspect of human needs and forms the core element of the nursing profession. A thorough understanding of nursing care is critical for nurses to provide high-quality care and services [26]. Strömgren and colleagues (2016) found that higher levels of social capital predict better job satisfaction, work motivation, and clinical empowerment. Therefore, social capital is an essential factor that contributes to job satisfaction and work motivation, leading to clinical advancements and improved patient safety [6]. Motivation and enthusiasm are essential for individuals to be more efficient and provide better services, including nurses. Therefore, nurses' job satisfaction can increase the quality of nursing care and performance [25]. In Ommen's study (2009), it was found that workload and professional experience were significantly correlated with job satisfaction, as well as trust, mutual understanding, and shared goals. The study concluded that the quality of social capital, which brings together members of social networks, is strongly related to job satisfaction [13]. Azadi and colleagues reported that an employee with strong social capital has effective professional communication skills and interacts positively with their coworkers. Such interactions promote job satisfaction, resulting in a sense of contentment, security, and attachment to their position within the organization [26]. In the case of nurses, social capital is made up of sources that are generated through socialization. These sources include trust, participatory norms, and networks of social ties that enhance efficiency and effectiveness, ultimately leading to improved job satisfaction and the quality of nursing care [25].

In the present study, a majority of nurses had high social capital, with the communication dimension having the highest value, particularly in the ICU. Khodayari (2015) also reported moderate social capital among nurses, with the communication dimension having a higher value compared to the other dimensions [27]. Another study conducted on nurses also reported moderate social

capital, with nurses having higher levels of social capital experiencing greater happiness in the workplace, job satisfaction, and quality of life [28]. Social capital is a critical element for the success of organizations and is associated with positive outcomes, such as increased job satisfaction, improved clinical risk management, and reduced turnover rates [25]. Dehghani's study (2014) found that nurses in the dialysis ward had the lowest social capital compared to those in other wards of the hospital [29]. Shin's study (2016) also reported that the social capital of nurses was lower than expected [11]. The variations in social capital levels observed among nurses may be due to several factors, such as the type of hospital ward, the nurses' work experience, psychological conditions, and place of residence. These factors cannot be standardized across all subjects and may contribute to differences in social capital levels.

The majority of the nurses had a desirable level of quality of nursing care, with the psychosocial dimension having the highest value, particularly in the ICU. Based on the findings of a study, the quality of nursing care was found to be higher in the ICU compared to other wards [30]. In fact, ICU nurses are required to complete specialized training when beginning work in the ICU. Additionally, the ICU typically has fewer patients and more available facilities and equipment, which allows for a more precise practice of clinical skills. Due to their continuous involvement in nursing care, ICU nurses play a crucial role in the recovery of critically ill patients. Based on the study results, the majority of ICU nurses exhibited moderate levels of job satisfaction, with the highest scores being observed in the coworkers' dimension. Additionally, the nurses reported moderate job satisfaction overall [9, 31]. The study also found that ICU nurses reported the highest job satisfaction with the availability of learning opportunities in the workplace, and their job satisfaction was higher compared to CCU nurses [31]. Hospital nursing organizations can enhance patient outcomes and overall organizational performance by giving priority to nursing job satisfaction and implementing efficient human resource management strategies [32]. The job satisfaction levels of hospital nurses in Turkey and Slovenia were found to be moderate in two separate studies [33, 34].

In the current study, social capital was found to have a significant correlation with work experience in ICUs, the type of hospital ward, organizational position, and work shift. Ommen's (2009) study reported a significant correlation between social capital and age, as well as

professional experience [13]. Shin's (2016) study also found a significant correlation between social capital and work experience, age, and academic degree [11]. The discrepancies in the study results may be attributed to variations in sample sizes, levels of education, age, gender, work experience, and the type of hospital ward, which cannot be standardized across all studies.

LIMITATIONS

The self-report nature of data collection for job satisfaction and quality of nursing care may introduce response bias, as participants may provide socially desirable answers rather than their true sentiments. As the study was conducted on ICU nurses in Iran, caution should be taken when generalizing the findings to other settings and countries.

IMPLICATIONS AND RECOMMENDATIONS FOR PRACTICE

Hospital managers and nursing administrators should consider social capital as a factor that can influence job satisfaction and the quality of nursing care among CCW nurses. It is also recommended to conduct interventional studies aimed at enhancing CCW nurses' social capital to improve the quality of nursing care. To improve the quality of public nursing services, hospital managers and nursing administrators must take into account the role of social capital in shaping job satisfaction and nursing care quality among CCW nurses. Additionally, nursing school teachers could teach nursing students how to increase their social capital, which may ultimately enhance their job satisfaction and the quality of their nursing care.

CONCLUSION

Job satisfaction and social capital are essential factors that impact the quality of nursing care. Promoting social capital among CCW nurses should be a top priority for nursing managers seeking to enhance the quality of care provided to patients. This can create a supportive work environment that fosters the delivery of high-quality nursing care and leads to improved patient outcomes. Hospital managers should be aware that investing in training, mentoring, and recognition programs can aid in building nurses' social capital and increasing their job satisfaction.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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PRIORITIZING THE PRECURSORS OF PATIENTS' EXPERIENCE IN INDIAN CORPORATE HOSPITALS: APPLICATION OF HYBRID RIDIT-GRA APPROACH

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ABSTRACT

OBJECTIVE

This study aims to identify, understand, and prioritize the influence of distinct patient experience (PX) antecedents that have substantial evidence in shaping the patients' preferences and experiences in Indian corporate hospitals. The study is expected to assist healthcare managers in the personalization and alignment of clinical services with consumer expectations and demands.

DESIGN/ METHODOLOGY

A cross-sectional study was conducted across eight corporate hospitals to collect 220 patient data samples. A recent measurement model, titled 'Patient Experience Questionnaire', was adopted to harness pre-validated PX factors and related items. Further, two independent prioritization techniques, Relative to an Identified distribution (RIDIT) analysis and Grey Relational Analysis (GRA), were executed to render item precedence of the precursors of PX.

RESULTS

Through RIDIT, items belonging to factors 'doctor services' and 'nursing services' secured favorable performance ratings, whereas items under 'information' and 'next-of-kin' obtained comparatively less favorable responses. There was evidence of minimal deviations when the results were verified through GRA, but the ranks obtained in both the independent techniques (RIDIT & GRA) revealed a robust correlation of 99.5%. Moreover, the applicability of two independent prioritization techniques enhances the rigor and reliability of findings.

CONCLUSIONS

Although the respondents were mostly satisfied with their care providers, an effective provider-patient communication was not evident in the care system. Patients seemed to be overly dependent on their physicians and showed limited intention to participate in a collaborative process. Lack of patient-centric culture, deficit infrastructure, excessive workload on healthcare providers, and restricted translation of patient-centric concepts into practice deterred organizations from fully benefiting from patients' involvement in clinical facets.

KEYWORDS

Patient experience, Indian corporate hospitals, RIDIT analysis, grey relational analysis

Prioritizing the Precursors of Patients' Experience in Indian Corporate Hospitals: Application of hybrid RIDIT-GRA approach

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1

INTRODUCTION

The endeavours to explore patient experience (PX) concepts have been gaining momentum since 2001 when the Institute of Medicine (IOM) identified 'Patient-centeredness' as one of the central pillars for achieving quality in the healthcare industry. However, 20% of identified patient-reported experience measures (PREMs) surfaced from 2015 onwards [1], thus reflecting increased adoption of PX measures across contemporary healthcare settings. Providing an optimum experience is steadily becoming a priority in many healthcare facilities. Improving PX can have numerous benefits for both patients and healthcare organizations, such as patients who have a positive experience are more likely to be satisfied with their care, comply with treatment recommendations, and report better health outcomes [1,2]. For healthcare organizations, improving PX can lead to increased patient satisfaction, which can, in turn, lead to higher patient retention rates, improved reputation, and financial benefits [3]. The notion behind implementing such concepts into healthcare is that the intended health outcomes are not only governed by the paternalistic provider-centric approach but can be redefined by patients' individual preferences and engagements in a shared care process. For such reasons, past studies have defined the patient-centeredness approach as a sustainable and multifaceted long-term strategy [4,5]. Previous studies have also shown that PX is an important factor closely related to clinical quality and satisfaction with care [1,6,7].

Despite recognizing PX as a determinant of healthcare quality (alongside patient effectiveness and safety), healthcare systems continue to face challenges in adopting and implementing patient-centric programs [20]. Since there is no universally accepted definition to pursue PX, many organizations fail to allocate resources to deliver an optimal healthcare experience [21,7]. Moreover, with multiple parameters of PX existing in the system, small- or medium-category hospitals may not have enough resources to account for all possible factors affecting PX. Hence, it is essential to identify relatively sensitive dimensions that have substantial impacts on patient well-being and experience. Identifying key enablers will help organizations strategize and focus their limited resources on selected aspects of the service design. The challenges related to healthcare resources, particularly in developing economies, are frequently discussed in the extant literature. For instance, Chauhan et al. [11] highlighted patients'

autonomy as a crucial factor that enhances healthcare literacy and service experience in the Indian context. However, such initiatives are severely hindered due to infrastructural barriers and an overburdened healthcare system [21]. This viewpoint aligns with the findings of Ng et al. [22], who suggest that people in the East, especially in Asia, lack a clear understanding of how to establish a patient-centric ecosystem.

Therefore, the lower participation and engagement rate of Asian healthcare consumers—compared to European countries—raises concerns about the replicability of Western PX models [23]. There is a growing need for a micro-level assessment, specifically in contexts where healthcare decisions are significantly influenced by societal groups and users' awareness levels [23]. This gap in research calls for further investigation into the fundamental factors of PX, which will empower patients to understand their roles and activities during a clinical process. Acknowledging patients' experiences and preferences provides a comprehensive evaluation of healthcare systems, which expands organizational capability and reach [21,25]. This work serves as an initial step in raising awareness about the importance of PX within various private healthcare systems—in a developing economy context. It explores the factors that impact in-patient service experience, aiming to familiarize individuals with the significance of PX and its role in shaping healthcare quality. The concept of PX provides a guided focus on the interpersonal transactions happening between a provider and a patient. Such transactions include communication, evaluation, participation and flow of information in a patient-centric manner. Therefore, PX is considered a novel measure of healthcare service quality and has been extensively studied under the concept of 'Healthcare Experience Quality (HCXQ)' [24]. PX factors are important determinants of HCXQ, and so far, individual assessment of PX factors from a consumer perspective is sparse. So, by focusing on the antecedents of PX, this study provides an incremental contribution to the patient-autonomy literature with a special reference to a developing economy context. Recent literature also supports HCXQ as an emerging indicator of healthcare service quality. For example, Ponsignon et al. [24] utilized HCXQ to indicate how cancer patients perceive healthcare service quality. Similarly, Park et al. [30] showed that PX could be used as an indicator to measure patient satisfaction and loyalty. Cadel et al. [26] conducted a literature review that emphasized the positive impact of PX programs on healthcare outcomes and overall service quality. However,

PX is a context-specific phenomenon [24,26] that needs to be applied across different hospital settings to improve its generalizability. Against this backdrop, it can be concluded that PX is increasingly employed to address various healthcare agendas from a consumer perspective. It provides a better understanding of healthcare quality and has been integrated into multiple frameworks to depict the expectations of both internal [27] and external healthcare consumers [30].

INDIAN HEALTHCARE SCENARIO AND PROBLEM IDENTIFICATION

The healthcare sector in India is the fourth largest employer, with the government and private sectors both playing significant roles. The government ensures access to basic healthcare needs mostly in rural and semi-urban regions through a network of public hospitals and primary healthcare centers, while the private sector operates hospitals, clinics, and diagnostic centers catering to the quality healthcare needs of urban and metropolitan consumers [8]. The private healthcare sector is a complex yet rapidly growing system owing to the demands derived from middle-class and foreign consumers for clinical experts, high-quality prognosis, modern infrastructures, and state-of-the-art clinical facilities. 80% of healthcare resources and professionals are concentrated in metropolitan areas, where only 31% of the total population resides. By 2025, the industry is set on a trend to achieve a market cap of US$ 372 billion by 22% CAGR, with public health expenditure increasing to 2.5% of the country's current GDP [9].

Despite such impressive figures, the unavailability of a generally accepted PX definition and fragmented studies on patient-centric approaches have kept the frontiers unexplored [10]. Also, patient-centric research in most developing countries—including India—has suffered massive backlash due to a lack of employee motivation, ineffective translation of conceptual interventions into practice, and poor practitioner-patient ratio [8,11]. Private parties have equally struggled to balance service personalization and sophistication while trying to bind clinical outcomes with patients rather than results. The existing studies display over-extensive usage of patient satisfaction parameters to assess clinical quality and have faced complications because satisfaction scores are subjective and can be influenced by a variety of factors that are not necessarily related to the clinical quality of care. Previous literature also affirmed that there was no consistent relationship between patient satisfaction and clinical quality or patient outcomes [6,7]. Therefore, when assessing consumer choices, PX scores better explain consumer preferences than satisfaction measures [6].

AN OVERVIEW OF PX MEASUREMENT SCALES AND RESEARCH APPROACH

Various scales have been developed in the process to quantify PX scores. However, most of the measurement scales have now existed for over a decade and warrant statistical modifications. In the process of doing so, many developing as well as developed countries have established PX scales of their own. For example: in the US, one commonly used tool is the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, which asks patients about their experiences with various aspects of care. It is integrated across 90% of acute care hospitals and is used as a determinant of value-based care and financial reimbursements [12]. Likewise, The Hong Kong in-patient experience questionnaire (HKIEQ) has been widely used in Hong Kong hospitals and has been shown to be a reliable and valid measure of the PX [13]. Recently, Hu et al. [14] developed a PX questionnaire for both in-patient and outpatient care clinics in China. The questionnaire consisted of 23 items that assessed quality domains and were organized into five major factors.

In this study, the authors have highlighted the perceptual importance of PX measures in apprehending clinical quality and put forth a PX framework for Indian corporate hospitals, which may assist healthcare managers to detect relatively important dimensions that positively influence patients' experiential evaluation. After considering various grey literature and measurement scales, a recent PX questionnaire was adopted to render a precedence analysis of PX dimensions and related items. A statistical hybrid approach was adopted for methodological execution that combines two analytical procedures: Relative to an identified distribution (RIDIT) analysis and Grey Relational Analysis (GRA). The techniques are acknowledged for their non-parametric nature [15,16] and the results display how consumers perceive the relative importance of PX items and prefer them accordingly. Collectively, the objective of this work is to identify and rank the factors influencing the healthcare experience as perceived by patients. Additionally, this research highlights relatively sensitive dimensions of PX to assist healthcare managers in the personalization and alignment of clinical services according to patients' preferences.

METHODOLOGY

SURVEY TOOL

The psychometric tools used to validate the statistical significance of PX scores have evolved over the years and yield better results [17]. In this study, the scale adopted for statistical analysis is the patient experience questionnaire (PEQ), which was originally developed in 2004 and modified by Addo et al. [17] in 2021. Unlike other measurement scales, the adjusted PEQ has undergone multiple statistical and psychometric validations before arriving at a final form of scaling. For instance, apart from traditional EFA, the scale has been tested for measurement invariance, composite reliability, convergent validity, discriminant validity, construct validity, and criterion-related validity. Each item of the survey questionnaire was rated on a seven-point Likert scale, ranging from 1 (Not at all) to 7 (A very large extent). A total of 6 pre-validated dimensions and 27 items were adopted from the PEQ (Addo et al., 2021), and each of the dimensions had the following items: nursing services (NS1-NS7), doctor services (DS1-DS7), information (INF1-INF3), organization (ORG1, ORG3-ORG4), next of kin (NOK1-NOK2), and standard (SD1-SD4, SD6) (See Appendix).

SAMPLE AND SURVEY OVERVIEW

The study used a cross-sectional survey in eight corporate hospitals—private, for-profit hospitals with more than 150 beds—operating in the southern and eastern regions of India. The patient data were collected through a self-administered questionnaire survey technique. The geographic vicinities were selected by keeping a dense concentration of corporate hospitals in view. The data collection took approximately three months (August-October 2022), and a total of 358 patients were approached, out of which 267 patients responded (72.5% response rate). The survey targeted inpatients only and the responses were obtained just before their discharge schedule. A traditional pen and paper method was used to collect data from the target audience. All of the patients were approached while they were in the hospital and their verbal consent was obtained before commencing the survey procedures. After removing a few incomplete and faulty responses, 220 valid questionnaires were considered for the data analysis. For eligibility criteria, patients must be 18 years of age or older and undergoing in-patient treatment for a minimum duration of 24 hours. In order to minimize participation bias, this study excluded respondents who had received emergency clinical

treatments or were transferred from other hospitals due to critical conditions. Therefore, the overall sampling unit comprised in-patients seeking medical assistance for various morbid and co-morbid conditions, including cardiovascular, pulmonary, neurological, hematological, and other related diseases. Several extraneous variables like comorbidities and duration of illness can influence the perception of experience. Therefore, this study has considered such parameters as control variables alongside patients' age, sex, and income levels. The English language-based questionnaires were presented before the patients at the time of their discharge. In some sensitive cases such as for patients being temporarily incapable of filling up the form, the family member or acquaintances verbally transcribed the patient's responses to fill up the questionnaire.

ANALYSIS AND FINDINGS

Prioritizing PX precursors by executing RIDIT analysis

RIDIT analysis is a widely used statistical method because it is robust to outliers, easy to implement, and can handle discrete and non-normal data. These advantages make RIDIT analysis a convenient choice for researchers evaluating the effectiveness of a treatment or intervention. The technique proves to be effective for scale rating of three-or more-point scales and items based on universal standards, and usually, the RIDIT values range from 0.00 to 1.00 [16]. According to the algorithms of RIDIT, when the population cannot be specified, the total responses obtained through the survey become the reference dataset [18]. If there are m items and n ordered categories listed from the most favored to the least favored on a Likert scale, then the algorithm is explained below:

The total frequency value (F_j) for each response category is computed (where j =1..., n). Further, mid-point accumulated frequency M_j was determined by:

$$M_j = 1/2 F_j + \sum_{k=1}^{j-1} F_k \text{ (where } j = 2..., n).$$

Next, RIDIT values R_j for the reference data set were calculated:

$$R_j = \frac{M_j}{N} \text{ where } j = 1..., n, \text{ and } N = \text{ total frequency of responses.}$$

Using the RIDIT values of the reference data set (see Table 1), RIDIT values for the comparison data set were determined as illustrated in Table 2. The RIDIT value for each category was evaluated by the formula:

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$r_{ij} = R_j * \pi_{ij}/\pi_i$, (where i = 1…, m, j = 1…, n, and π = response frequency for each item)

RIDIT value$_{(NS1,7)}$ = (0.0725*24/220 = 0.0079),

RIDIT value$_{(NS2,6)}$ = (0.2535*60/200 = 0.0691), and so on.

Subsequently, the mean RIDIT (ρ_i) for the comparison data set was calculated by the formula:

$\rho_i = \sum_{k=1}^{n} r_{ik}$ (Where i = 1…, m).

$\rho_1 = 0.0079 + 0.0553 + 0.1414 + 0.1261 + 0.0844 + 0.0748 + 0.0089 = 0.4989,$

$\rho_2 = 0.0092 + 0.0691 + 0.1414 + 0.1198 + 0.0461 + 0.0499 + 0.0177 = 0.4533,$ and so on.

TABLE 1: RIDITS FOR THE REFERENCE DATA SERIES

Items	7	6	5	4	3	2	1	π
NS1	24	48	66	40	22	18	2	220
NS2	28	60	66	38	12	12	4	220
NS3	60	58	36	26	18	12	10	220
NS4	32	50	70	36	18	12	2	220
NS5	48	22	28	100	8	6	8	220
NS6	10	36	70	94	2	4	4	220
NS7	58	78	36	22	10	8	8	220
DS1	10	22	74	82	18	10	4	220
DS2	78	78	42	12	4	4	2	220
DS3	34	66	40	56	12	8	4	220
DS4	50	48	56	34	16	4	12	220
DS5	14	60	48	72	6	5	15	220
DS6	41	66	40	49	12	8	4	220
DS7	38	42	56	44	12	4	24	220
IF1	12	10	20	28	24	68	58	220
IF2	14	18	28	56	56	28	20	220
IF3	16	12	26	52	46	52	16	220
ORG1	16	46	42	74	20	14	8	220
ORG3	48	58	60	18	28	4	4	220
ORG4	16	44	70	54	18	8	10	220
NOK1	14	8	28	36	38	48	48	220
NOK2	14	60	48	71	6	4	17	220
SD1	38	36	70	56	8	6	6	220
SD2	36	76	34	46	4	16	8	220
SD3	22	84	48	50	6	4	6	220
SD4	40	38	54	48	14	20	6	220
SD6	50	66	42	50	6	4	2	220
Fj	861	1290	1298	1344	444	391	312	5940
1/2Fj	430.5	645	649	672	222	195.5	156	
Mj	430.5	1506	2800	4121	5015	5432.5	5784	
R_j	0.0725	0.2535	0.4714	0.6938	0.8443	0.9146	0.9737	

Note: The results are limited to 4 decimal spaces with rounding errors.

NS = Nursing services; DS = Doctor services; INF = Information; ORG = Organization; NOK = Next of kin; SD = Standard.

If the mean RIDIT score is lesser and closer to 0.5, the respondents have chosen the favorable performance option, or in our case, 'To a very large extent (7)' point. Similarly, if the mean RIDIT score is more than 0.5, the responses are more inclined toward the least favorable, or

'Not at all (1)' [16]. The final column of Table 2 assorts the items based on their respective RIDIT values.

To validate the claim that the sample responses obtained from the Likert survey belong to the same distribution, a

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Kruskal-Wallis Test (K) was performed on the overall data set.

K = $12 \sum_{i=1}^{m} \pi_i (\rho_i - 0.5)^2$; the result obtained from the calculation is shown below:

$$K = 12 * [220\{(0.4989 - 0.5)^2 + (0.4553 - 0.5)^2 + ... + (0.3887 - 0.5)^2\}] = 907.2663.$$

TABLE 2: RIDITS FOR THE COMPARISON DATA SERIES

Items	7	6	5	4	3	2	1	ρ_i	LB	UB	Rank
NS1	0.0079	0.0553	0.1414	0.1261	0.0844	0.0748	0.0089	0.4989	0.4600	0.5378	16
NS2	0.0092	0.0691	0.1414	0.1198	0.0461	0.0499	0.0177	0.4533	0.4143	0.4922	11
NS3	0.0198	0.0668	0.0771	0.0820	0.0691	0.0499	0.0443	0.4090	0.3700	0.4479	4
NS4	0.0105	0.0576	0.1500	0.1135	0.0691	0.0499	0.0089	0.4595	0.4206	0.4984	12
NS5	0.0158	0.0254	0.0600	0.3154	0.0307	0.0249	0.0354	0.5076	0.4686	0.5465	17
NS6	0.0033	0.0415	0.1500	0.2964	0.0077	0.0166	0.0177	0.5332	0.4943	0.5721	21
NS7	0.0191	0.0899	0.0771	0.0694	0.0384	0.0333	0.0354	0.3626	0.3236	0.4015	2
DS1	0.0033	0.0254	0.1586	0.2586	0.0691	0.0416	0.0177	0.5741	0.5352	0.6131	23
DS2	0.0257	0.0899	0.0900	0.0378	0.0154	0.0166	0.0089	0.2842	0.2453	0.3232	1
DS3	0.0112	0.0761	0.0857	0.1766	0.0461	0.0333	0.0177	0.4466	0.4077	0.4855	10
DS4	0.0165	0.0553	0.1200	0.1072	0.0614	0.0166	0.0531	0.4301	0.3912	0.4691	7
DS5	0.0046	0.0691	0.1028	0.2271	0.0230	0.0208	0.0664	0.5139	0.4749	0.5528	18
DS6	0.0135	0.0761	0.0857	0.1545	0.0461	0.0333	0.0177	0.4268	0.3879	0.4657	6
DS7	0.0125	0.0484	0.1200	0.1388	0.0461	0.0166	0.1062	0.4886	0.4496	0.5275	15
IF1	0.0040	0.0115	0.0429	0.0883	0.0921	0.2827	0.2567	0.7781	0.7392	0.8171	27
IF2	0.0046	0.0207	0.0600	0.1766	0.2149	0.1164	0.0885	0.6818	0.6428	0.7207	24
IF3	0.0053	0.0138	0.0557	0.1640	0.1765	0.2162	0.0708	0.7023	0.6634	0.7412	25
ORG1	0.0053	0.0530	0.0900	0.2334	0.0768	0.0582	0.0354	0.5520	0.5131	0.5909	22
ORG3	0.0158	0.0668	0.1286	0.0568	0.1075	0.0166	0.0177	0.4098	0.3708	0.4487	5
ORG4	0.0053	0.0507	0.1500	0.1703	0.0691	0.0333	0.0443	0.5228	0.4839	0.5618	20
NOK1	0.0046	0.0092	0.0600	0.1135	0.1458	0.1995	0.2125	0.7452	0.7062	0.7841	26
NOK2	0.0046	0.0691	0.1028	0.2239	0.0230	0.0166	0.0752	0.5154	0.4765	0.5543	19
SD1	0.0125	0.0415	0.1500	0.1766	0.0307	0.0249	0.0266	0.4628	0.239	0.5017	13
SD2	0.0119	0.0876	0.0728	0.1451	0.0154	0.0665	0.0354	0.4346	0.3957	0.4736	9
SD3	0.0072	0.0968	0.1028	0.1577	0.0230	0.0166	0.0266	0.4308	0.3919	0.4697	8
SD4	0.0132	0.0438	0.1157	0.1514	0.0537	0.0831	0.0266	0.4875	0.4485	0.5264	14
SD6	0.0165	0.0761	0.0900	0.1577	0.0230	0.0166	0.0089	0.3887	0.3498	0.4276	3

Notes 1: Lower bound and upper bound denotes the confidence interval of the mean RIDIT value at 95% significance level.
Notes 2: The results are limited to 4 decimal spaces with rounding errors.
. NS = Nursing services; DS = Doctor services; INF = Information; ORG = Organization; NOK = Next of kin; SD = Standard.

The finalized value of the K is significantly greater than the critical value of $⟦ X ⟧ ^2$ (Chi-square) = 25.336 (at 26 degree of freedom and 95% confidence interval), which suggests that the pattern of responses of scale items in both the reference data set and the comparison data set are dissimilar and differ among various respondents.

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Prioritization of PX precursors by executing Grey Relational Analysis (GRA)

The grey relational analysis can be seen as a part of grey system theory for analyzing discrete sets or data series. It imitates a single grey relational grade from complex multi-factor attributes, allowing comparison with a reference data set [18]. To deal with obscure practical situations, the grey system theory is extremely helpful for diverse decision making solutions. GRA analysis is utilized to cross-verify the rankings of RIDIT and detect any execution-related errors during the procedural progress of the algorithm. GRA algorithms demand a reference data set (S_0) equivalent to the 'most favorable' point of the employed Likert scale. For the comparison data set, all 27 scale items are represented as S_1 to S_{27} and each contains a value equivalent to the original survey response.

Procedural steps for GRA

The difference data series (D_i) was computed by using the formula: $D_i = (|S_{01} - S_{i1}|, |S_{02} - S_{i2}|, ..., |S_{0m} - S_{im}|)$ (where the i = 1..., k, k = total number of scale items, m = total number of respondents, and n = total ordered categories).

For example,

$$D_1 = (|7 - 6| = 1),$$
$$D_2 = (|7 - 5| = 2), \text{ and so on.}$$

From Table 3, the identified maximum global value (D_{max}) = 6 and minimum value (D_{min}) = 0. Then by using the above values, the grey relational coefficient (α) was calculated for each element, as shown in Table 4.

The particular equation can be denoted as $\alpha_{im} = (D_{min} + \mu * D_{max}) / (D_{im} + \mu * D_{max})$ (where i = 1..., k, k = total number of scale items). Usually, the value of μ is fixated at 0.5. This specific coefficient is used to adjust the effect of D_{max} and argues whether D_{max} should indicate the extreme value in the data series.

$$\alpha_{11} = (0 + (0.5 * 6)) / (1 + (0.5 * 6)) = 0.75,$$
$$\alpha_{12} = (0 + (0.5 * 6)) / (2 + (0.5 * 6)) = 0.60, \text{ and so on.}$$

In the proceeding steps, grey relational grade values (β) for each different scale item are computed by using the formula: $\beta_i = 1/m * (\sum_{n=1}^{m} \alpha_{in})$ (where i = 1..., k, and k = total number of scale items, and m = total number of respondents).

$$\beta_1 = (0.75 + 0.76 + 0.50 + ... + 0.38 + 1.00) / 220 = 0.6202,$$
$$\beta_2 = (0.60 + 1.00 + 0.50 + ... + 0.43 + 1.00) / 220 = 0.6481, \text{ and so on.}$$

TABLE 3: DIFFERENCE DATA SERIES FOR GRA

Respondents	NS1	NS2	NS3	NS4	.	.	.	SD2	SD3	SD4	SD6
D_1	1	2	2	2	-	-	-	1	1	5	0
D_2	2	0	1	0	-	-	-	2	3	0	0
D_3	3	3	4	5	-	-	-	5	4	4	2
D_4	5	1	1	1	-	-	-	5	2	5	3
D_5	1	1	0	1	-	-	-	1	1	0	1
D_6	4	1	0	1	-	-	-	1	1	3	1
D_N	-	-	-	-	-	-	-	-	-	-	-
D_O	-	-	-	-	-	-	-	-	-	-	-
D_{200}	6	6	3	6	-	-	-	6	6	6	3
D_{201}	2	1	1	3	-	-	-	1	2	4	2
D_P	-	-	-	-	-	-	-	-	-	-	-
D_a	-	-	-	-	-	-	-	-	-	-	-
D_{219}	5	4	3	1	-	-	-	2	1	1	3
D_{220}	0	0	0	1	-	-	-	0	1	2	1

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TABLE 4: GREY RELATIONAL COEFFICIENT (A)

Respondents	NS1	NS2	NS3	NS4	.	.	.	SD2	SD3	SD4	SD6
1	0.7500	0.6000	0.6000	0.6000	-	-	-	0.7500	0.7500	0.3750	1.0000
2	0.6000	1.0000	0.7500	1.0000	-	-	-	0.6000	0.5000	1.0000	1.0000
3	0.5000	0.5000	0.4286	0.3750	-	-	-	0.3750	0.4286	0.4286	0.6000
4	0.3750	0.7500	0.7500	0.7500	-	-	-	0.3750	0.6000	0.3750	0.5000
5	0.7500	0.7500	1.0000	0.7500	-	-	-	0.7500	0.7500	1.0000	0.7500
6	0.4286	0.7500	1.0000	0.7500	-	-	-	0.7500	0.7500	0.5000	0.7500
.	-	-	-	-	-	-	-	-	-	-	-
.	-	-	-	-	-	-	-	-	-	-	-
200	0.3333	0.3333	0.5000	0.3333	-	-	-	0.3333	0.3333	0.3333	0.5000
201	0.6000	0.7500	0.7500	0.5000	-	-	-	0.7500	0.6000	0.4286	0.6000
.	-	-	-	-	-	-	-	-	-	-	-
.	-	-	-	-	-	-	-	-	-	-	-
219	0.3750	0.4286	0.5000	0.7500	-	-	-	0.6000	0.7500	0.7500	0.5000
220	1.0000	1.0000	1.0000	0.7500	-	-	-	1.0000	0.7500	0.6000	0.7500

Note: The results are limited up to 4 decimal spaces with rounding errors.

The final β value has been arranged and sorted to rank the items under GRA. The results and rankings under GRA are represented in Table 5. A higher β value signifies a favorable and higher priority inclination for a specific item, whereas a lower β value denotes a comparatively less favorable tendency of respondents.

TABLE 5: GREY RELATIONAL GRADE VALUES, GRA RANKING, AND COMPARISON

Scale serial	Item Name	GRA Grades	GRA Rank	RIDIT Rank	Remarks
1	NS1	0.6202	17	16	Deviation
2	NS2	0.6481	12	11	Deviation
3	NS3	0.6984	4	4	No deviation
4	NS4	0.6472	13	12	Deviation
5	NS5	0.6348	16	17	Deviation
6	NS6	0.5895	21	21	No deviation
7	NS7	0.7230	2	2	No deviation
8	DS1	0.5668	23	23	No deviation
9	DS2	0.7799	1	1	No deviation
10	DS3	0.6590	9	10	Deviation
11	DS4	0.6771	6	7	Deviation
12	DS5	0.6057	18	18	No deviation
13	DS6	0.6749	7	6	Deviation
14	DS7	0.6352	15	15	No deviation
15	IF1	0.4574	27	27	No deviation
16	IF2	0.5158	24	24	No deviation
17	IF3	0.5052	25	25	No deviation
18	ORG1	0.5872	22	22	No deviation

19	ORG3	0.6879	5	5	No deviation
20	ORG4	0.6002	20	20	No deviation
21	NOK1	0.4777	26	26	No deviation
22	NOK2	0.6047	19	19	No deviation
23	SD1	0.6485	11	13	Deviation
24	SD2	0.6672	8	9	Deviation
25	SD3	0.6585	10	8	Deviation
26	SD4	0.6382	14	14	No deviation
27	SD6	0.7020	3	3	No deviation

Note: The results are limited to 4 decimal spaces with rounding errors.

DISCUSSIONS AND CONCLUSIONS

To date, several PX-related works have focused on its interactions with healthcare quality and patient welfare domains in various developing countries, like India [11] and China [14], as well as in developed nations, like the USA [12] and Australia [19]. However, very few studies have focused on the individual dimensions of PX and their unique degree of impact on the construct of PX as a whole. To bridge this acute gap, the present study attempted to assimilate typical antecedents of PX employed in multi-dimensional scales and adapted a recently developed measurement model to quantify the perceptual importance of PX dimensions from the perspectives of patients.

Both the GRA and RIDIT prioritization techniques reflect the relative importance of PX items from a patient's standpoint. From the results, the comparatively poor performing item was IF1 from the 'information' factor, which evaluated the patients' know-how aspect of clinical tests and examinations. From the same factor, all the items, including IF2 and IF3, also secured lower ranks. Item IF2 evaluated patients' initial awareness regarding clinical tests and examination and item IF3 inquired whether the patients had received sufficient prior information about their diagnosis or complaints. Likewise, comparatively positive responses were associated with items DS2, NS7, and SD6, respectively. Item DS2 belongs to the factor 'doctor services', which probed whether the doctor took proper care of the concerned patient or not. Item NS7 is associated with the dimension 'nursing services' and investigates nurses' timely care in proportion to the patient's needs. Item SD6 undergoes the factor 'standard', which enquired about the cleanliness of the whole establishment and treatment spaces.

The above findings suggest that most of the patients were satisfied with their peripheral hygiene and care provided by doctors and nurses as well. Patients perceived their overall treatment as timely, effective, and empathetic. However, patients seemed to be overly dependent on providers' professional competency, restricting the flexibility of communication in a shared-care system. The lower rankings of the information factors validate the argument that patients did not receive ample information regarding their clinical examinations and did not feel included in their treatment processes. Despite higher ratings of personnel services, multiple items representing provider-patient interaction (items like DS1 and NS6) obtained relatively poor ratings. Through literature, the reasons behind such poor ratings can be attributed to two perspectives: organizational and personal. From the provider's perspective, Sun et al. [28] conducted an interview and discovered that physicians struggle to establish effective communication with patients due to a lack of organizational training. They also suggested that physicians rely more on their personality and experience rather than their knowledge while practicing patient-centricity. This indicates that doctor-patient communication, as a set of learned skills, needs to be improved by training. Liu et al. [29] further support this opinion by emphasizing the need for communication skill training for Chinese physicians in order to improve their interpersonal and knowledge-sharing abilities.

From a personal perspective, factors such as patient's self-awareness, psychological beliefs, and cultural communities have been found to significantly influence their involvement in a shared-care process [23]. However, patient participation in Asian countries has been greatly hindered by an overburdened healthcare system and limited implementation of patient-centric programs [11,21,22]. As a result, patients fail to realize the importance

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of collaborative tactics and are vulnerable to information loss caused by communicational deficiency [4]. Also, the lack of clinical infrastructure and hospital support prevents healthcare systems from fully benefitting from consumer-centric practices [11]. It is essential to rethink the roles of healthcare providers in bringing more inclusivity, transparency, and specificity to the communication they share with their patients. Lastly, the results justify the rank disparity and indicate that effective patient-provider communication generates a significant influence on consumers' perceived experiences [1,2,4].

From Table 5, it is evident that the GRA ranking based on the GRA grade scores is almost similar to the RIDIT rankings. While there were occurrences of rank deviation with items NS1, NS2, NS4, NS5, DS3, DS4, DS6, SD1, SD2, and SD3, these variations were marginal. In most cases, the difference between these rank variations was no more than one, except for SD1 and SD3. Statistically, a few deviations were expected as both the techniques (RIDIT and GRA) are independent and follow their unique algorithm to compute the results. These deviations can be conceptually explained by looking into the nature of the questions asked to participants. For instance, the items NS1, NS, NS4, and NS5 contained overlapping terms such as 'talk', 'tell', 'description', etc. Although these items examine distinct areas of nursing care, they mutually share a common theme. Similarly, items DS3, DS4, and DS6 contained terms like 'trust', 'time', 'interest' etc., which are subjective and vary depending upon the patient and provider involved. Lastly, items SD1, SD2, and SD3 addressed the infrastructural conditions through terms like 'equipment', 'condition', 'room', etc. Thus, when subjected to two different methods, the similarities between items within specific factors accounts for minor deviations. Since no major deviations were found in the results of both methods, it can be inferred that the prioritization values are conclusive and suitable for decision-making [18]. The prioritizations ranking in both scales showed a 99.5% correlation, ascertaining the precision of the analysis.

The findings provide key insight into consumer preferences and choice domains by using the dimensions of consumer experience. The results will be helpful for healthcare managers and practitioners to identify relatively stronger as well as weaker performing domains of clinical experiences and prioritize the solutions accordingly. The dual-hybrid technique is replicable across various healthcare platforms such as e-health, telehealth, public policies, m-health etc., to measure the orientation of modern consumers toward

novel healthcare trends. Also, the results will assist healthcare professionals to focus on the relatively weaker dimensions and devise a more effective patient-centric culture in their respective departments.

LIMITATIONS AND FUTURE RESEARCH

This precedence analysis delivers some limitations. First, the rank reversal phenomenon is a common attribute in decision-making analyses, where the addition or deletion of some variables causes significant deviations among the rankings. Although neither of the above techniques assumes the nature of the data distribution, they heavily rely on the sample size and the number of dimensions included in the study. It is also important to mention that the term 'distribution' means whether the data dispersion follows a normal (bell-shaped curve) or non-normal (skewed) pattern. The results of both RIDIT and GRA showed rank deviations. However, these deviations were minimal and did not indicate any possibilities for rank reversal. When reassessing the ranks, future studies could enhance their methodology by experimenting with a wider range of indicators and employing a larger sample size to ensure more stable outcomes.

Second, a cross-sectional study was undertaken in a certain frame of time, which fails to capture the ongoing variations that occur over a long period of time. To establish generalizability, future studies can experiment with longitudinal sampling techniques to validate and extrapolate the current findings.

Third, the analytical tools used here focus only on patient-side assessment, whereas the gap between management perception and consumer expectation has been a long-discussed problem. Implementing shared decision-making policies is a dyadic process that demands additional efforts from both management and providers. Thus, to gain deeper insights, future studies should aim to integrate management perceptions with consumer expectations.

Lastly, the analysis presented in this study only presents a hierarchical structure of factors influencing PX. It is recommended that causal analysis and examination of interrelationships between these factors be conducted. This approach will enable the generation of a broader understanding of the associativity and outcomes related to PX. Furthermore, practitioners are encouraged to explore other fundamental PX dimensions, such as pain management [21], healthcare awareness/ literacy [21], and self-perceived health [7]. These fundamental factors,

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as antecedents of PX, can be examined through structural modeling techniques to verify their linkages with important service outcomes like patient satisfaction and loyalty intentions. Also, it is crucial to recognize that PX programs and cultures are highly context-specific [24]. Therefore, in order to ensure the replicability of this experiment, it is necessary to verify the findings by considering a broader population base. For example, researchers can extend their focus beyond corporate hospitals and include patients seeking treatment in public hospitals, nursing homes, and non-profit hospitals. By incorporating diverse healthcare settings, a more representative picture of PX can be obtained.

ETHICS APPROVAL

This research was approved by the National Institute of Technology Rourkela, India. The application for the survey was approved in July 2022. We obtained verbal consents of patients before considering them as participants of this survey.

COMPETING INTERESTS

The Authors declare that there is no conflict of interest.

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APPENDIX - SURVEY QUESTIONNAIRE WHICH WAS RATED ON A SEVEN-POINT LIKERT SCALE

Item	Variable
NS1	"Did the nursing staff talk to you so you understood them?"
NS2	"Did you find that the nursing staff cared for you?"
NS3	"Do you have confidence in the professional skills of the nursing staff?"
NS4	"Did you tell the nursing staff everything you thought was important about your condition?"
NS5	"Did you find that the nursing staffs were interested in your description of your own situation?"
NS6	"Were you included in the advice on questions regarding your care?"
NS7	"Did the nursing staff have time for you when you needed it?"
DS1	"Did the doctors talk to you so you understood them?"
DS2	"Did you find that the doctors took care of you?"
DS3	"Do you trust the doctors' professional skills?"
DS4	"Did the doctors have time for you when you needed it?"
DS5	"Did you tell the doctors everything you thought was important about your condition?"
DS6	"Did you find that the doctors were interested in your description of your own situation?"
DS7	"Did you find that the treatment was adapted to your situation?"
IF1	"Did you know what you thought was necessary about how tests and examinations should take place?"
IF2	"Did you know what you thought was necessary about the results of tests and examinations?"
IF3	"Did you receive sufficient information about your diagnosis or your complaints?"
ORG1	"Did you find that there was a permanent group of nursing staff that took care of you?"
ORG3	"Did you find that the hospital's work was well organized?"
ORG4	"Did you find that important information about you had come to the right person?"
NOK1	"Were your relatives well received by the hospital staff?"
NOK2	"Was it easy for your relatives to get information about you while you were in the hospital?"
SD1	"Did you get the impression that the hospital equipment was in good condition?"
SD2	"Did you get the impression that the hospital was in good condition?"
SD3	"Was the room you were in satisfactory?"
SD4	"Was the opportunity for rest and rest satisfactory?"
SD6	"Was the cleaning satisfactory?"

PERFORMANCE OF PRIMARY HEALTH CENTRES, PROVIDER'S PERSPECTIVE OF WELLBEING, AND PATIENT'S ASSESSMENT OF THE CENTRES USING A NEW TOOL IN BANGALORE, INDIA: AN EMPIRICAL STUDY

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ABSTRACT

BACKGROUND:

Primary Health Centres (PHC) in India have evolved over the last seven decades to meet the healthcare needs of communities aligned to the epidemiological transitions the country has undergone. It is a well understood fact that the performance of PHCs is vital for overall improvement in the general health of the population of any nation. The relationship between the performance of PHCs, patients' perspectives of PHC performance and provider perspective of well-being is not well understood. This research aimed to test a new tool for patients' assessment of PHC performance and to explore the relationships between the centre's performance and the provider's well-being across centres with different workloads.

METHODOLOGY:

PHC workload was assessed based on the number of babies delivered to the population covered by the facility. Three PHCs with high, medium and low workloads were selected for the study in Bengaluru (Bangalore), Karnataka, India. The centres were assessed based on the Indian Public Health Standards. A new tool 'Questionnaire for Patient's Perspective on Performance of Primary Health Centres' (Q4PHC) was developed and tested for reliability. A total of 298 patients assessed the performance of these PHCs using Q4PHC by an 'exit survey'. 36 Provider's perspective on one's well-being were studied using the Quality of Life (WHO QoL Bref) tool and the work engagement tool (The Utrecht Work Engagement Survey - UWES). The data were analysed across the three centres using the ANOVA test.

RESULTS:

Q4PHC was found to be reliable with have high internal consistency. Patients assessed the 'low' workload PHC as the best-performing among the three centres (p<0.000). Provider's well-being was found better in 'medium' workload PHC but was not statistically significant.

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CONCLUSION:

Q4PHC is found to be a useful instrument to assess PHC performance from patients' perspective in the Indian context. The study results suggest that there is a trade-off between the provider's perspective on well-being and maximum PHC performance.

KEYWORDS

primary health centres, performance assessment, healthcare provider's perspective, patient's perspective, multi-approach.

INTRODUCTION

Life expectancy in India has been enhanced and one of the reasons for this is a reduction in communicable diseases and better reproductive and child health care. This was achieved by providing extensive preventive and promotive healthcare services and some curative services at dedicated public centres called Primary Health Centres (PHCs) that have evolved to provide care as per the epidemiological transition over time. The use of primary healthcare was universally accepted following the declaration of Alma-Ata and the PHCs deliver care in the communities. [1, 2]. Hence the performance of PHCs is vital for overall improvement in the general health of the population, specifically in a developing country like India [3]. With a fast-growing economy and more than a third of the world's population, disparities in the health of the population in India vary from state to state, from rural to urban areas and also within the same urban settings [4, 5]. In this scenario, PHC performance grows in importance, greatly contributing to the health of the masses. Optimising PHC performance, therefore, is the key to the success for this health care.

Research into the performance of public healthcare is usually based on the number of services delivered with an emphasis on care effectiveness, access, equity, and efficiency [6-8]. The Primary Health Care Performance Initiative Framework for the assessment of primary healthcare consisted of health financing, drugs and supplies, available infrastructure and workforce, accessibility and availability of effective primary healthcare services, quality of primary care, effective services coverage, health status and equity [9]. Traditionally in India, the performance of PHC has been assessed based on output and outcome indicators, such as the number of patients served, maternal mortality rate, infant mortality rate, cost of care, etc., with minimal

emphasis on patient satisfaction, cost-effectiveness and fund utilisation [10]. While there has been some emphasis on the performance of the primary health system, there is a general lack of knowledge on what works in a primary health setting, including inputs from various stakeholders, which is based on the principles of co-design that could be the way forward [9, 11].

Researchers believe that there is a need for agreement on the indicators that fit the purpose as only a few validated primary care performance measurement instruments exist, but they are not validated for PHCs in low and middle income countries [12]. There is also a need for knowledge on the effects of various components of performance in these countries [6].

The performance of a PHC itself has been assessed from the perspectives of the centre and of the providers [3]. Provider performance is generally assessed based on the number of cases treated or other output indicators, but no single standard measure exists [13]. Provider performance could be tested with well-being tools, such as the Work Engagement Scale [14, 15]. Kahn defined employee engagement or rather work engagement as 'the harnessing of organisation members' selves to their work roles; in engagement, people employ and express themselves physically, cognitively, and emotionally during role performances'' [16]. This concept has further evolved to a positive, fulfilling and work-related state of mind that is characterised by vigour, dedication and absorption [17]. Thus, engagement means being psychologically as well as physically present when working and refers to work-related well-being. The quality of life is an indicator of the functional dimension in all life spheres of a person and is an essential outcome of the interactions of oneself and their environment [3, 18-19].

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The utilization of the PHC depends on the perceived performance of these centres by patients [21, 22, 23]. A tool to measure patient satisfaction, the 'Patient Satisfaction Questionnaire – Short Form 18' has been established and long been used [24], however a tool to measure PHC performance from a patient's perspective in an Indian setting is not available. There is a need for developing such a tool so as to aid in accurate assessment and to enable enhanced utilization by the patients.

Further, the performance of PHC has been studied from various perspectives individually but never from multiple perspectives. We identified that PHC performance should be captured as a whole, and the inter-relationships explored from multiple perspectives of the centre, the providers, and the patients. Thus, this study was designed not only with the objective of developing a reliable questionnaire to capture the patient's assessment of the PHC, but also to explore providers wellbeing (work engagement and quality of life) and explore how these relates to the input-output of the centres.

The research questions addressed in this study are:
1. What is the performance of a PHC in terms of infrastructure availability and services delivered?
2. What measures are used by the patients to assess a PHC? Are these reliable in the Indian context?
3. What is the patient's perspective on the performance of each PHC?
4. What is the performance of the providers defined by their wellbeing assessed by the quality of life and work engagement at each PHC?
5. Can we distinguish patterns among the centre, provider's wellbeing, and patients' perspectives of performance across different PHCs?

METHODOLOGY

STUDY DESIGN

A descriptive cross-sectional quantitative research methodology was employed in three PHCs to capture the performance at centre level, to assess the Quality of Life and Work Engagement of the providers and to assess the patients' perspective on performance, for which a new questionnaire was developed.

The data was collected in multiple phases by the first author from various perspectives (centres, providers, and patients) between September 2017 and July 2019. The quantitative data was analysed with statistical tests.

ETHICS APPROVAL

The study was approved by the Manipal University Ethics Committee, Manipal University, Manipal, Karnataka. Ethics in research procedures were followed in the study by obtaining written informed consent from the participants with assurance of confidentiality.

PHC SAMPLE

The research was conducted in three PHCs located in the urban district of Bengaluru, India. The Bengaluru urban district is administratively divided into four talukas or blocks, and there are 20 PHCs that operate 24 hours a day, seven days per week. The number of pregnant women who delivered babies at these centres is related to the number of patients utilising the services and their perceived quality of care at the PHC reflecting the general performance of the PHC concerned [25]. The number of deliveries conducted at PHCs is also a major output indicator [25], hence the PHCs were selected based on the number of pregnant women who delivered babies in the centre in relation to the population served (delivery load) in the financial year 2016-2017. The PHCs were arranged in the order of delivery load (number of births to the population served) that was considered as the performance; the PHCs with the highest, medium, and least maternal delivery load were included in the study. The well-performing PHC-1 had five subcentres, while both the medium PHC-2 and the low-performing PHC-3 had four subcentres, all providing primary care in the community. The PHCs were included in the study to explore the relation between the performance of PHCs from the provider's well-being and the patient's perspective.

PROVIDER SAMPLE

On visiting the PHC, all the healthcare providers (doctors, staff nurses, laboratory technicians, pharmacists, optometrists, and health assistants) at these centers were requested to participate in the study to record their quality of life and their work engagement. All the providers participated in the study by offering their consent and the details of the personnel included are in Table 1.

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TABLE 1. DETAILS OF PHC FACILITY PROVIDERS WHO PARTICIPATED IN THE STUDY

Personnel	High Number Deliveries PHC-1		Medium Number Deliveries PHC-2		Low Number Deliveries PHC-3		Gender Total		Total
	Male	Female	Male	Female	Male	Female	Male	Female	
Doctors	1	0	0	1	1	1	2	2	4
Staff Nurses	0	4	0	3	0	4	0	11	11
Pharmacists	1	0	0	1	0	1	1	2	3
Laboratory technicians	0	0	0	1	0	1	0	2	2
Optometrists	1	0	1	0	0		2	0	2
Health Assistants	0	4	2	4	0	4	2	12	14
Total	**3**	**8**	**3**	**10**	**1**	**11**	**7**	**29**	**36**
Mean Age (SD)	47.3 (9.5)		40.2 (9.8)		39.0 (10.0)				41.94 (10.2)
Population covered	56,081		48,037		54,513				158,631

PATIENT SAMPLE

All the patients attending a PHC were approached after their consultation by a doctor, nurse, or healthcare worker to participate in an exit survey, with the aim of including 100 willing patients who had received care at each PHC. For patients under 18, their parents were asked to participate or if the patients wanted their guardians to participate on their behalf, they were included in the study.

PERFORMANCE MEASUREMENTS

AT THE LEVEL OF THE CENTRES

PHC service delivery data was captured and maintained by the Health Management Information System. Retrospective secondary data for the year 2016-2017 was utilised. The following service delivery data were collected from the Health Management Information System:

1. The number of patients treated on an outpatient basis

2. The number of patients in the middle of the night was considered equal to the number of in-patients

3. The number of pregnant women who received three pre-natal check-ups

4. The number of children older than 16 months who received the measles vaccine (full immunisation)

5. The number of women who delivered babies in the PHC

The availability of infrastructure and services was assessed based on the Indian Public Health Standards checklist on

the first day of the visit to the PHC [25, 26]. This tool had 216 items that can be assessed. In order to attain a numerical value to aid in the comparison, these items were scored as: 0 – not available; 1 – available but not functioning; 2 – available but partly functioning; and 3 – available and fully functioning. Negative items like 'Is there a garbage dump close to PHC', 'Is there any incidence of any sexual advances., oral or physical abuse, sexual harassment by the doctors or any other paramedical?' were reverse scored to attach more numbers to the absence of the event and increase the total score. The maximum score a PHC could obtain was 648 and the minimum was 0.

AT THE LEVEL OF THE PROVIDERS

The World Health Organization Quality of life Bref (WHO QoL BREF): The WHO developed a short version of the questionnaire (original with 100 questions), which consisted of four domains with 26 items: D1-Physical Health (7 questions); D2-Psychological (6 questions); D3-Social Relationships (3 questions); D4-Environment (8 questions), along with general questions on the quality of life (Q1) and general health (Q2) [27-29]. The questions were scored on a Likert scale of 1 (not at all) to 5 (extreme/completely). Some examples of questions were: How much do you enjoy your life? How often do you have negative feelings, such as blue mood, despair, anxiety, and depression? The questionnaire was applied in English as well as the local language to aid in better interpretation and understanding of the questionnaire by the participants. These translated tools were verified by an expert in both languages to ensure the quality of the translation.

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The Utrecht Work Engagement Survey (UWES): Utrecht Work Engagement Survey tool (UWES) was used to capture health professional engagement, which is a positive job outcome [30]. The UWES questionnaire has been validated for the Indian setting and applied in research [31, 32]. The instrument contained 17 items and was applied in English as well as the local language to aid in better interpretation and understanding of the questionnaire by the participants [30]. The items were scored on a Likert scale from 0 (never) to 6 (always or every day). The items covered three dimensions of engagement: vigour (6 items), dedication (5 items) and absorption (6 items). An example of an item in the absorption subscale was 'Time flies when I'm working'.

AT THE LEVEL OF THE PATIENTS

The patient's assessment of the PHC was performed using the newly developed 'Questionnaire for Patient's Perspective on Performance of Primary Healthcare Centres' (Q4PHC). The details of the development, testing for the validity and reliability of the tool are as follows.

- In-depth interviews were conducted with 188 patients at the selected PHCs to develop insights from the patient's perspectives on PHC performance. Interviews with the consenting patients were conducted in the local language to aid in communication. The recorded interviews were translated into English by professionals, transcribed and analysed thematically [33] using ATLAS-TI software to develop themes for PHC performance assessment by the patients.

- The analysis of these interviews resulted in the following themes: the behaviour and attitude of providers; availability of 24/7 diverse services; availability of diagnostic services; diagnosis and treatment for emergencies; availability of medicines; cost of care and medicines; effectiveness of treatment; PHC infrastructure; organisation of services for better functioning of the PHC. For each of these nine themes, items were formulated, which resulted in 53 initial items.

- The tool consisting of nine dimensions and 53 initial items is presented in Appendix 1. The items were finalised based on a discussion with the authors. The items were formulated as statements to be scored on a Likert scale of 1 (totally disagree) to 5 (totally agreed).

- Validity was tested using Principal Component Analysis and Factor Analysis which showed considerable overlap at the item level and did not contradict the theoretical scales [34, 35]. The items loaded on 11 factors as opposed to the original nine domains, however, the loadings were inconclusive except for the domain 'cost of care and medicine'. Hence, all nine theoretical themes were retained as nine subscales.

- After initial reliability analysis of each of the nine subscales, two subscales (availability of medicines and organisation of services) and certain items were deleted. This resulted in the Q4PHC tool with seven subscales and 41 items. The Cronbach's alpha for the total tool was found to be highly reliable with 0.938 (Appendix 2). The Cronbach's alpha for the subscales varied from sufficient (>.60) to high (>.80). Table 4 gives the details of the number of items and Cronbach's alpha per subscale.

The RAND short-form Patient Satisfaction Questionnaire-18 was also administered so as to triangulate patient findings in this study. This questionnaire consisted of seven domains, namely general satisfaction, technical quality, interpersonal manner, communication, financial aspects, time spent with doctor, accessibility, and convenience with 18 statements (nine positive and nine negative) and was scored from 1 (strongly agree) to 5 (strongly disagree); the negative statements were reverse coded in the analysis of the tool for appropriate scoring [24].

The patient feedback form from the Urban PHC Quality Manual of the Ministry of Health and Family Welfare, Government of India was used. This tool included 10 statements addressing the behaviour and attitude of staff, the waiting time, promptness, availability of drugs, tests, and information at PHC, time spent in care, cost of care and cleanliness of PHC with scoring on the Likert scale of 1 (poor) to 5 (excellent) [36].

DATA ANALYSIS

The data were cleaned and analysed using IBM SPSS 25. The validity of the Q4PHC tool was tested using Principal Component Analysis and Factor Analysis, while the reliability was tested with Cronbach's alpha. The data from the centres, providers and patients were analysed within the PHC as means and distribution that were computed per centre. One-way ANOVA with Scheffé test was conducted to check for differences between the centres (threshold: $p < 0.05$).

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RESULTS

The availability of the infrastructure and services delivered at the PHCs, the quality of life and engagement of the providers, and the PHC performance from the patient's perspective were analysed to identify patterns and understand the relations between various components.

The results of the analysis and comparison between the PHCs are presented in Tables 2, 3 and 4. The detailed results are described below.

Availability of infrastructure and services delivered at PHCs
It was observed that the PHCs did not have any significant difference in the availability of infrastructure and other sources assessed based on the Indian Public Health Standards checklist (Table 2). All the PHCs had buildings on government owned land with sufficient vacant areas around their designated boundary (compound). The availability of the infrastructure was better in PHC 1 (score 484) and PHC 2 (score 479) in comparison with PHC 3 (score 433). Even though PHC 2 served less people, the PHCs showed no significant difference in total population: PHC 1 (56,081), PHC 2 (48,037) and PHC 3 (54,513). On examining the availability of infrastructure and other resources, PHC 1 performed best, followed by PHC 2 and PHC 3.

The number of deliveries conducted, the number of outpatients treated, the number of inpatients, and the number of women who received three antenatal check-ups were all highest in PHC 1, followed by PHC 2 and PHC 3. The number of children who received full immunisation was highest in PHC 1, followed by PHC 3 and PHC 2. On the whole, PHC 1 performed best in the number of services delivered.

PERFORMANCE OF PHCS IN RELATION TO PROVIDER WELL-BEING

Provider well-being represented as the quality of life and work engagement was analysed in the PHCs individually (Table 3). Provider quality of life did not show any significant difference between the PHCs, however, PHC 3 scored higher than PHC 2, and PHC 2 scored higher than PHC 1. On examining the work engagement of providers, PHC 2 was significantly better than PHC 1 ($p < 0.030$), nevertheless, there was no significant difference between PHC 1 and PHC 3.

PATIENT ASSESSMENT OF PHC PERFORMANCE

A comparison of PHCs using the total score from Q4PHC (Table 4) found that PHC 3 performed best, followed by PHC 1 and PHC 2 ($p < 0.000$). Patient PHC assessment based on the total score of short-form patient satisfaction questionnaire-18 showed that PHC 3 was performing the best, followed by PHC 1 and PHC 2 ($p < 0.000$). The patient's assessment based on the patient feedback form from the Urban PHC quality manual showed that PHC 3 performed best, followed by PHC 1 and PHC 2 ($p < 0.000$).

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TABLE 2. ANALYSIS OF INFRASTRUCTURE AND SERVICES PROVIDED AT THE PHCS

Component	Source	Variable (Measure)	Statistics	1 High Number Deliveries PHC	2 Medium Number Deliveries PHC	3 Low Number Deliveries PHC	Difference**
Population served	Indian Public Health Standards tool survey		Number	56,081	48,037	54,513	1>3>2 (1,3,2)
Infrastructure	Indian Public Health Standards tool survey*		Total Score	484	479	433	1>2>3, 1~2 (1,2,3)
Service delivered	Health Management Information System (2016-17)	Women who delivered babies in PHC	Number	399	133	22	1>2>3 (1,2,3)
		Out-Patients treated		16474	15114	10457	1>2>3, 1~2 (1,2,3)
		In-Patient Head Count at midnight		792	240	44	1>2>3 (1,2,3)
		Women who received 3 ANC check-ups		681	190	0	1>2>3 (1,2,3)
		Fully Immunized children		332	169	322	1>3>2, 1~3 (1,3,2)

*PHC (216 items with the maximum score of 648); **1- High Deliveries PHC, 2- Medium Deliveries PHC, 3- Low Deliveries PHC

TABLE 3. ANALYSIS OF PROVIDER DATA

Group	Source	Variable (Measure)	Statistics	1 High Number Deliveries PHC	2 Medium Number Deliveries PHC	3 Low Number Deliveries PHC	Scheffé test**
Provider	Employee survey	Quality of Life (QoL Bref)	N	11	13	12	No significant difference but trend in 3>2>1 seen (3,2,1)
			Mean	13.7053	14.6053	14.9648	
			F	2.515			
			Sig.	0.096			
		Work Engagement (UWES)	N	11	13	12	2>1, 1~3
			Mean	4.5936	5.2443	4.8971	
			F	3.923			
			Sig.	0.030			

**1- High Deliveries PHC, 2- Medium Deliveries PHC, 3- Low Deliveries PHC

TABLE 4. ANALYSIS OF PATIENT DATA

Tool	Variable (Measure)	Number of Items	Cronbach's alpha	Statistics	1 High Number Deliveries PHC	2 Medium Number Deliveries PHC	3 Low Number Deliveries PHC	Scheffé test**
				N	101	97	100	
Q4PHC	Behaviour and attitude	13	0.941	Mean	4.1464	3.9055	4.4180	3>2, 3>1 (3,2/1)
				F	13.372			
				Sig.	.000			
	Availability of Specialist care	4	0.652	Mean	2.7343	2.3686	3.4767	3>1>2 (3,1,2)
				F	37.338			
				Sig.	.000			
	Availability of diagnostic services	5	0.876	Mean	2.8779	2.3090	3.8300	3>1>2 (3,1,2)
				F	24.610			
				Sig.	.000			
	Availability of Emergency care	5	0.727	Mean	3.3772	3.1198	3.5940	3>2, 1=3 (3/1,2)
				F	6.945			
				Sig.	.001			
	Cost of Treatment	4	0.865	Mean	4.3045	4.2191	4.8200	3>1, 3>2, 1=2(2,1/2)
				F	23.228			
				Sig.	.000			
	Effectiveness of Treatment	5	0.725	Mean	3.2084	3.1828	3.3715	3>1, 3>2, 1=2 (3,1/2)
				F	11.939			
				Sig.	.000			
	Adequate Infrastructure of PHC	5	0.875	Mean	4.2320	3.3077	3.7115	1>3>2 (1,3,2)
				F	26.116			
				Sig.	.000			
	Total Q4PHC	**41**	**0.938**	**Mean**	**3.5522**	**3.2022**	**3.9431**	**3>1>2 (3,1,2)**
				F	**32.123**			
				Sig.	**.000**			
Short form Patients satisfaction	General Satisfaction	2	.331	Mean	4.1832	4.1563	4.4350	3>1>2 (3,1,2)
				F	4.356			
				Sig.	.014			
		4	.608	Mean	4.2921	3.9897	4.3175	

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questionnaire - 18	Technical Quality			F	8.528			1>2, 3>2, 1=3 (1/3,2)
				Sig.	.000			
	Interpersonal Manner	2	.688	Mean	4.3713	3.8041	4.5150	1>2, 3>2, 1=3 (1/3,2)
				F	19.442			
				Sig.	.000			
	Communication	2	.636	Mean	4.3366	3.8299	4.4900	3>1, 3>2, 1=3 (1/3,2)
				F	15.322			
				Sig.	.000			
	Financial Aspects	2	.662	Mean	4.3416	4.3247	4.7350	3>1, 3>2, 1=2 (3,2/1)
				F	15.048			
				Sig.	.000			
	Time spent with doctor	2	.427	Mean	3.8564	3.4485	4.4200	3>1, 3>2, 1>2 (3,1,2)
				F	28.184			
				Sig.	.000			
	Accessibility and Convenience	4	.507	Mean	3.7500	3.4107	3.9367	3>2, 1>2, 1=3 (3,1,2)
				F	11.493			
				Sig.	.000			
	Total Score for Patient Satisfaction	**18**	**0.840**	**Mean**	**4.1329**	**3.8181**	**4.3450**	**3>1, 3>2, 1>2 (3,1,2)**
				F	**26.487**			
				Sig.	**.000**			
Patient feedback form	**Patient feedback form for Urban PHC**	**10**	**0.869**	**Mean**	**3.9777**	**3.6450**	**4.3340**	**3>1>2 (3,1,2)**
				F	**26.317**			
				Sig.	**.000**			

**1- High Deliveries PHC, 2- Medium Deliveries PHC, 3- Low Deliveries PHC

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DISCUSSION

Three PHCs in Bengaluru, India was selected based on the number of deliveries conducted at the centres, these were compared to explore patterns among the availability of the infrastructure and services delivered, provider's quality of life and work engagement, and PHC performance from the patients' perspectives. A new tool 'Q4PHC' was developed for capturing the patient's perspective on PHC performance, this was valid and reliable. The main results showed that all centres had similar infrastructure and other resources availability. However, the centre that delivered most women scored moderate on providers scores and moderate to low according to patient's assessment. The PHC that was delivering the medium number of deliveries had better provider wellbeing scores with moderate patient assessment of performance. The centre with the lowest number of deliveries had higher patient scores and moderate provider scores. PHCs did not perform high in all the three aspects of assessment. So, centres either performed much work at the cost of moderate provider wellbeing and low/ moderate performance according to patients (PHC 1) or had high provider wellbeing scores at the cost of a moderate amount of work and moderate performance according to patients (PHC 2) or had high-performance ratings according to patients at the cost of a low amount of work and only moderate provider wellbeing (PHC 3).

PHC PERFORMANCE AS AVAILABILITY OF INFRASTRUCTURE AND SERVICE DELIVERY

In the literature, both availability of infrastructure and quantity of service delivery have been consistently considered as indicators of PHC performance [9, 10, 37, 38]. As PHCs in this study were sampled on the basis of varying numbers of women who delivered babies in the centres, it is also evident that they varied similarly in the availability of infrastructure and showed significantly different service delivery. That is, the number of deliveries still remains a good indicator of centre performance. However, this study clearly showed that this was not related to the other performance indicators, which will be discussed below.

PHC PERFORMANCE AND PROVIDER WELL-BEING

The results showed that the centres with high service delivery did not correspond with better quality of life and employee engagement. Provider quality of life (significant) and work engagement (insignificant) were better in the centre that delivered less in comparison with the other PHCs probably because they had less stress from the

workload and were able to provide the needed attention to patients. The positive association between quality of life, work engagement, workload, and patient satisfaction has long been established [39]. The improved time and attention for patients not only would improve patients' perception of the centre but also provider satisfaction, which was depicted in the patients' assessment of PHC performance.

The literature has shown that provider performance and provider well-being are related, that is, providers with low engagement are less productive [14]. There is no established method of assessing provider performance at the PHC level other than the quantity of care delivered, or quality of care measured as patient satisfaction [3, 9, 10, 13]. However, our results showed that higher performance in terms of increased patient service at PHCs may be associated with the providers being low on the quality of life and work engagement. This association, which has been established in the literature, seemed to be confirmed by our study. This might be explained by reverse causality: the workload might have been so high that engagement was hampered [40].

PHC PERFORMANCE FROM THE PATIENT'S PERSPECTIVE

PHC performance has been evaluated in two ways: through patient satisfaction according to the WHO aspects for performance assessment, which are also being followed by other researchers, and by a new reliable tool to assess the performance of PHCs from the patient's perspective that was developed based on the interviews [10, 41, 42]. The aim of the latter was to encompass the experiences of people, which would be appropriate to the local context of the current study. The significance of the new Q4PHC tool, which had high internal reliability, is that it was developed based on the assessment criteria of the patients utilising the services of the PHC. Thus, the assessment of PHC using Q4PHC is more realistic in the local context than the patient satisfaction assessed using the short-form patient satisfaction questionnaire or the patient feedback form from the quality manual. As the number of items is higher, it would aid as a compass for addressing various local concerns of patients, aiding in further PHC improvement, if attempted.

A HOLISTIC MODEL FOR PHC PERFORMANCE

PHC performance assessment is a complex phenomenon since PHC functioning involves multiple stakeholders of different calibre. An apt representation of reality is possible

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only when performance is represented from various perspectives reflecting the local context. It is essential to include various perspectives to get a realistic representation of the PHC functioning [43]. A combined measurement of the availability of infrastructure, service delivery, provider well-being and patient perception of PHC performance would not only enable better assessment but also provide better information for enhancing performance. Further, sharing this integral information with the patient community should be encouraged as educating them on its interpretation would enable patients to make better choices, thereby enhancing the accountability from providers and in turn better service delivery [44]. Finally, developing countries encounter resource and data constraints, so a blend of various sources (both registered/ secondary data and questionnaire/ primary data) will increase the validity of performance assessment [45]. The study results seem to depict a trade-off between working hard on the one hand and having providers who have enough time and energy for good communication with patients on the other hand.

Work engagement in primary healthcare settings is very important to unlock their true potential [46]. Engagement is positively related to patient care quality and safety outcomes, and thus patients' assessments of the service provision [47, 48, 49, 50]. Various studies have shown that the relationship between workload and work engagement could be positive or negative depending on the country, resource availability and professionals being studied [51, 52]. This inter-relationship should be studied in a greater number of PHCs so that a norm can be established. Periodic PHC performance assessment can be undertaken for regular monitoring of the PHC functioning. Performance analysis and timely reporting using data that can impact performance improvement should be considered [53].

METHODOLOGICAL CONSIDERATION

Assessing performance by the availability of infrastructure and services along with both the provider and the patients provides a multimodal approach that would result in a complete PHC assessment. However, the inclusion of only three PHCs out of the available 20 in the urban setting could be considered as a small sample. For the results to be more general in their application to urban and rural settings and to other low and middle income countries, further large-scale research replicating the study is recommended.

The Q4PHC developed from in-depth interviews with patients provided a strong theoretical base to assess performance as envisaged by patients themselves, thereby making it highly applicable to the setting. As not all items were loaded on all factors, further research on factor validation is needed.

CONCLUSION

The study showed that the PHC performance assessment from multiple perspectives offers a realistic view of the centre encompassing the local context. The new tool Q4PHC was valid in measuring patient perspective of PHC performance in an Indian context. The seven scales not only provide an opportunity to assess but also could direct further improvement in PHC service delivery. The providers demonstrated better wellbeing with moderate amounts of work. The centres with lower workload were scored better by the patients. The PHC performance assessment from multiple perspectives suggests there is a trade-off between providers wellbeing and the increased performance from patient's perspective; that is them working hard on the one hand and providers having enough time and energy for good interaction with patients on the other hand. Further research is needed to study and establish the interrelationship of various components; also, the allocation of weightage for various perspectives in PHC performance assessment should be explored.

DECLARATIONS

Ethics approval and Consent to Participate
The study was conducted after obtaining approval (MUEC/017/2017) from the Ethics Review Committee of Manipal University, Manipal, Karnataka, India, also, written informed consent was obtained from the study participants before conducting the interview.

CONSENT FOR PUBLICATION
All the study respondents consented to the publication of the results.

AVAILABILITY OF DATA AND MATERIALS
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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COMPETING INTERESTS

FUNDING

AUTHORS' CONTRIBUTIONS

RBS did the literature review, tool development, data collection, data analysis, and interpretation and wrote the draft. AdR contributed to the research design, research questions, data analysis and interpretation and to writing the draft. AK discussed the research design and writing the draft. UM contributed to data interpretation and writing of the draft. OvS contributed to the research questions, data interpretation and to the writing of the draft. All authors read and approved the final manuscript.

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APPENDIX 1

QUESTIONNAIRE FOR THE PATIENT'S PERSPECTIVE ON PERFORMANCE OF PHC (Q4PHC)

Scoring pattern: 1-Totally disagree; 2-Disagree; 3-Do not disagree or agree; 4-Agree; 5-Totally agree

SI No	Behaviour and Attitude of staff — Details	1	2	3	4	5
1	I/patient feel welcomed in this Primary Healthcare Centre (PHC)					
2	My doctor treats me/patient with respect					
3	My doctor explains me/patient about the disease/illness					
4	My doctor raises his voice when I have/patient has doubts about medication/illness [R]					
5	My doctor shows sincere interest in solving my/patient's problems					
6	My doctor and nurse tell me/patient exactly when services are provided					
7	My doctor and nurse are always willing to help me/patients					
8	My doctor is busy to respond to my/patient's requests [R]*					
9	My doctor spends adequate time in treating me/ patient					
10	The staff are neat in appearance					
11	The staff are empathetic to me/patient during the visits					
12	I am happy that I/patient came to this hospital for treatment					
13	My/patient's expectations from this hospital were fulfilled					
14	I/patient will recommend this hospital to my friends and relatives					

SI No	Availability of diverse and rich care by doctor round the clock and specialists — Details	1	2	3	4	5
15	All my/ patient's health problems are addressed here					
16	I/patient can get my eye check-up done in this hospital*					
17	I/we can get my/ patient's spectacles in this hospital*					
18	There is need for an additional lady doctor in this hospital [R]					
19	There is need for an additional male doctor in this hospital [R]					
20	I am /patient is happy to get specialist care from a private setup [R]					

SI No	Availability of diagnostic services — Details	1	2	3	4	5
21	Blood tests are always available in this hospital					
22	I am/patient is paying for the blood tests in this hospital [R]					
23	I am/ patient is happy to have an ECG facility in a private hospital [R]					
24	I am/ patient is happy to get x-ray facility in private hospital [R]					
25	I am/patient is happy to get scanning facility in private hospital [R]					

SI No	Diagnosis and treatment for emergencies — Details	1	2	3	4	5
26	I/patient get emergency services like care during accidental and heart attack					
27	I am/patient is happy to get emergency services like care during accidental and heart attack in private hospital [R]					
28	I/patient prefer to come to this hospital for dog bite					
29	I/patient prefer to come to this hospital for snake bite					

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| 30 | I/patient prefer to go to private facility in case of emergency like accident/ heart attack [R] | | | | | |

Availability of medicines

SI No	Details	1	2	3	4	5
31	The medicines that the doctor prescribes are available in this facility only*					
32	The doctor prescribes some medicines to be bought outside [R]*					

Cost of care and medicines

SI No	Details	1	2	3	4	5
33	I/patient have to pay for some services here [R]					
34	I/patient have to pay for doctor's consultation here [R]					
35	I/patient have to pay for medicines here [R]					
36	I/patient have to pay for baby delivery services here [R]*					
37	I/patient have to pay for blood tests here [R]					

Effectiveness of treatment

SI No	Details	1	2	3	4	5
38	My/patient's illness is cured in this government hospital most of the time					
39	Most of the time I/patient go to private set up for care as treatment is better there [R]					
40	I/patient go to private set up for care as treatment is not available here [R]					
41	When costs are ignored, recovery is quicker in private setup [R]					
42	Most of the time treatment is better in a government hospital					
43	Someone (sister/brother) from the PHC visits me at home*					

Infrastructure of PHC

SI No	Details	1	2	3	4	5
44	This hospital has adequate number of beds					
45	The physical facilities at PHC are visually appealing (building is aesthetic with good roof, wall and flooring)					
46	There is need for more furniture in this hospital [R]*					
47	The hospital should be cleaner than it is at present [R]*					
48	There is adequate drinking water facility					
49	The delivery room is comfortable and clean					
50	The PHC building should be extended as there are more patients [R]*					
51	The toilet facility (with water) in this hospital is adequate					

Organization of services for better functioning of PHC

SI No	Details	1	2	3	4	5
52	I/patient was received by nurse/other hospital staff as soon as I/patient came*					
53	The delivery facility is well organized in this PHC*					

[R]Reverse coded (23 items)

*Deleted from final analysis of the PHCs

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APPENDIX 2

Reliability scores of various tools and its subscales

SI No	Tool	Subscale	Cronbach's Alpha	Items to be deleted for Alpha to increase	Alpha after deleting affecting items
1	QolBref*	Physical Health	0.443		
		Psychological	0.531		
		Social relationships	0.573		
		Environment	0.543		
2	UWES*	Vigor	0.558		
		Dedication	0.558		
		Absorption	0.450		
3	Patient satisfaction questionnaire from UPHC		0.869$		
4	RAND	General Satisfaction	0.331		
		Technical Quality	0.608#		
		Interpersonal Manner	0.688#		
		Communication	0.636#		
		Financial Aspects	0.662#		
		Time spent with doctor	0.427		
		Accessibility and Convenience	0.507		
		Total RAND	0.840$		
5	Q4PHC	Behaviour and Attitude of Staff	0.906	8: 0.941$	
		Availability of rich and diverse care round the clock	0.389	16: 0.486 17: 0.480	0.652#
		Availability of Diagnostic services	0.876#		
		Diagnosis and treatment for emergencies	0.727#		
		Availability of medicines	-0.362	31, 32	
		Cost of care and medicines	0.847	36: 0.865	0.865$
		Effectiveness of treatment	0.625	43: 0.725	0.725#
		Infrastructure of PHC	0.690	46: 0.761 47: 0.720 50: 0.697	0.875$
		Organization of services	0.577	52, 53	
		Total Q4PHC	0.938$		

Items deleted from Q4PHC after Cronbach's alpha for ANOVA analysis: 8, 16, 17, 31, 32, (31 and 32 are all items in the dimension availability of medicine) 36, 43, 46, 47, 50, 52, 53 (52 and 53 are all items in the dimension organization of services)

*Small sample size of 39; # Sufficient; $ High

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PUBLIC-PRIVATE PARTNERSHIP IN HEALTHCARE IS A NECESSITY IN DIFFICULT TIMES: A CASE STUDY

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ABSTRACT

Healthcare delivery is a risky enterprise for both public and private systems which may face adversity in a volatile, uncertain, complex, and ambiguous world. There has been a global emergence of Public-Private Partnership (PPP) hospitals to enhance delivery of sustainable healthcare, although its existence in developing countries remains limited. Risk management strongly influences PPP success; few PPP hospitals were able to meet contractually specified quality and performance requirements, creating debate regarding merits of the PPP model. Conversely, we present a case study of the first PPP hospital operated by not-for-profit organisation in New South Wales, Australia, to successfully complete the contract period. A Continuous Quality and Performance Improvement Framework was applied at five stages of organisational growth during the contract term. This case study demonstrates adaptive leadership and just organisational culture are equally important in providing high quality healthcare services to the community. We show the future potential of PPP model for service delivery as a third option to pure public or private sector hospitals, even in the post COVID-19 era when there is likelihood of financial instability in many settings.

KEYWORDS

INTRODUCTION

The Australian healthcare system is acknowledged as one of the best in safety of patient care in the Organisation for Economic Co-operation and Development (OECD) countries [1]. However, challenges including the growing burden of chronic disease and an ageing population, have underlined inefficacies of the current system such as wasteful spending, lack of healthcare accessibility, high out of pocket expenses, extended hospital waiting lists, unacceptable inequities in health outcomes, and substandard quality and safety outcomes [1]. These inefficacies indicate that reforms are needed to better support a strong and effective healthcare sector in Australia.

In developing countries, access to effective healthcare is a major problem; most struggle to establish and maintain well-functioning public health systems to promote health and complete management of the sick [2]. When the quality of healthcare is compromised, leaving its effectiveness well short of potential efficacy; hence, it is not surprising there may be gross under or inappropriate utilisation of these services by those who are able to access them. Private sector dominance is observed in many low to

middle income countries (LMICs) for health service delivery that is usually accessible by the rich only [3]. Rising incomes and failure of public services to meet expectations has driven an increase in the number of private providers leading to the suggestion they should be harnessed to address the physical inaccessibility of services, staff shortage and maldistribution, and inadequate drug and supply stocks [4]. It has been argued that given the failure or capacity limitations of public sector efforts, the more formal private sector can be contracted to manage services such as hospital facilities on behalf of the public sector [5].

It is important to understand the changing nature of healthcare expenditures, financing and sources of funding, especially during the period of post Second World War free market economy [6, 7]. Over the last 50 years, health expenditure has mostly outpaced economic growth across OECD countries. Although projections show that per capita health spending will essentially be slower than its growth in history, it is predicted to continue to be greater than the economic growth of these countries, reaching 10.2% of the Gross Domestic Product (GDP) in 2030 increasing from 8.8% of GDP in 2015 [8]. Achieving greater value for money from health spending is imperative to better health outcomes, higher quality of care, reduced waste, and improved access to health services [9].

Although, the free market health economy was established for serving humans with respect, dignity, the common good, subsidiarity and solidarity in medicine [10], it may not be a sustainable option due to market failures in a volatile, uncertain, complex and ambiguous world. Governments also fail due to economic conditions, populism about efficiency, consumer satisfaction, poor planning, low implementation, lack of supervision capacity and capture by lobbies. Engagement of the private sector may be viewed as inviting privatisation of healthcare, however when the capacity of the public sector is limited, seeking a mix of public and private provision of services can be seen as a pragmatic approach [4, 11]. Subsequently, market failure in post 1970 OPEC oil embargo period has driven the emergence of public-private partnership (PPP) globally [12]. This PPP concept, based on the federated system of government in Australia is demonstrated in Figure 1, was thought to be an alternative to attract funding for significant ageing infrastructure projects such as, hospitals, roads and schools, etc., from private sectors in difficult economic times. As a result, the birth of PPP projects from

Europe scaled up around the world, as well as in Australia in early 1990 [13].

FIGURE 1. CONCEPT OF THE PPP SERVICE DELIVERY.
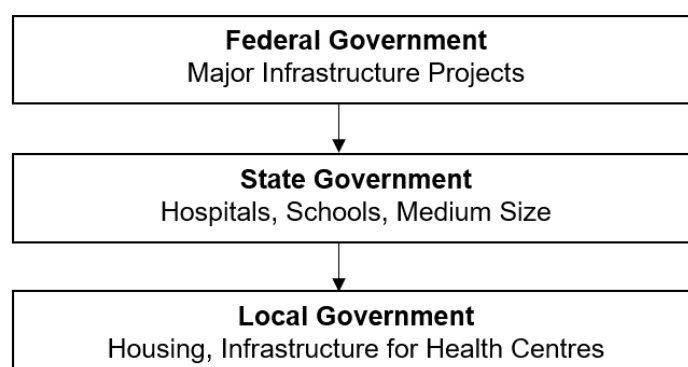
Schematic diagram of the PPP model of service delivery in Australia. PPP – public-private partnership

A risk-sharing relationship is based upon a shared aspiration between the public sector and one or more partners from the private and/or voluntary sectors to deliver a publicly agreed outcome and/or service [14]. The standard definition does not recognise the diversity of PPP models and the contracts; PPP models of contract vary from complete contract that is fully outsourced to an incomplete contract that includes collaboration and cooperation. This incomplete form of PPP service provision is adapted in many public hospital settings.

PPPs have some distinguishing features compared to pure public or private provision. Private finance is involved in the following [15]:

1. Project and delivery cost of the service.
2. Pay for performance of the service.
3. Long term contracts (>25 years).
4. Risk transfer from public to private sector.
5. Value for money.
6. Output specifications.
7. Bankability shows evidence to generate revenue from using facilities and services by third parties.
8. Hard and soft facilities management during the contract period.

While the NSW State Government views private sector borrowing to be more costly, it may, however, compensate by providing better value for money in many ways such as [15]:

1. Private sector is more innovative in design, construction, maintenance, and operation over the life of the contract.

2. Creates better efficiencies and synergies between design and operation.
3. Invests in quality of the asset to improve long term maintenance and operating cost.
4. Advanced risk management.
5. Capacity for providing safe, efficient, quality health service as public hospitals.

Leaving alone the economic and political agenda, NSW Treasury Department's control of public spending brought about the alternative views to justify the policy.

- Public services can be delivered by private sectors.
- Private management is efficient.
- Makes sense to differentiate between the purchases and providers.
- Fair competition.
- Focus on outcomes rather than ownership.
- Does not matter who provides, as long as it is value based [15].

It is important that the discussion on PPP also focuses on service outcomes. The debate should be extended to consider public service provision with pragmatic accountability and delivering good quality services for societal needs. There are claims that this service delivery model is not suitable or able to fulfil contractual obligations. Early Australian experience of contract failure risks are highlighted in several case studies [16].

While the PPP model of service delivery has created debate as to its merits in the community, this case study, conducted for an Australian hospital, specifically highlights the successful completion of the contract period with several positive outcomes and sets an example for future PPP projects of this nature. This includes PPPs in developed countries, but also the potential and implication for PPPs in LMICs.

The aim of reporting this case study is to demonstrate sustainable economic model of high quality, evidence-based health care delivery in difficult economic conditions.

METHODS

A case study was used to demonstrate the success and different other aspects of a PPP model of healthcare delivery from its conceptual/birth stage through to the maturation stage.

SETTING

This case study is based on and set in the first PPP hospital operated by a not-for-profit organisation in one of the District Health Services (the Case Study Health Services), in NSW, Australia.

This case study presents retrospective analysis of publicly available data and the hands-on experience of the corresponding author. The methodologies behind the success of this PPP model of health service delivery would be invaluable for other settings.

ETHICAL APPROVAL

The study did not require ethical approval as it was considered a quality improvement activity. The corresponding author was the Director of Medical Services of the Case Study Hospital and it was a requirement to conduct such a study for completing his Fellowship in Medical Administration from the Royal Australian College of Medical Administrators (RACMA).

REPORTING OUTCOMES

The study involved a Continuous Quality and Performance Improvement Framework (CQPIF) methodology for reporting outcomes. The hospital adapted the Institute of Medicine USA's six domains of quality improvement framework at each stage of the project during the contract period to deliver quality services to the community: patient safety, timely care, efficiency of the service, effectiveness of the service, patient participation and equity, and patient centeredness [17]. CQPIF methodologies were implemented in the case hospital for improving services (Table 1). Strengths, weaknesses, opportunities and threats (SWOT) methodology [18] was adopted at each stage of organisation's growth. Also, the study presents anecdotal experience of the corresponding author who served The Case Study Health Services as the Executive Director of Medical Services between 2002 and 2017.

RISK MITIGATION

The risk mitigation process in this study is entirely based on the NSW Health risk management and framework policy directive (Table 2) [20]. Risks such as Operating Costs, Performance Risk, Industry Relations Risk, Compliance to Law and Statutory Regulations, Demand Risk, Clinical Risk and Contractual Risks are managed using this directive at each stage.

TABLE 1. STAGES OF CONTINUOUS QUALITY AND PERFORMANCE IMPROVEMENT FRAMEWORK (CQPIF) [17]

Stages	Tools (examples)	Utility of the Tools
Identification of issues	Press Ganey Survey, Staff Satisfaction Surveys and reports from clinical Quality Management Reports	Survey results were used to identify the issues and problems
Develop clear project plan including (SMART Goals[19])	Specific, Measurable, Achievable, Relevant, Timebound	Progress of project outcomes per plan and timeliness
Diagnostic Phase	Conceptual flow	Operational model to run the health services
	Customer grid	Customer centric service provisions
	Fishbone diagram	To diagnose the root cause of any problems and finding the best possible solutions
	Pareto chart	Identify and work on the most impactful factors to provide quality services
	Run chart	Look back to the data to evaluate performance and identify any trend for either poor or better performance
	Root cause analysis	Identify causal factors that may contribute to system failure or impede providing quality care
	Fault mode analysis	Identify the system failure potential, their causes and effects to prevent them to occur
	Surveys	Identify all the factors for improving overall system functionality and quality of care
	Chart audits	Identify shortcomings in patient care and build confidence of the leadership team to discuss and implement changes
	Focus groups	Discuss with small group of staff from each technical and general category and consumer representatives to improve quality of services
	Market research	Analyses of patient reported experience and outcome data to improve their satisfaction
Intervention phase	Plan a change	Identify the best available solution to the challenges
	Do it a small test	Implement the best solution at small scale
	Study its effects	Measure the outcome
	Act on result	Implement the outcome at large scale
	Repeat as required	Monitor the progress and repeat the above steps to sustain the improvement
Measure impact	Run chart	Evaluate the data to improve performance
Sustain improvement	Ongoing monitoring of information	Continuous improvement of care and services

TABLE 2. RISK RATINGS AND THEIR MITIGATION STRATEGIES [20]

Risk rating	Action required
Red = Extreme	Escalate to Chief Executive or head of health service -Implement a detailed action plan to reduce risk rating
Orange = High	Escalate to senior management -Implement a detailed action plan to reduce risk rating
Yellow = Medium	Specify management accountability and responsibility -Monitor trends and plan for improvement
Green = Low	Manage by routine procedure -Monitor trends

The Policy Directive advised a stepwise methodological approach for mitigation of risks in health service management. These steps are communication and consultation, establishes the context, identify, analyse, evaluate, and treat risks, monitor and review after treatment.

RESULTS AND DISCUSSION

The Case Study Health Services is the first PPP hospital operated by not-for-profit organisation in NSW to complete the full term of contract. The project outlines identification of five stages of the organisation's growth.

BIRTH STAGE (1993-1996)

The Case Study Health Services began in late 1993 when the NSW Government called for tender by an NGO to build a new hospital to serve the community in the Case Study Hospital Local Government Area (LGA) [21]. The call was in an era when the second oldest hospital in the nation, then with 200 years of history, needed urgent infrastructure renewal. There was debate between community and government at that time as to whether the Government would rebuild the Case Study hospital or involve the private sector as a component of re-development. The Government decided upon the PPP model of expression of interest awarding the contract arrangement to an NGO Healthcare Services. Hospital construction began in 1994 under a consortium model. Private sector partners were The Case Study Health Services (not-for-profit) owned and controlled by the NGO Healthcare Services and a Private Limited Constructions Company. The contract value was $AUD 46.7 million. Hospital operations began on 7th August 1996. The hospital was role delineated as a Level 4 district general hospital [22], licensed as a private hospital with NSW Health Private Licensing Branch and accredited by Australian Council on Healthcare Standards (ACHS).

The consortium arrangements were modelled in three different potential legal types: Lead Provider Model, Managing Agent Model, and Hub and Spoke Model. The NGO Healthcare Services was established as a Hub and Spoke model with five key features: 1) a new legal entity for setting up the consortium, 2) the consortium members become owners, 3) the new entity would take on the risks, 4) service delivery could be outsourced to members and external companies, and 5) has six member partners. The NGO Healthcare Services Consortium was a new start-up legal entity for this purpose The Consortium means few church groups join together to form a parent body to apply for the tender, bid for and won the tender for rebuilding the old Hospital in the Case Study Hospital LGA, with the following rationale:

1. A green-field development of a regional hospital for the community.
2. Entrepreneurship model and believed that there is a role for NGO to provide health service in Australia.
3. In the early 1990s, when private hospitals were targeting Christian Hospitals for acquisitions [22], the religious orders had concern they couldn't sustain their facilities if they worked alone.
4. NSW Government called a tender to build a new hospital to replace the ageing Windsor hospital by a not-for-profit provider.
5. In 1994, members of the Consortium encouraged The NGO Healthcare Services to bid for the tender.

The PPP contractual arrangement was for a 20-year period that commenced in 1996 with a provision of additional 5 years extension. Each year, The Case Study Health Services submit a funding claim based on inpatient and outpatient services provided, costs for salaries and wages, award increases and Consumer Price Index (CPI) escalations. Through the annual budget setting process, both parties

can negotiate various elements listed under the contract to address the community needs of the Hawkesbury LGA.

EARLY DEVELOPMENT STAGE (1996-2002)

The Case Study Health Services started operating in 1996 with a lean management structure comprising an executive and clinical leadership team. Similar to other hospital operational processes during those days, The Case Study Health Services operated on a financial forecast basis and remained closed in a controlled environment.

Contextually during this liminal period [23], a few key outcome measures indicated some intervention needs for sustainable quality health service delivery and to avoid risk of organisational failure. Using the CQPIF methodology, two independent reviews were undertaken in 1997 and 1999 to address the important issues identified in those reviews. The first issue was staff culture; a change from pure public to a public-private mixed system, there was a blame and shame culture (expected during liminal state). As a result, staff turnover was high with difficulty in recruitment and retention. This reflected in the cost and financial performance with the organisation running into deficit of the annual budget.

Secondly, clinical indicators highlighted that elective access to surgical services could be improved and the emergency department performance on triage categories to treatment time and response time for deteriorating patients could also be improved. The CQPIF methodology provided diagnostics for the hospital to act on the following issues: cost pressures, workforce pressures, clinical safety issues, clinical access issues and other service measures (like organisational culture). This led to a period when the executive team was redesigned to implement the necessary change management interventions.

THE TRANSITION STAGE (2002 -2005)

During this phase, the project addressed improvement of patient access. An integrated model of service delivery was adapted with LHD hospitals. This enabled a smoother patient transfer pathway from The Case Study Health Services to Nepean and Westmead Hospitals. This laid the foundation for increasing elective surgical work at The

Case Study Health Services and improved the emergency department service quality for deteriorating and high-risk patients.

Clinical guidelines, policies and clinical governance framework were implemented in alignment with the Nepean/Westmead LHD Public Hospital System to ensure that the patients received identical clinical care as per other public hospitals. Every month The Case Study Health Services conducted peer review for complex patient's management of complex patient's care, mortality, and morbidity review related to each clinical speciality. These in turn attracted a more stable clinical workforce to provide better quality and safe healthcare services and contained workforce costs that were spiralling out due to locum agency usage costs.

Subsequently The Case Study Health Services developed its workforce plan and implemented it in the following manner:

1. Recruit required specialists and multi-skilled medical officers from overseas under the area of needs provisions.
2. Hospital was accredited for postgraduate medical training by the relevant Colleges and the Postgraduate Medical Council of NSW (Health Education Training Institute-HETI).
3. Registrar training programs in each speciality.
4. Interns' program for each clinical area.
5. As a long-term strategy, starting a multidisciplinary clinical school, so the clinical workforce is trained locally.
6. Multiskilling the clinical workforce by starting innovative education programs such as for hospital skills program, simulation education, leadership, and team building.
7. Reviewed private enterprise bargaining agreement.

Patient satisfaction survey results were promising during transition period (Table 3).

TABLE 3. MEAN SCORE OF PATIENT SATISFACTION SURVEY AFTER THE CONCEPTION OF PPP MODEL AT THE CASE STUDY HEALTH SERVICES

Indicators	May 2003	Sept 2004	Sept 2005
Mean Score the Case Study Health Services	82.8%	81.6%	82.0%
Peer ranking percentile in other NSW hospitals	56.0%	50.0%	53.0%
Likelihood of recommending The Case Study Health Services	90.0%	89.0%	89.4%

THE GROWTH STAGE (2005-2016)

After implementing the recommendations of the CQPIF reviews, there was supplementary funding by service level agreements from LHDs. This eased cost pressures, clinical governance processes were strengthened, quality outcomes were very satisfactory, and staff culture improved moving from 'blame and shame' to 'reaction and consolidation'. In 2006 and 2009 there was ambitious and celebrated success of clinical delivery programs, financial stewardship, new service models, and better clinical education. The notable outcomes were:

1. The Case Study Health Service became the centre for elective surgery for the whole health district.

2. Agreement for approximately 100-140 orthopaedic patients to be treated per year were commenced as part of the State Surgical Access Plan.

3. Improvement in hospital culture (Figure 2).

4. Improvement in clinical quality and community feedback on clinical services that benchmarked with peer groups.

FIGURE 2. PROGRESS OF CULTURAL CHANGE IN THE CASE STUDY HEALTH SERVICES.
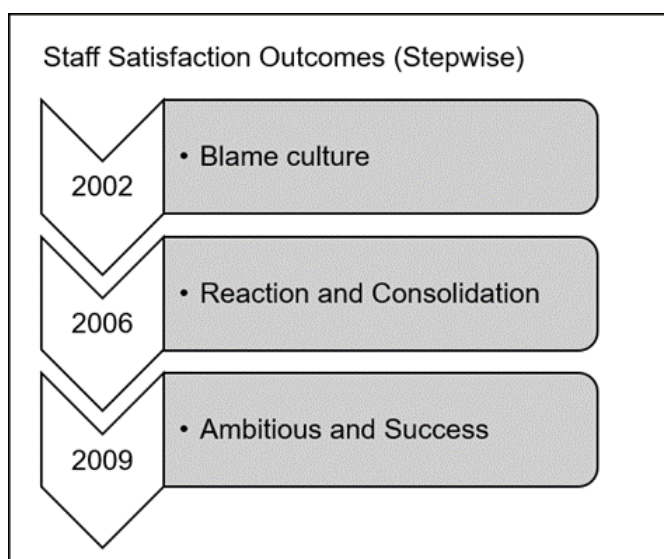
Schematic diagram representing stages of the organisation's cultural development at different time points of the project.

All of these identified outcomes assisted The Case Study Health Service to become a centre for multidisciplinary clinical teaching including simulation teaching, medical trainee teaching, and establishment of a University of Notre Dame Medical School.

The NGO Healthcare Services also recognised the need for improving aged care services and established an aged care specific services spectrum in the Case Study Health Services and neighbouring health districts. This was primarily used to facilitate the flow of patients from the hospital. This benefited the aged care services to grow as it is predicted that the country will face huge challenges in providing aged care services in the near future.

Furthermore, the Case Study Health Services, working in partnership with general practitioners (GPs) commenced an "afterhours" GP service co-located within the Case Study Health Service premises. This GP service helped the nursing homes and other vulnerable members of the community in accessing necessary services also contributing to improved access performance of the hospital's emergency department.

All of these growth initiatives and initiatives attracted extra State and Federal Government funding and the organisation's financial strength grew progressively.

THE MATURATION STAGE (2016-2021)

The patient satisfaction in each care area is identified as 'very good' as indicated by the most recent healthcare quarterly survey conducted by the Health Department [24]. In comparison to the early stages of the hospital's operation, these results show how important the service experience is to the community [25]. Patient data in both emergency and elective care are comparable to peer facilities in the state and this service delivery model has delivered what was expected from the beginning of the project.

By the end of the initial 20 years of project phase the Consortium developed other services like aged care

services, community care services to complement acute services for wider benefit to the community as an integrated care model at the Case Study Hospital.

This case study has outlined the observations and challenges during each of these stages and how they were addressed, including strategies for minimising risk, growth of the organisation to the full potential, value for money, and quality of services to the community. Community participation through a Community Board of Advice and promoting a just organisational culture [26] focussing on compassionate care played a vital role in the growth of the organisation. Additionally, excellent contract management skills, appropriate negotiations with NSW Health and LHDs have put the organisation at the forefront of financial governance, continuum of care and risk management. Contract management is an ongoing operational issue, and it is important to have such relationships to successfully implement contractual components and develop additional service level agreements. The continuing success of this PPP project was endorsed by successful periodic ACHS accreditation and Health Department audits.

CONCLUSION

This case study demonstrated that PPP model of service can deliver comparable health services to peer organisations using standard parameters such as patient satisfaction.

The quality dimensions examined covered patient safety, timely care, efficiency and effectiveness of the service, patient participation and equity, the project was successful. The organisation functioning as a network of service made a huge impact on service delivery and understood that service delivery is not a linear model but a complex adaptive systematic model [27]. The operator consortium based on a hub and spoke model is important for sustainability, entrepreneurship and sharing risks. Engagement with the community through a Board of Advice has benefited the organisation in delivering the community needs at all stages. The organisational values of the hospital for compassionate, open transparent care and respect to every individual served at all stages made the staff and patient satisfaction to grow. Risk mitigation tools, continuous quality improvement processes, tools and an emotional intelligence framework and appropriate power

made transition from each stage smoothly with successes sustained over time.

These sustained achievements and effective hospital operations illustrate the future potential for adoption and successful implementation of PPP models of healthcare delivery in appropriate settings. Furthermore, although PPP existence in the developing world is very limited, this case study highlights the potential for adoption of PPP projects into LMICs for better healthcare and in reducing the deficit in standards of care between developed and developing countries.

CONFLICTS OF INTEREST/COMPETING INTERESTS:
The authors declare no conflict of interests.

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RESEARCH ARTICLE

AUSTRALIAN HEALTH SERVICES MANAGEMENT COURSES: A DISCUSSION ON SYLLABUS

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ABSTRACT

OBJECTIVE

The aim of this research was to understand core knowledge areas offered by master's courses in health services management in Australian universities.

DESIGN

A Google search identified relevant Masters' degrees in health services management. Course syllabus was then extracted from each university's website. Common core subjects were then collated and compared.

SETTING

Data for this study was collected from Australian university websites.

MAIN OUTCOME MEASURES

Findings were compared with those presented in a similar study conducted in 2013. Interpretation was also informed by an appraisal of key issues that characterise the current context of health care in Australia.

RESULTS

Masters' degrees in health services management were offered by 18 universities. Common core subjects included management, evaluation, evidence, health system, governance, law and human resource management. A comparison with an earlier study conducted by Ritchie and Yen [1] found an increase in the following subjects: health system, quality management, health economics, policy and research, and a decrease in health information, epidemiology and resourcing. New knowledge areas included leadership, planning and project management, change management, and strategy.

CONCLUSIONS

This paper presents a discussion on knowledge areas that comprise syllabus in Masters level health services management education nationally. Key findings revealed differences between courses and the responsiveness of core syllabus to the current health care environment. The emergence of leadership, planning and project management was unsurprising while an absence of subjects that gave explicit reference to First Nations peoples was a notable finding.

KEYWORDS

management, education, health services, syllabus, curriculum

BACKGROUND

The complexity of the environment in which managers and leaders of health services practice is well known. Challenges to service delivery brought about by the recent pandemic [2] as well as an ongoing network of issues including the health of First Nations peoples, staff retention and recruitment, service access, safety and quality matters including the persistent rates of adverse events, as well as health service resourcing, new technologies, and the influence of a wide range of stakeholders with diverging interests [3] are characteristic of the Australian healthcare environment as the context of health services management practice.

Understanding the nature of management practice in this environment is foundational to the design of learning experiences. Traditional views of management work as a rational process of planning, organising, coordinating and controlling are contested by contemporary research that seeks to unravel the nuances of management work as it is practiced in the dynamic environment of healthcare. A focus on management practice capabilities, rather than skills, that enable effective response to changing circumstances, recognises the diversity of management work including the nature of the settings in which it is practiced [4]. Adaptation to the evolving context including being able to initiate and respond to change is a key capability common to recent research on the evolving role of health services managers [5]. These findings have important implications for management development.

In response to professional development needs for existing and emerging managers, a range of educational approaches are available, including workplace in- house professional development courses as well as those offered by such institutions as the Health Education and Training Institute (NSW Health); the Australasian College of Health Service Management (ACHSM) [6] and various registered training organisations. Formal academic courses are available in universities nationally and are asked to map their courses against the ACHSM Master of health service management competency framework for the purpose of ASCHSM accreditation[7].The number of university courses over time has grown, and our survey of websites identified 24 courses nationally. Our survey noted considerable variation in syllabus across these courses. This finding was consistent with that of Ritchie and Yen [1] who, in a previous study, identified a lack of consensus on core curriculum

and questioned the need for consistency. This paper aims to compare subjects offered in existing courses with those identified by Ritchie and Yen [1]. Further, the extent to which changes reflect the current context of healthcare will guide our discussion.

LITERATURE REVIEW

A search of the academic literature informed our understanding of current research relating to syllabus in post graduate health services management courses. Search terms included 'health services/care management/administration' 'health services/care leadership' and 'syllabus' 'learning' 'development', 'competency' and 'education'. Articles published from 2011-2022 from Australia and internationally, were sourced from the university data base as well as from Scopus, EBSCOhost, Informit and Google Scholar. Literature was also sourced from a snowballing approach involving a scan of reference lists and citations of identified articles.

Recent research justifies curriculum that is responsive to the dynamic nature of the healthcare context [8] [9]. The design and delivery of courses that include innovation and creativity [8] [10], cultural competence [11], diversity [12], and health informatics [13] were justified similarly on the basis of a need for sustained adaptation to the changing context. Pre pandemic literature identified knowledge and skill in epidemiology as fundamental to decision making in health services management [14]; a recommendation that has clearly increased in significance since the start of the COVID-19 pandemic. Other studies reported progress towards identifying knowledge areas to support competency development in health services management [15] although educational implications were not specific to university level learning. Overall, our review of the academic literature identified evidence supporting a broad range of content areas for inclusion in postgraduate courses in health services management, however none presented justification for a core syllabus.

Several studies have evaluated HSM curriculum in Australia. Further to the study conducted by Ritchie and Yen [1], HSM course websites in Australia have been analysed for evidence of content in creative and innovative thinking [8] and for inclusion of personal engagement, emotional intelligence and conflict resolution [16]. This research, drawing on a similar methodology, seeks to extend that of Ritchie and Yen [1] to determine areas of commonality and

difference in knowledge areas that constitute health services management syllabus.

METHODS

With the widespread availability of course information on the internet, university websites provide a ready source of information on course content. A content analysis, as a systematic approach for analysing and describing communication presented in various media including websites [17], enabled the researchers to extract, group and analyse subject areas identified in relevant courses. A Google search was undertaken using the search terms 'master/health/health services/health leadership/health management'. Course websites were analysed to ascertain their relevance to health services management practice. Courses that were specific to other sectors such as the welfare sector were eliminated owing to differences in the contextual influences on course design. Business courses that offered fewer than 50% health services

management subjects were also excluded. Of 24 courses, 18 were included in the study. A data base enabled organisation of collected data for each university. Two academics undertook analysis of data, thereby assuring consistency and accuracy of interpretation.

To ensure rigor and comparability between the current data set and Ritchie and Yen's [1] 2013 data set, the researchers agreed on a consistent approach to nomenclature. Identification of subjects listed as new from 2022 was based on the presence of the general topic area in their title and from supporting descriptors. This approach was similar to that taken by Ritchie and Yen in 2013.

FINDINGS

A comparison of core subjects identified in the 2013 and 2022 studies is presented in Table 1. Subjects that have been identified only in the current study are presented in Table 2.

TABLE 1: PERCENTAGE OF COURSES OFFERING CORE SUBJECTS IN 2013 AND 2022

Subject	2013 (% of courses)	2022 (% of courses)	% Difference (a/b-a)
Management	82	89	+8.5
Resourcing	53	6	-88.7
Health system	53	72	+35.8
Epidemiology	47	28	-40.4
Evaluation	35	28	-20
Quality	35	50	+42.9
Law	35	33	-5.7
Evidence	24	22	-8.3
Health economics/finance	24	72	+200
Research	24	56	+133
Governance	18	22	+22.2
Health information	18	6	-66.7
Bio data/statistics	18	28	+55.6
Human resource management	12	22	+83.3
Policy	6	67	+1016.7

TABLE 2: SUBJECTS OFFERED ONLY IN 2022

Subject	% of courses
Social determinants/competence PHC	17
Planning/project	44
Change/improvement	33
Leadership	72
Risk	17

Decision making with strategy (In finance)	28
Vision	11
Marketing	11
Accounting	6
Strategy	44

DISCUSSION

This research has identified similarities and differences between this data set and that reported by Ritchie and Yen [1]. Not surprisingly, across the two studies (Table 1), management was the most common subject, with little change in the percentage of courses offering evaluation, evidence, health system, governance, law and human resource management. Differences in the percentage of courses recorded in the two data sets that demonstrated a change included policy, resourcing, health economics/finance, health system, epidemiology, research, health informatics, and quality. Leadership, planning, project management, change management and strategy were among new subjects identified in the current study. The following discussion analyses these findings with reference to significant health care challenges and trends health services managers encounter in the current health care environment.

POLICY AND GOVERNANCE

Policy has increased in frequency across the courses (Table 1). Issues of significance in the healthcare sector such as aged care [18] and rapidly changing demands caused by the pandemic [19] have rendered policy a focal issue. Increasingly, health services management courses are addressing the needs of students working in a greater variety of health care services as the private sector is growing and the public sector is becoming more diverse. As these changes progress, governance of such services is also becoming a more relevant knowledge area [20].

RESOURCING, FINANCE AND ECONOMICS AND DECISION MAKING

Resourcing, finance, accounting and economics have always been essential aspects of health service management courses [1], however the current study (Table 1) found a movement away from the term 'resourcing' to 'health finance/economics' which could represent a broader perspective of health on the whole as not only providing a service that needs to be resourced, but a movement towards primary health care where prevention is now seen to be a greater part of the overall focus of health care services [21]. Inclusion of subjects on decision making also demonstrates the broader appeal of teaching related to ongoing challenges of resource allocation and meeting efficiency targets [5].

HEALTH SYSTEM, SOCIAL DETERMINANTS, PUBLIC AND PRIMARY HEALTH CARE

While both studies included the Australian health care system as the contextual centrepiece of mainstream health care activity (Table 1), social determinants of health and primary health care emerged as new subjects in the current study (Table 2). Their presence is well justified as managers' understanding of social determinants, as indicators of the health of a population [22] is foundational to decision making in other dimensions of practice including service planning, evaluation and primary health care- as a focus for achieving quality health care in Australia today [23].

EPIDEMIOLOGY

Our study identified epidemiology and public health in 47% of courses in 2013 [1] and in only 28% of courses in the current study (Table 1). Public health was considered a foundational area of study in health services management in the nineties, although the escalation of Masters courses in public health since 2001 [24] may have contributed to a decline in this subject area. However, as the impact of the 2020 pandemic on health care practice, education and resourcing has implications for managers at all levels, it would be reasonable to expect an emphasis on this subject to resume.

RESEARCH

Although some courses (24%) identified by Ritchie and Yen [1] identified research as a core subject, this had grown substantially in the current review to 55% (Table 1). This likely reflects increased involvement by the Australian Government with the Tertiary Education Quality and Standards (TEQSA) Agency Act 2011 which established an independent agency to ensure quality and increase regulation of higher education. Course accreditation through this agency involves explicitly identifying 'research content' for all masters' courses offered in Australia [25].

HEALTH INFORMATION, HEALTH INFORMATICS

Health informatics, as a core subject, dropped from 18% of courses [1] to 5% in the current study (Table 1). The limited presence of this subject area across the courses was surprising given the escalation of digital health across the health care sector nationally and globally and in particular since the onset of the Covid 19 pandemic. Significant events in digital health include the introduction of My Health Record and accompanying legislation, and the rapid development of digital technology including telehealth, MHealth and electronic records [26]. The establishment of the Australian Digital Health Agency (ADHA) to lead the National Digital Health Strategy, a framework for enabling secure, quality healthcare through digital health development and integration, reflects digital health as an embedded knowledge area in health. Further collaboration between the nursing profession and the Agency to develop and implement the National Nursing and Midwifery Digital Health Capability Framework [27] exemplifies professional adoption of digital health. These events signal digital health as a dominant knowledge area across the sector and therefore worthy of greater visibility in health services management courses.

QUALITY

Our analysis revealed that quality has increased from 35% in the 2013 study [1] to 50% in the current study (Table 1). Concern with quality and safety has grown considerably across the intervening period, and despite efforts to curtail the frequency of adverse events, little has changed [28]. An increase in the percentage of courses offering this subject is therefore unsurprising. Recognition of safety and quality in health care as a priority area has been endorsed nationally by the Australian Commission on Quality and Safety in Health Care [29]. The mandate for managers to advance quality and safety constitutes a foundational knowledge area for health services management practice.

EMERGING KNOWLEDGE AREAS

The following subjects emerged as new subject areas.

LEADERSHIP

Leadership was the most frequently cited subject across all courses (72%) in the current study (Table 2), although notably absent from core units identified in the earlier study [1] (Table 1). The need for health services to generate innovation and engagement as they adapt to the complex and dynamic environment of health care [5] has seen a growing emphasis on leadership as a means for building relationships and garnering commitment alongside management practice [30]. Furthermore, an influence of post graduate leadership education has been found to positively impact practice [31] and leadership has been given emphasis across health care accreditation and quality policies, for example, the National Safety and Quality Health Service Standards [29] and health professional standards including the Master of Health Service Management Competency Framework [7]. Its growing emphasis in health services management curricula is therefore unsurprising.

PLANNING, PROJECT AND CHANGE MANAGEMENT

In the current study, change and improvement management (33%), planning and project management (44%) emerged as new subject areas (Table 2). While a justification for these subjects was not explicit on the websites encountered, innovations in service delivery arising from population health including the increases in chronic illness and a move towards primary health service [22], and an ongoing mandate to enhance the quality and cost performance for health care [3], form a credible basis for the inclusion of these subject areas. Project management methodology in health care has surfaced as a particularly valuable approach to enhancing quality and safety and leveraging change [32] and as an active and authentic learning approach in higher education [33].

STRATEGY AND VISION

Strategy, absent from the earlier study [1] was identified in 44% of courses in the current study, and vision as a related knowledge area, in 11% (Table 2). Strategic management, supported by effective leadership in health care has been recognised as a means for responding positively to complex, rapid, discontinuous and unpredictable change in health care environments [34]. As complexity in health care environments continues to escalate, a growing focus on knowledge areas in management education that embrace strategic management is unsurprising.

FIRST NATIONS' PEOPLES

While it is conceded that subject names do not clearly reveal the nature of the subject content, it is noted that as one of the most significant health care challenges in Australia, the health of First Nations peoples [35] [36] is not more explicit within the data collected. Managers of health services often deemed leaders of change, and innovative thinkers [8] [9][10] have great capacity to influence the health outcomes of First Nations peoples. Given the significance of this issue, their role in advancing the health

of First Nations peoples, while likely embedded in subject content, could be made more explicit in published subject titles and accompanying information across the courses.

LIMITATIONS

The data collected in this research was confined to publicly available information on university websites and does not reflect knowledge of subject content, learning and teaching approaches or curriculum experiences. The authors interest in publicly available information sought to establish a collective understanding of common knowledge areas that reflect university priorities and shape potential student choices.

CONCLUSION

This research reports knowledge areas included in health services management courses as represented on university websites to be diverse. This finding is consistent with conclusions made by Ritchie and Yen [1] that concluded there is a lack of consensus between courses. This is not necessarily a weakness, as areas of difference present courses with a basis for reflective critique and curriculum deliberation, and prospective students with a choice that meets their learning needs and preferences. Of interest were omissions in some of the more obvious knowledge areas that have significance to the current healthcare landscape. The health of First Nations' people is conspicuous by its absence, and in a world that has been shaped by the pandemic inclusion of health informatics, and reinstatement of public health data and epidemiology could be reasonably expected. It is recommended that publicly available health services management course information is more explicit in reflecting knowledge areas of current relevance to health service management practice.

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RESEARCH ARTICLE

GAP ANALYSIS OF PROVIDING PRIMARY HEALTH CARE IN COMPREHENSIVE RURAL HEALTH CENTERS OF IRAN

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ABSTRACT

BACKGROUND:

The lack of primary health care (PHC) assessment will lead to the lack of knowledge of the client's final needs and to a deviation from the mission of the health system. This study was conducted to compare the understanding and experience of PHC providers and recipients regarding the principles of PHC in Iran.

METHODS:

This cross-sectional descriptive-analytical study was conducted in Comprehensive Rural Health Centers (CRHCs) in 2022. The research population consisted of health service providers and recipients in rural areas. A Primary Care Assessment Tool (PCAT) was used. 410 child / adolescent and 402 adult PCAT forms were completed by using a stratified cluster sampling method and 413 service providers were randomly selected. This questionnaire had 6 core domains and 3 ancillary domains designed to measure quality of primary care services. After collection and entering into the Excel spreadsheet; data were analyzed by inferential statistics tests including Independent T-test and one-way ANOVA, by SPSS26 and STATA16 at the significant level of $P > 0.05$.

RESULTS:

Except for the Cultural Competence and Services Available domains, in the remaining domains, there was not the same understanding between the service provider and recipient regarding PHC services. Child/adolescent PHC respondents had the same understanding as adult PHC survey recipients in the domains of Cultural Competence, Family Centeredness, Information System, Ongoing Care, and Access. A significant difference between the two recipient groups were in the other domains of Primary Care Score, and Primary Care Expanded scores ($P > 0.05$).

CONCLUSIONS:

For common understanding amongst all three compared groups, cultural competence was the strongest component, and coordination-referral system, services provided, and community orientation were the weakest components. To address these gaps, it is necessary to augment community health literacy, do needs analyses, deliver services aligned with community requirements, and overhaul the referral system procedures and the government's commitment to implement them.

INTRODUCTION

The lack of Primary Health Care (PHC) assessment in Comprehensive Health Centers (CHCs) will lead to the lack of knowledge of the client's final needs in the primary care system [1]. PHC should naturally maximize the level of health and equitable distribution of well-being in the shortest time, focusing on the needs of people both as individuals and communities, in the context of health promotion including treatment, rehabilitation and palliative care [2]. The lack of knowledge on such need leads to deviating from the mission of the health system [1].

Iran has a long history of implementing PHC projects, especially in rural areas. The first project was the Behdar (healer) plan (training of health workers) in the 1940s during four years of health education when the health workers became employees in the health system [3]. Since 1981, the PHC has served communities in the form of healthcare networks at three levels. The first level includes comprehensive urban and rural health centers. The urban health office and the rural health house are its subcategories. The rural health house is located in the main village and covers a number of satellite villages based on geographical distance and population. The second level is the general hospital, and the third level is the specialized and super-specialized hospital. There is a referral system from level one to three [3]. Despite many decisions and interventions in the history of PHC implementation in Iran [4], and increasing access to health services [5], there is still public distrust in the health system [6], low quality of services [7], and dissatisfaction with the referral system [8]. The demand for PHC services are increasing due to changes such as increasing complex chronic diseases, the elderly population with multiple co-morbidities, shortage of human resources, geographical dispersion, health costs, and development of new technologies which have increased in recent years [9].

Health system assessment is the basis for reforms in structures and processes in order to achieve better quality [10]. It is important for governments to improve the quality of care according to the needs of the community [11]. Hence, different countries have assessed the state of their primary care systems and services [12-16]. The Primary Care Assessment Tool (PCAT) designed by Starfield [17], is one of the most widely used measures for PHC assessment [18]. This tool can measure the presence of essential features of PHC principles [11]. Kalavani et al. in the south-east of Iran, used this tool to assess the status of providing care in service recipients as they desired relative to individual needs [19]. In a study in the south of Tehran, Dargahi et al. used this tool and found the quality of the services provided to the recipients was lower than the average [20]. Although the basic physical structures and hardware of health care delivery are available, the provision of necessary facilities to maintain and improve the quality of services provided should be considered [19]. The assessment of primary care using PCAT in Brazil indicated that it is necessary to pay attention to people's perception of the services provided and create value for health services [21]. A study in China found Level One (Preventive Care) health care to improve the utilization and coordination of PHC, but due to poor access and ongoing care, the current system needed reforms [22].

Based on our search, despite numerous studies worldwide and in Iran that have utilized the PCA tool, none of them have investigated the gap between the perceptions of care providers and care recipients. This raises a crucial question: Are the services offered at the primary level of Iran's healthcare system driven by induced need or actual need, and to what extent are they perceived by the care recipients? The present study was conducted to compare the understanding and experience of care providers and care recipients regarding the principles of PHC and a gap analysis for providing PHC in Comprehensive Rural Health Centers (CRHCs) of Iran. The study results can help policy makers to take into consideration the perceived, induced, and real needs necessary so as to make more favorable policies for primary services in the country's health care system.

METHODS

STUDY DESIGN

This cross-sectional descriptive-analytical study [23] was conducted in 2022 to compare the understanding and experience of care providers and recipients regarding the

principles of PHC and gap analysis in providing PHC in CRHCs of Iran. First-level rural primary care in Iran includes general practitioners under the title of a family physician, healthcare providers (midwives, nurses, family health workers; environmental; and occupational health workers) in CRHCs, and local healthcare workers (with two years of training so-called "Behvarz" to provide basic PHC services such as vaccination, screening, mother and childcare, etc) in premises called "Health Houses" within the villages [5]. If the physician diagnoses to receive specialized care, patients are referred to higher levels. All the households living in the rural area are primary registered in the electronic care system and have visited the health center at least once. Each Local Health House is located in the main village and covers a number of satellite villages; Several Local Health Houses operate under the supervision of a CRHC. The research site consisted of CRHCs and the research population consisted of service providers (physicians) and service recipients in rural areas. The inclusion criteria for the service provider were physicians working in CRHCs and having at least five years of continuous experience in the field of providing rural health services, and for the recipient of the service were a resident of the village and the content for completing the questionnaire. The physicians who did not want to participate in this study or answered incompletely to the questionnaire; service recipients who were not available at the time of the questionnaire completion; and illiterate people who did not have a literate person as a companion were excluded from the study. In order not to create bias in completing the questionnaire of illiterate people, health workers or service providers at any level were not hired. Written informed consent was obtained from all participants.

DATA COLLECTION TOOL

The Standard Questionnaire of Provider Short Version (PCAT-PS) (physicians), Adult Short Version (PCAT-AS) (over 18 years old), and Child Short Version (PCAT-CS) (under 18 years old which were completed by their parents or guardians) were used for the status of providing care in CRHCs. When arranging the appointments, we requested the parent/guardian with the most information about the child's needs to answer the questionnaire. To save time, we only talked about one child in the family. This questionnaire is one of the PHC quality assessment models that has been used in many countries [19, 21, 22, 24-28]. In addition to conducting a previous study in Iran, to be sure, the reliability of the questionnaire was confirmed using Cronbach's alpha and SPSS23. For this purpose, 30 questionnaires of all three types (n=90) were completed; Cronbach's alpha coefficient was 0.8 for the service provider and 0.9 for the service receiver, which indicated good internal consistency in the questionnaire questions. The first part of the questionnaire contained demographic questions (including age, gender, education level, employment status, work experience, etc.) and then specific questions. The variables of this questionnaire included 6 core domains and three ancillary domains common to the service provider and receiver. The service recipient questionnaire had two other core domains (Table 1).

TABLE 1: FEATURES OF CORE AND ANCILLARY DOMAINS OF PHC ASSESSMENT IN THE PCAT QUESTIONNAIRE

Core domains	N	AS/CS	PS	Definition [29]
Continuity (Extent of Affiliation with a Provider)	2	*		It reflects the creation of a "Center of Health Care" recognized by both the patient and the provider, regardless of the presence or absence of disease or injury.
First Contact (Utilization)	3	*		It refers to the primary care provider's behavior, being responsible for assisting the client to enter the health care system for each non-referred and non-emergency provision of health care.
First Contact (Access)	4	*	*	service provision must be accessible as the first entry point to PHC; when new health or medical need arises.
Continuity (Ongoing Care)	4	*	*	It refers to the service provider's behavior in creating an ongoing person-focused (not disease-focused) relationship between patient and provider over time that is not limited to certain types of healthcare needs.

	N	AS	CS	
Coordination (Information System; MRA)	3	*	*	It requires the establishment of mechanisms to communicate information and the incorporation of that information into the client's plan of care.
Coordination (Referral System)	4	*	*	It refers to transferring information to and receiving it from other resources that may be involved in the care of a client, and to developing and implementing an appropriate plan for health care management and disease prevention.
Comprehensiveness (Services Available)	4	*	*	It provides a range of essential personal health services that promote and preserve health and provide care for illness and disability.
Comprehensiveness (Services Provided)	5	*	*	Primary care that is comprehensive arranges for clients to obtain services elsewhere for uncommon or special needs.
Ancillary Domains				
Family Centeredness	3	*	*	It understands the impact of family characteristics on the genesis and prevention of ill health, as well as the response to both medical and psycho-social interventions.
Community Orientation	3	*	*	It refers to efforts to recognize the primary care needs of a defined population.
Cultural Competence	2	*	*	Services are designed to be acceptable to people in the community, who may be distinguished by common values, language, heritage, and beliefs about health and disease.

Number of Questions=N; Adult Short Version= AS; Child Short Version= CS; provider Short Version= PS, Medical Record Adequacy= MRA

SCORING METHOD

Questions were scored based on a 5-point Likert scale (always = 5, sometimes = 4, rarely = 3, never = 2, no idea = 1). According to the questionnaire scoring guide, since less than 50% of the answers were "no idea" for scoring, this option became "rarely" and for the component for Comprehensiveness-Services Provided which became zero. The average score of each domain was calculated by adding the number of answers and dividing the total by the number of items. Primary Care Score is obtained from the sum of the average scores of core domains and Primary Care Expanded Score is obtained from the sum of the average scores of core and ancillary domains [17].

SAMPLING STRATEGY

Based on the inclusion criteria, 413 physicians in rural areas of 17 provinces in 10 macro-regional planning of the university randomly completed the self-reporting questionnaire. Overall, 410 PCAT-CS and 402 PCAT-AS surveys were completed using stratified cluster sampling. Within the centers and based on the sample size, 400 households were randomly selected through the electronic care system. Each cluster consisted of ten cluster heads.

Taking into account the correction factor 1.25(25%), first 50 clusters were selected and finally 812 service recipient questionnaires were completed in forty clusters. The correction factor was used so that if a cluster was not suitable for completing the questionnaire for any reason, the next cluster was used.

STATISTICAL ANALYSIS

First, all the data were entered into a Microsoft Excel spreadsheet. Other software used were IBM SPSS26 and StataCorp STATA16. Given the normality of the data, Independent T-test and one-way ANOVA were used to compare PHC domains in the group of adults, children and service providers ($P < 0.05$).

RESULTS

There were 228(55.21%) women in the Providers group. 238(57.63%) people had work experience of 11-20 years. 216(52.30%) people had completed a MPH course. There were 202(50.25%) women in the adult service recipient group. The average age was 43.05 ± 13.72 years. For education level, 3(0.75%) people were illiterate and 24(5.97%) people had a Masters degree or higher. There

were 206(50.24%) males in the Child/Adolescent group. The
average age was 8.41 ± 5.38 years (Table 2).

TABLE 2: DEMOGRAPHIC INFORMATION OF SERVICE PROVIDERS AND RECIPIENTS IN CRHCS

Characteristics	Recipient		Provider
	Child/Adolescent (%)	Adult (%)	(%)
Gender			
Male	206(50.24)	200(49.75)	185(44.79)
Female	204(49.76)	202(50.25)	228(55.21)
Age (mean ±SD)	8.41 ± 5.38	43.05 ± 13.72	41.68 ± 6.05
Work experience (year)			
5 -10			120(29.06)
11 - 20			238(57.63)
≥ 21			55(13.32)
Family physician workplace			
small city ᵃ			31(7.51)
Village			382(92.49)
Completion of MPH course			
Yes			216(52.30)
No			197(47.70)
Job Status of the person/parent			
Employee	79(19.27)	51(12.69)	
Housewife	238 (58.05)	137(34.08)	
Other (Manual Worker, Job seeker, Self-employed, Student, Retiree, Disabled)	93 (22.68)	214(46.76)	
The income of family monthly (in Million Rials)			
20 (20≈US$ 70)<	25(6.10)	52(12.94)	
20-40	117(28.54)	138(34.33)	
40-60	74(18.05)	61(15.17)	
60-80	59(14.39)	31(7.71)	
80>	71(17.32)	48(11.94)	
Not informed	64(15.61)	72(17.91)	
Education of the person/parent			
Illiterate	1(0.24)	3(0.75)	
< High school	120(29.27)	119(29.6)	
End of High School	148(36.10)	148(36.82)	
Junior college	43(10.49)	65(16.17)	
Bachelor Degree	85(20.73)	43(10.70)	
≥ Master's degree	13(3.17)	24(5.97)	
Type of insurance			
Health insurance (rural/government employees)	156(38.05)	226(56.22)	
Social Security Insurance	226(55.12)	148(36.82)	
Other insurances	21(5.12)	16(3.98)	
not insurance	7(1.71)	12(2.99)	

a Small City is considered as a rural area in health divisions; Master of Public Health= MPH

The results showed that except for the Cultural Competence and Comprehensiveness- Services Available, the rest of domains there was not the same understanding of PHC services between the service provider and recipient. T-Score showed the lowest understanding of Access and Community orientation in the client group and cultural competence in the service provider group (P < 0.05) (Figure 1) (Table 3).

A radar chart was prepared that shows the average score of service receivers' understanding and experience was lower than that of the service providers' (Figure 1).

The results showed that the recipients of child/adolescent care had the same understanding as the recipients of adult care in the domains of Cultural Competence, Family Centeredness, Information System, Ongoing Care, and Access. But in other domains, Primary Care Score, and Primary Care Expanded Score, a significant difference was between the two groups (P < 0.05) (Table 4).

TABLE 3: COMPARISON OF PHC DOMAINS FROM THE PERSPECTIVE OF SERVICE PROVIDERS AND CLIENTS OF CRHCS

Domains	Total (n=1225)		Recipient (n=812)		Provider (n=413)		T- Statistics	P-value
	Mean ±SD	T-score	Mean ±SD	T-score	Mean ±SD	T-score		
Access	3 ± 0.71	-0.95	2.83 ± 0.71	-1.245338703	3.31 ± 0.59	-0.421531652	12.4713	<0.001
Ongoing Care	3.39 ± 0.72	0.88	3.2 ± 0.8	0.597762578	3.75 ± 0.29	0.969522799	17.4852	<0.001
Information System (MRA)	3.3 ± 0.71	0.46	3.15 ± 0.78	0.348694837	3.6 ± 0.39	0.495299691	13.519	<0.001
Referral System	3.37 ± 0.75	0.79	3.15 ± 0.81	0.348694837	3.8 ± 0.33	1.127597168	19.993	<0.001
Services Available	3.14 ± 0.66	-0.29	3.16 ± 0.77	0.398508385	3.11 ± 0.37	-1.053829129	1.5498	0.121
Services Provided	3.41 ± 0.71	0.97	3.34 ± 0.82	1.295152252	3.56 ± 0.38	0.368840195	6.6025	<0.001
Family Centeredness	3.38 ± 0.74	0.83	3.24 ± 0.83	0.79701677	3.65 ± 0.39	0.65337406	11.988	<0.001
Community Orientation	2.97 ± 0.79	-1.09	2.77 ± 0.88	-1.544219992	3.37 ± 0.34	-0.231842408	17.11	<0.001
Cultural Competence	2.86 ± 0.91	-1.61	2.88 ± 1	-0.996270963	2.84 ± 0.7	-1.907430724	0.7579	0.448

FIGURE 1: COMPARISON OF THE AVERAGE UNDERSTANDING AND EXPERIENCE OF PHC IN THE GROUP OF RECEIVERS AND SERVICE PROVIDERS SEPARATELY AND GENERALLY (SERVICE PROVIDERS AND RECEIVERS)
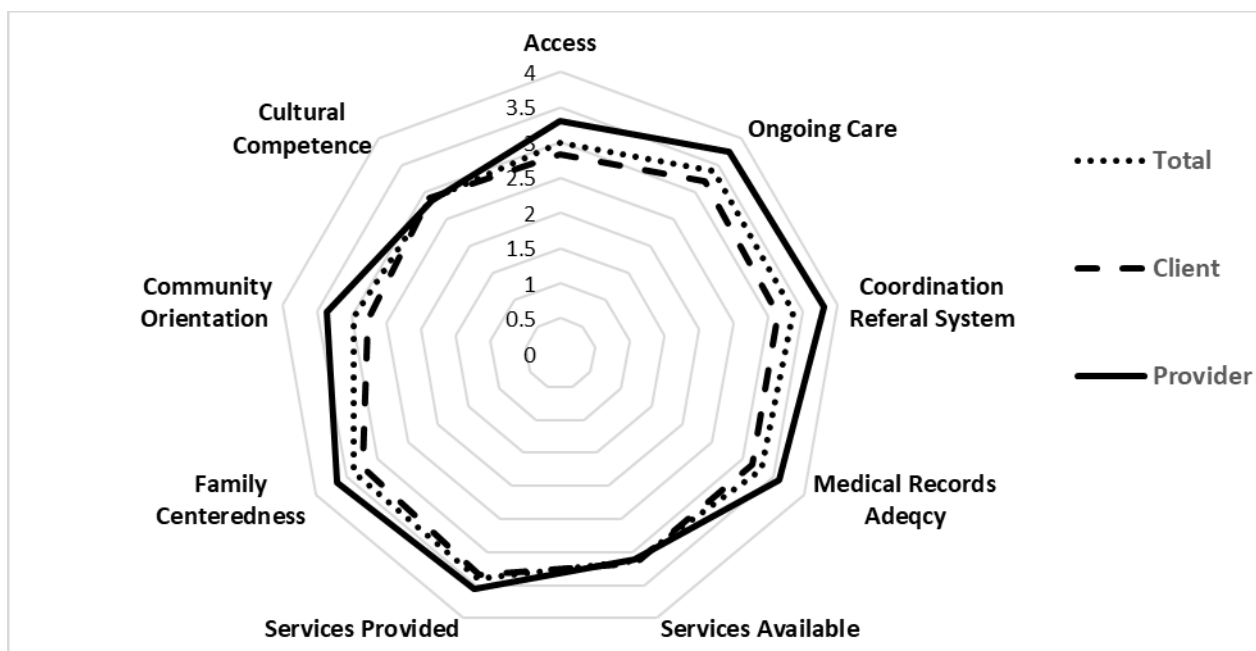
TABLE 4: COMPARISON OF PHC DOMAINS FROM THE PERSPECTIVE OF CHILD/ADOLESCENT AND ADULT PARTICIPANTS IN THIS STUDY

Domain	Child/Adolescent (n=410)	Adult (n=402)	T- Statistics	P-value
	Mean ±SD	Mean ±SD		
Access	2.79 ± 0.73	2.87 ± 0.69	1.6274	0.104
Utilization	3.14 ± 0.86	3.31 ± 0.7	3.1693	0.0016
Extent of Affiliation with a Provider	3.52 ± 0.04	3.68 ± 0.03	2.7163	0.0067
Ongoing Care	3.16 ± 0.86	3.25 ± 0.74	1.6055	0.1088
Information System (MRA)	3.1 ± 0.78	3.19 ± 0.79	1.6187	0.1059
Referral System	2.99 ± 0.83	3.31 ± 0.75	5.8578	<0.001
Services Available	3.01 ± 0.83	3.31 ± 0.67	5.6163	<0.001
Services Provided	3.25 ± 0.88	3.42 ± 0.73	2.9305	0.0035
Family Centeredness	3.21 ± 0.84	3.27 ± 0.81	1.0232	0.3065
Community Orientation	2.69 ± 0.83	2.84 ± 0.91	2.374	0.0178
Cultural Competence	2.82 ± 0.98	2.94 ± 1.01	1.7458	0.0812
Primary Care Score	24.97 ± 4.92	26.35 ± 4.19	4.2961	<0.001
Primary Care Expanded Score	33.68 ± 6.9	35.39 ± 6.16	3.7072	0.0002

DISCUSSION

The results of the data analysis showed that the people who received PHC services from CRHCs had the same understanding as the personnel who provided the services directly only in terms of the principles of comprehensiveness-services available and cultural competence. In other domains, the average score of service recipients was lower than that of service providers. In a study by Bresick et al. in South Africa, in terms of the domains of comprehensiveness-services provided, cultural competence, coordination-information system, coordination-referral system, ongoing care, and family-centeredness, there was the same understanding between the provider and the recipient of the service and in other domains, such as the results of our study, the score of service receivers was lower than that of service providers [30].

The lower mean score of the clients in all domains indicates an undesirable status between what they demand and what they receive. In a study by Oliveira et al. on service adult recipients, all the assessed features, except coordination, showed insufficient orientation to PHC [11]. The study results of Aoki et al. in Japan, which compared the experiences of visitors to community-oriented health centers with hospitals; also showed that the score of access to services in the recipients of care in community-oriented centers was lower than that of patients in hospitals [31]. The

asymmetry of understanding towards the implementation of PHC principles is a sign of the inadequacy of the services provided or the lack of effective communication between the provider and the recipient of the service, which fades the mission of PHC. While it is expected that the vision of universal health care and social determinants affecting health in the 21st century will cross the path of PHC [32] service delivery.

From the point of view of service recipients and service providers, there was no agreement on the comprehensiveness of services provided in health centers which can be a sign of service recipients' dissatisfaction with the quality of the service received. The quality of service can be related to the service received or the process followed to receive the service; long waiting time to receive the service; inappropriate behavior of the service provider, unsuitable physical space for receiving the service; or any other factor that can contribute to the dissatisfaction of the service recipient. For example, Aoki et al. found that improving the accessibility to community health centers, including out-of-hours care, led to an increase in the quality of PHC [31]. The comprehensiveness of services provided is a behavioral feature. It seems that the service providers do not have the necessary skills to communicate effectively with the service recipient and provide effective training, or they do not spend enough time for this. Spending insufficient time or skills for the service recipient causes mistrust, disruption in ongoing care and lack of regular visits to health centers. Ongoing care is also

a behavioral principle in PHC, which indicates the existence of a continuous relationship focused on the person (not on the disease) over time between the provider and the recipient of the service [17]. According to the rural family physician law in Iran, people who live in a rural area should refer to the comprehensive health service center of the same rural area and due to the special conditions of the rural area, we cannot expect the option to change and to be able to select the service provider as occurs in urban areas. Therefore, dissatisfaction with that center makes them not attend without expressing their dissatisfaction due to the small geographical area and special considerations of communication between the service provider and recipient, or they refer to the hospital and private practices outside of the systematic referral process.

The low level of health literacy of the people makes the real value of the services provided not understood. In their study, Inoue and Aoki assessed the health literacy of the service recipients in a significant positive relationship with PHC features, especially with the principle of ongoing care and comprehensiveness services provided [18]. Cultural competence respects the beliefs, attitudes, and behaviors of individuals in providing health care [17]. Perhaps it can be said that the most obvious feature of PHC in Iran is the adaptation of services to people's beliefs and behaviors. Because comparing all groups in our study, there was the same understanding of this principle. Families that are at a good level of economic ability or do have not a child under five ages may not have a specific understanding of the cultural competence of the services provided. The main reason for most people visiting PHC centers is children's vaccinations or to measure their height and weight. Families living in health poverty are usually unaware of the cultural appropriateness of services due to information asymmetry. On the other hand, it seems that in recent years, services such as the requirement of COVID-19 vaccination or the decision-making method for adjusting the family size in Iran are not liked by many people. Maybe the questions of the questionnaire used should have examined the cultural competence from different aspects such as these mentioned. The results of Besigye et al. correspond with our research due to finding similar perceptions among managers, care providers, and care receivers regarding the cultural competence of PHC services [33]. A study by Nascimento et al, which used the Portuguese version of this questionnaire in Brazil, the same understanding of cultural competence was not observed between recipients and providers of oral care [34].

Comparison of child/adolescent PHC responses with those over 18 years showed that, in terms of three core domains of access, ongoing care, coordination-care system, and two ancillary domains of cultural competence, there was a similar understanding of family-centeredness between the two groups. But in terms of five core domains and one ancillary domain, as well as in terms of the total score and PHC score, there was no agreement between the two groups in terms of their understanding. The total score and PHC score were significantly higher in the adult group. PHC services as the first level of care in the health system, should be available to everyone. Access is a structural property. One of the very good features of Iran's PHC is the existence of Local Health Houses and CRHCs. But the "utilization" component reflects the population's use of the facilities. Utilization is a behavioral feature [17]. The study results assessed PHC utilization by adults more than that of children/adolescents. Perhaps adults visited the center the most for blood pressure and diabetes checkups. Although it can be seen that some people with non-communicable diseases (NCDs) tend to refer continuously for blood pressure and diabetes measurements, which should not cause the care of other groups to be neglected. In a study by Pinto et al. in Brazil it was also shown that the elderly group had the most visits to health centers and assessed the performance of service providers more positively than other groups [21]. Family centeredness reflects the understanding of the nature, role, and effect of health, disease, disability, or injury of members on the family, the effect of the structure, function, and dynamics of the family, as well as the family history of diseases in individuals [17]. In the care registration system in health centers and homes in Iran, people are covered by the service provider unit as a family. Although urban areas still face problems with this issue, it has been completely resolved in rural areas. A study by Shi et al. showed that PHCs in rural centers were significantly better than the city in the domains of utilization, access, referral system, comprehensiveness-services available, and community orientation. However, both domains needed improvement in electronic information registration [35]. Due to the relationship with the population covered, the rural family physician knows people based on the household and asks questions about possible diseases or problems in the family.

Community orientation is concerned not only with the health care needs of the patients and families who used the services by the provider, but also with those whose health care needs are not met and the features that affect the health needs of everyone in the community [17]. In our

study, there was not the same understanding in terms of community orientation in the group of recipients and service providers. In a study by Moe et al. on the domains of PHC among adults receiving services in community-oriented clinics during 2007-2016 at four intervals in Canada, the average access score improved significantly during these years. But community orientation, ongoing care, coordination-referral system, family centeredness and cultural competence satisfaction reduced. Dependence on a service provider, utilization and coordination of the care system were not improved [36]. Community-oriented PHC, which operates on the principles of community participation and mobilization, is now more critical than ever [37].

Referral system coordination is a behavioral feature that refers to the logical ordering of those services including community resources [17]. The rural family physician serves as an intermediary connecting rural households with the second level of health services. Upon conducting their own diagnosis, if the individuals under their care require the expertise of a specialist physician, it is incumbent upon the rural family physician to guide and assist them in obtaining the appropriate referral. Subsequently, after the individuals have consulted with the specialist, the family physician is responsible for engaging in discussions with them and monitoring the progress of their care and treatment. It seems that children and adolescents often refer to higher levels of care services without consulting a family physician. It can be asserted that with enhanced accessibility to specialists, facilitated by shorter geographical distances and widespread availability of transportation, individuals are inclined to seek perceived higher quality services by paying more. Consequently, they opt for direct referrals to specialists and urban centers. A study by Liang et al. also showed that in the adult population who were definitely referred to higher levels through Level 1 (primary care), compared to the same population that was referred to higher levels of care without a referral system then the domains of utilization and coordination of the referral system were higher. However, the domains of access and ongoing care were lower [22].

LIMITATIONS OF THE STUDY

Our study was based on a questionnaire in which the perceptions and experiences of the participants regarding how to receive and provide PHC services were conducted. But this study did not address the causal relationships between the studied components. On the other hand, the researchers had intended to include more samples (participants) in the study from all over the country but distributing and completing three types of questionnaires and convincing people to complete the questionnaire was too difficult because of the high costs, high workload in the executive departments, the start of an electronic prescription program and coincidence with the COVID-19 pandemic throughout the world.

CONCLUSION

The results from this study showed that there was more similarity between the child/adolescent group and the group over 18 years old in terms of understanding of services where these two groups had the same understanding of cultural competence in terms of the three core domains of access, ongoing care, information system and two family centeredness ancillary domains. However, the group of providers, and service recipients had the same understanding in only one core domain of comprehensiveness of existing services and one ancillary domain of cultural competence.

The components of the coordination-referral system, comprehensiveness-services provided, and community orientation should be paid more attention because they were among the weak components regarding common perception among all three groups. For common understanding between the three groups, cultural competence was one of the strongest components and other components had an average rank. To address these gaps, it is necessary to augment community health literacy, do needs analyses, deliver services aligned with community requirements, and overhaul the referral system procedures and the government's commitment to implement them. The study findings can serve as valuable insights for healthcare policymakers and enable them to formulate favorable policies for primary services within the country's healthcare system, considering the clients' perceived, induced, and actual needs.

ETHICS CLEARANCE

The study was done after holding the ethical code IR.IAU.CHALUS.REC.1399.022 from Islamic Azad University, CHALUS Branch. Written informed consent was obtained from all study participants.

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ASSESSMENT OF OCCUPATIONAL BURNOUT AND ITS DETERMINANTS, CAUSES OF OCCUPATIONAL STRESS, AND ITS COPING STRATEGIES AMONG NURSES WORKING IN THE PSYCHIATRIC WARDS: A MIXED-METHOD STUDY

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ABSTRACT

AIMS:

This study assessed occupational burnout and its determinants, causes of occupational stress, and its coping strategies amongst 13 nurses working in the psychiatry wards in India.

METHODS:

This was a longitudinal mixed-method study. The qualitative component comprised interviewing each participant under the steps of "free listing" and "pile sorting" to assess the causes of occupational stress and its coping strategies. The occupational burnout experiences were assessed using the Maslach Burnout Inventory.

RESULTS:

Low-level depersonalization scores were present among six (46.1%) participants. Scores under this component of burnout were negatively correlated with years of work experience in providing nursing care for admitted psychiatric patients (rs = -0.548, p=0.05). Median scores of the emotional exhaustion scale (p=0.047) and of the depersonalization scale (p=0.016) were significantly higher among participants working at the government hospital. The major cause of occupational stress was poor infrastructure and treatment facilities with a salience score of 0.154. The most adopted strategies to tide over occupational stress were reading books and meditation with a salience score of 0.128 and 0.109 respectively.

CONCLUSION:

Extended work experience of participants was associated with their better ability to understand and empathize more with the patients as reflected by the low depersonalization scores. Two components of occupational burnout were found to be higher among nurses working in the government hospital. Organizational relationships were a more common cause of occupational stress than client-related matters among the participants. Recreational activities were the most common coping strategies adopted by the participants to deal with stress.

KEYWORDS

occupational burnout, determinants, occupational stress, causes, coping strategies, psychiatric nurses, free listing, pile sorting, mixed-method study

Assessment of Occupational Burnout And Its Determinants, Causes of Occupational Stress, And Its Coping Strategies Among Nurses Working In The Psychiatric Wards: A mixed-method study

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1

INTRODUCTION

Occupational stress refers to how people react when presented with high work demands and pressure that may or may not match their capability and knowledge. It challenges their ability to cope with the situation [1].

Over the years, it has been accepted and documented that nurses work under immense stress. A study in Mumbai, India reported that 87.6% of nurses experienced occupational stress [2]. Their work involves sudden swings from routine repetitive work to emergent situations, being exposed to excessive noise, unpleasant sights, and prolonged and irregular hours without rest [3]. This can affect their emotional well-being. Most of the problems in this field arise from the high demands of the work setting and delivery of a high standard of care for critical patients. This was supported by the findings of an analysis of 70 research papers for the period 1966 to 2000 reviewed as part of this study, which explained the adverse effects of work-related stress on the mental health of nurses. This was also found to affect enthusiasm to work, resulting in absenteeism and reduced work efficiency and performance [4]. Instances of unpredictable patient aggression and violence act as potential detrimental forces [5].

Nurses working in the psychiatric field have to face many ethical issues. A primary concern of psychiatric nurses is to ensure that the patient is not harmed. This limits their actions, making it one of the most stressful areas of nursing practice [6]. If the stress is not well managed, it can lead to a plethora of emotional and psychological issues such as depression, anxiety, irritability, resentment, insecurity, and a high attrition rate [6].

It has been observed that the strategies usually employed by nurses could be both adaptive or maladaptive, which may depend on their social support [2]. It is seen that the most common coping strategies include escaping, avoidance, detachment, withdrawal, and catharsis, which have a negative impact on their lives [7-9]. Effective use of coping strategies has been reported to stabilize and nullify the harmful effects of stress and improve mental health [10]. This study was hence done to assess occupational burnout and its determinants, causes of occupational stress, and its coping strategies among nurses working in the psychiatry wards of two tertiary care hospitals in Mangalore city, Kamataka, India. A mixed-method study was chosen so that the qualitative component will give a description of the causes of occupational stress and of the various coping strategies adopted by the participant. The quantitative component of the study will help to identify the determinants of occupational burnout.

MATERIALS AND METHODS

This hospital-based mixed-method study (quantitative and qualitative) was done in November and December 2019. The Institutional Ethics Committee approval was taken in November 2019. It was a longitudinal study done among nurses posted in the psychiatric wards in a government and private hospital. This was done because the working environment in a government hospital set up is different from that of a private hospital set up. Permission to conduct this study at the above-mentioned hospitals was taken from the respective medical superintendents.

The sample size was based on the Law of Saturation. "The definition of the law is that data collection is considered saturated when no new elements are found, and the addition of new information ceases to be necessary since it does not alter the comprehension of the researched phenomenon" [11]. The convenience sampling method was used to recruit participants. Staff nurses who were posted in the psychiatric ward for at least six months were eligible to be part of this study. Non-consenting participants were excluded from this study.

Complete information about the nature and purpose of the study was given to the participants in a language that they could understand.

Written informed consent was taken from each of the participants. They were reassured that the information provided by them would not be disclosed. Each participant was interviewed on a one-to-one basis in a private room in the hospital.

Data were collected using both a semi-structured self-administered questionnaire and an interview schedule. The data collection tools were content validated with the help of subject experts. It was translated into the local language Kannada, and was language validated by the process of translation and back-translation. The questionnaire had three sections:

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Part I was a self-administered questionnaire. It consisted of questions to collect the socio-demographic information of the participants such as age, gender, type of family, place of residence, educational qualifications, and work experience.

Their work settings in terms of whether working in a government or private hospital were also enquired. This was because the infrastructure of the hospitals, treatment facilities available, cost of treatment, number of patients, and the socio-economic conditions of the patients are different in both these organisations. Therefore, these factors could also influence the mental health of the nurses working at these hospitals.

Part II was an interview schedule. A one-on-one personal interview was conducted with each participant. This interview comprised of two components— "free listing" and "pile sorting".

Free listing [30]: In this procedure, participants were invited to answer two questions.
1. What do you think are the causes of stress in your work settings?
2. What are the coping strategies used by you to tide over these stressors?

Before beginning the interview, all the participants were given a briefing about the proceedings. Then these two questions were read out to the participants, and any clarification sought was explained to them. This ensured that they had an adequate understanding of these questions. The participants then wrote their responses on a sheet of paper. They were given 20 minutes time to complete this exercise. The answers provided by each of the participant was read out to them on a one-to-one basis.

After the "free listing" procedure was conducted among all the participants, they were invited on a later date to participate in the "pile sorting" procedure [30]. This was also done on a one-to-one basis for each participant in a private room in the hospital. The responses obtained from "free listing" were put together in this procedure. The dissimilarities and similarities in the responses provided by the participants were identified. The aim was to narrow down the responses into specific groups. "Pile sorting" was done for those responses (reasons), which showed a relatively high "Smith's S" value.

"Smith's S (Smith's saliency score) refers to the importance, representativeness, or prominence of items to individuals or the group. It is measured by word frequency across lists and word rank within the list."

The identified sources of stress and the coping mechanisms stated by the participants were written on separate cards. Each card was assigned a number. The cards were then handed to the participants, who arranged them in groups according to their choice. The participants were then asked to explain the reason behind choosing the selected group. The set of cards was then handed over to the next participant. All participants were finally given the opportunity to rearrange the stack should they choose to do so. Each participant was given 20 minutes time to complete the exercise.

Part III was a self-administered questionnaire. It comprised the Maslach Burnout Inventory (MBI) [12]. This focuses on three aspects: exhaustion, depersonalization, and personal achievement. Permission to use this questionnaire for this research study was obtained from its manufacturers. This inventory assesses the effect of occupational burnout on the mental health of the participant nurses. It comprises 22 questions. Each question being designed on a seven-point Likert scale with options – "never", "a few times in a year", "once in a month", "a few times in a month", "once in a week", "a few times in a week", and "every day". The scores corresponding to these options ranged from 0 to 6.

The MBI questionnaire had three sections:
- Section A had seven questions that assessed the "emotional exhaustion" experienced by the nurses. A score of up to 17 was considered low level, 18-29 as moderate, and above or equal to 30 as high-level burnout.
- Section B comprised of seven questions to assess the "depersonalization" among the participants. A score ≤5 was considered low level, 6 to 11 as moderate level, and ≥12 as high level of occupational burnout.
- Section C comprised of eight questions to assess the "personal achievement" among the participants. A score ≤33, 34 to 39, and ≥40 corresponded to a high-level, moderate level, and low level of occupational burnout respectively.

The entire process of data collection from the participants was sequential and was completed over three separate days. Part I and the "free listing" component of Part II of the

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data collection tool was done in one setting for all the participants.

The pile sorting component of Part II was conducted on another day. Finally, Part III of the data collection tool was completed by all the participants at a later date.

The quantitative data were coded and entered into IBM SPSS Statistics for Windows (version 25.0. Armonk, NY: IBM Corp.).

The normality of their age distribution, their work experience, work experience in psychiatry wards, and scores obtained by them for emotional exhaustion, depersonalization, and reduced personal accomplishment under MBI, were done using the Shapiro-Wilk test. Only the age of the participants followed the normal probability distribution. The descriptive statistics were presented as proportions, mean, standard deviation, median, and interquartile range (IQR).

Statistical tests like the Chi-square test, Mann-Whitney U test, and Spearman's rank correlation coefficient were used for analysis. A p value of ≤0.05 was considered as a statistically significant association. Qualitative analysis was done using Visual Anthropac (4.98.1) software. This software was used to interpret the results of both "free listing" and "pile sorting". To get a collective picture, multidimensional scaling and hierarchical cluster analysis of the pile-sorted data were undertaken.

RESULTS

A total of 16 nurses fulfilled the inclusion criteria for participation. Of which, 13(81.2%) gave written informed consent for participation. The majority of whom were female [11(84.6%)]. The mean age of the study participants was 40.4±10.7 years. Majority of the nurses were working in the government hospital [8(61.5%)]. Their median work experience was 12 years [IQR 4.75, 24.5]. Their median work experience providing care to admitted patients with various psychiatric illnesses was one year [IQR 0.5, 1]. (Table 1)

TABLE 1: SOCIO-DEMOGRAPHIC DISTRIBUTION AND WORK-RELATED CHARACTERISTICS OF THE STUDY PARTICIPANTS (N=13)

Characteristics	Number	Percentages
Age group (years)		
≤30	3	23.1
31-40	4	30.7
41-50	3	23.1
>50	3	23.1
Gender		
Male	2	15.4
Female	11	84.6
Marital status		
Unmarried	3	23.1
Married	10	76.9
Type of family		
Nuclear	8	61.5
Joint	5	38.5
Educational qualification		
BSc Nursing	5	38.5
Diploma Nursing	8	61.5
Place of residence		
Urban	11	84.6
Rural	2	15.4
Work experience (years)		
1-10	5	38.5
11-20	3	23.1

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21-30	4	30.7
>30	1	7.7
Work experience in psychiatric wards (years)		
6 months to 1 year	4	30.8
1.1 to 2 years	7	53.8
>2 years	2	15.4
Workplace		
Government hospital	8	61.5
Private hospital	5	38.5

High, moderate, and low levels of the emotional exhaustion scores were present among 1 (7.7%), 3 (23.1%), and 9 (69.2%) participants respectively. High, moderate, and low levels of the depersonalization scores were present among 4 (30.8%), 3 (23.1%), and 6 (46.1%) participants respectively. High, moderate, and low levels of reduced personal accomplishment scores were present among 5 (38.5%), 2 (15.4%), and 6 (46.1%) participants respectively.

There was no significant correlation between the age of the participants with scores obtained under the emotional exhaustion (rs= 0.067, p=0.829), the depersonalization (rs= -0.283, p=0.349), and the reduced personal accomplishment (rs= 0.004, p=0.989) component of occupational burnout.

There was no association of gender, marital status, educational qualification, type of family, and place of residence of participants with any of the components of occupational burnout.

There was no significant correlation between years of work experience among participants with their scores obtained under the emotional exhaustion scale (rs= -0.133, p=0.666), the depersonalization scale (rs = -0.501, p=0.081), and the

reduced personal accomplishment scale (rs = 0.273, p=0.367) of occupational burnout.

There was no significant correlation between the years of work experience in providing nursing care for admitted psychiatric patients and their scores obtained under the emotional exhaustion scale (rs = 0.331, p=0.269) and reduced personal accomplishment scale (rs = -0.306, p=0.309) of occupational burnout among participants.

However, scores obtained in the depersonalization scale were significantly but negatively correlated with years of work experience of participants in providing nursing care for admitted psychiatric patients (rs = -0.548, p=0.05). Median scores of the emotional exhaustion scale (p=0.047) and of the depersonalization scale (p=0.016) were significantly higher among participants working at the government hospital. (Table 2)

FINDINGS FROM "FREE LISTING" AND "PILE SORTING" PROCEDURES

The major cause of stress perceived by the nurses working in the psychiatric wards was the poor infrastructure and treatment facilities with a salience score of 0.154. (Table 3)

TABLE 2: ASSOCIATION BETWEEN WORKPLACE OF PARTICIPANTS WITH VARIOUS COMPONENTS OF OCCUPATIONAL BURNOUT (N=13)

Characteristics	Median scores of emotional exhaustion scale (Q1, Q3)	Z value	p value
Workplace			
Government hospital (n=8)	18.5 (10.7, 25.2)	1.987	0.047
Private hospital (n=5)	7 (6.5, 12.5)		
Workplace	Median scores of depersonalization scale (Q1, Q3)		

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Government hospital (n=8)	12 (5.2, 16.7)	2.419	0.016
Private hospital (n=5)	3 (0.5, 6)		
	Median scores of reduced personal accomplishment scale (Q1, Q3)		
Workplace			
Government hospital (n=8)	34.5 (23.7, 46.2)	0.881	0.378
Private hospital (n=5)	44 (35, 46)		

TABLE 3: CAUSES OF OCCUPATIONAL STRESS REPORTED AMONG PARTICIPANTS AT THEIR WORK SETTING (N=13)

Causes of occupational stress	Salience
Poor infrastructure and treatment facilities	0.154
Handling suicidal patients	0.115
Shortage of manpower	0.077
Handling aggressive patients	0.077
Depressed patients are hard to handle	0.077
No separate wards for male and female patients	0.077
Shortage of male nurses	0.077
High work pressure	0.077
Communication difficulties	0.077
Anxiety about patient's well-being	0.077
Lack of sufficient Group D workers (Peons)	0.077
Handling violent patients	0.077
Lack of adequate security staff	0.062
Inadequate salary	0.038
Long working hours	0.019

Cognitive mapping revealed the distribution of various causes of occupational stress into four major categories (Figure 1).

The participants grouped the salient items into categories according to their own will.
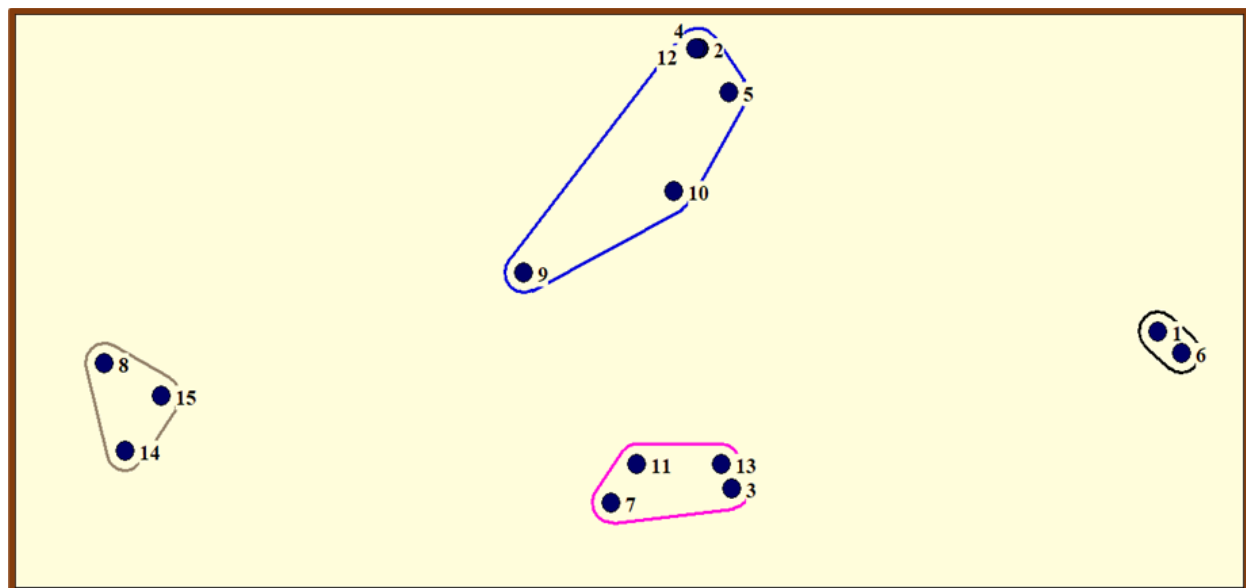
Pile 1: Poor infrastructure and treatment facilities and no separate wards for male and female patients piled under the title "infrastructural deficits".

Pile 2: This pile includes the various "difficulties faced while dealing with patients", such as handling depressed, suicidal, aggressive, and violent patients, anxiety about patients' well-being, and communication difficulties with the patients.

Pile 3: Lack of group D workers (peons), security staff, male nurses, and shortage of manpower are all sorted under "lack of supportive measures".

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Pile 4: The nurses categorized high work pressure, inadequate salary, and long working hours under "high workload with poor remuneration". (Figure 1)

FIGURE 1: COGNITIVE MAP SHOWING CAUSES OF OCCUPATIONAL STRESS AMONG NURSES WORKING IN THE PSYCHIATRIC WARDS (N=13).

1. Poor infrastructure and treatment facilities, 2. Handling suicidal patients, 3. Shortage of manpower, 4. Handling aggressive patients, 5. Depressed patients are hard to handle, 6. No separate wards for male and female patients, 7. Shortage of male nurses, 8. High work pressure 9. Communication difficulty, 10. Anxiety about patient's well-being 11. Lack of sufficient group D workers (Peons) 12. Handling violent patients, 13. Lack of adequate security staff, 14. Inadequate salary 15. Long working hours

Reading books with a salience score of 0.128 was the most commonly adopted coping strategy to tide over occupational stress among the participants (Table 4).

TABLE 4: DISTRIBUTION OF COPING STRATEGIES ADOPTED BY THE PARTICIPANTS TO TIDE OVER VARIOUS STRESSORS REPORTED AT THEIR WORK SETTING (N=13).

Coping strategies	Salience
Reading books	0.128
Meditation	0.109
Attending stress management classes organized by the hospital	0.077
Take security's support to deal with aggressive patients	0.077
Taking help from other nursing staff	0.077
Talking to family members and friends	0.077
Seeking consultation from a psychiatrist	0.077
Striving to communicate better with the patients and offering them good care	0.077
Improving awareness about the problems faced by the patients and understanding the source of these problems	0.077
Seeking help from the nursing superintendent	0.077
Seeking support from other hospital staff when dealing with a difficult patient	0.077

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Prioritizing work and maintaining proper timings	0.077
Periodically listening to music	0.077
Playing chess	0.077
Trying to solve problems with a positive approach	0.019

Cognitive mapping revealed the distribution of various strategies used for coping with occupational stress among participants into four major categories (Figure 2).

Pile 1: This pile includes reading books, meditation, playing chess, periodically listening to music, and talking to family and friends, and it is titled "rest and recreation".

Pile 2: This pile consists of strategies like trying a positive approach, communicating better with the patients, and taking good care of them that helped the participants to relieve stress. It is titled "caring for the patients".

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Pile 3: This pile titled, "self-discipline and professional help" includes the following measures to reduce stress: attending stress management classes organized by the hospital, seeking help and support from the security, consulting the psychiatrist, and at the same time maintaining proper timing and prioritizing work.

Pile 4: This pile includes improving awareness about the problems faced by the patients and the source of the problems and seeking help from the nursing superintendent, colleagues, other staff, and security when dealing with a difficult or aggressive patient. It talks about "creating a support network" to handle challenging situations in the workplace to reduce occupational stress. (Figure 2)

FIGURE 2: COGNITIVE MAP SHOWING THE VARIOUS COPING STRATEGIES USED BY THE NURSES TO DEAL WITH THE STRESSORS FACED BY THEM AT THEIR WORKPLACE (N=13).
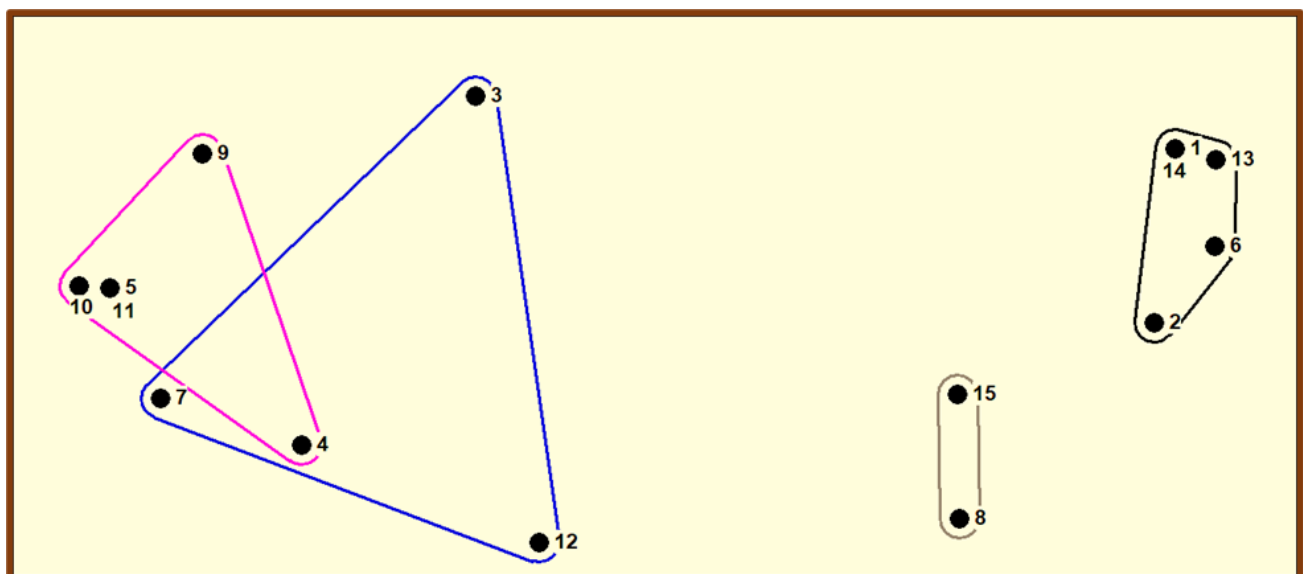
1.Reading books, 2. Meditation, 3. Attending stress management classes organized by the hospital 4. Take security's support to deal with aggressive patients, 5. Taking help from other nursing staff, 6. Talking to family members and friends, 7. Seeking consultation from a psychiatrist, 8. Striving to communicate better with the patients and offering them good care, 9. Improving awareness about the problems faced by the patients and understanding the source of these problems, 10. Seeking help from the nursing superintendent, 11. Seeking support from other hospital staff when dealing with a difficult patient 12. Prioritising work and maintaining proper timings, 13. Periodically listening to music, 14. Playing chess, 15. Trying to solve problems with a positive approach

DISCUSSION AND CONCLUSION

In this study the majority of the nurses had low scores under the emotional exhaustion, the depersonalization, and high scores under the personal accomplishment component,

indicating a low level of burnout. Similarly, studies done in the United Kingdom among psychiatry nurses reported that 21.6% [13] and 41% [14] had high scores under the emotional exhaustion scale, 7.1% [13] and 20.5% [14] had high scores under the depersonalization scale and 21.7%

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[14] and 33.1% [13] had low scores under the personal accomplishment component. The majority of psychiatry nurses experiencing low occupational burnout in the present study and in other studies could be because of the various coping strategies.

In another study done among psychiatric nurses in Japan, female nurses experienced higher stress levels than male nurses, especially in areas of nursing care, attitude towards work, fatigue, and anxiety [15]. On the contrary, the present study found no significant differences in the occupational burnout scores with gender, marital status, education, type of family, and place of residence of participants.

The years of work experience were negatively correlated with the depersonalization scores. This implies that with more extended work experience, one learns newer and easier ways to deal with situations resulting in occupational burnout, which helps them understand patients better. Less experienced nurses might not be able to relate to patients' problems and hence prefer to dissociate or depersonalize themselves to deal with such situations. In a study done in Sangli, India, nurses with more than five years of work experience in psychiatry units reported significantly greater job satisfaction than the less experienced ones [16].

In this study, it was found that occupational burnout under subscale emotional exhaustion and depersonalization were significantly higher among the nurses working in the government work setting than in the private setting. This could be due to the higher patient load in the government setting.

The qualitative aspect of the study was achieved through the "free listing" and the "pile sorting" methods to obtain a deeper perspective on the causes of occupational stress at the workplace and the various coping strategies used by the participants.

The major cause of occupational stress among the participants in the present study was poor infrastructure and treatment facilities. Present findings were consistent with a study done among psychiatric nurses in Cairo [6] and Ireland [17]. In the study done in Sangli, India workplace support was reported to be sufficient by 95.1% of nurses working in psychiatry units. As many as 63.7% of them reported high job satisfaction. The significant positive correlation between the two meant that extrinsic factors

like a good workplace favored job satisfaction among them [16]. Hence psychiatric nurses had more concern for organizational relationships than client-related difficulties or high workload as also observed in the Irish study [17].

In this study, the most common methods of coping with stress among participants were reading books followed by meditation and attending stress management classes organized by the hospital. In another study done in Ireland, the common coping methods among psychiatric nurses were reflecting on the problems personally and with their family, friends, supervisors, or counsellors [18]. Apart from this, taking courses to gain more education or training and dealing more professionally and empathetically with patients was found to relieve occupational stress among them [18]. In a study done in the USA, psychiatric nurses preferred having pastimes and hobbies outside work life to help them deal with stress [19].

Several studies have stated that educational interventions significantly reduced perceived stress among nurses working in psychiatry wards [20-22]. These interventions were in the form of communication skills, stress education, time management skills, taking leisure breaks, assertiveness training, negotiation skills, responding to criticism, problem-solving skills, and humor. Apart from lectures, various active learning methods like behavior rehearsal, role play, and group work were used to deliver this training [21]. Effective stress management at the workplace further influenced their general well-being and reduced sickness absenteeism from work [22].

Some of the other suggested preventive self-care strategies to destress are spiritual practices, meditation, relaxation techniques, healthy lifestyle practices like eating healthy food, adequate sleep, regular exercise, recreational activities, and hobbies [23].

Nursing supervisors need to periodically organize and conduct such training programs to reinforce stress management among nurses, particularly for those posted in psychiatry wards. Asking experienced nurses to mentor the work of novice nurses in real time will help increase their interest while dealing with patients with various mental illnesses [24]. Apart from these measures, nurses also need to utilize informal channels like peer-to-peer support to help one another through the process of debriefing their experiences and discussing possible solutions amongst their peer group through group discussions [25]. Workplace

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stress management has also been emphasized under the National Mental Health Programme [26].

In studies done in Iran, nurses posted in psychiatry wards reported non-disclosure of their workplace to their family members and friends [24, 27] This was because others had a poor understanding of psychiatry illnesses and a negative attitude towards psychiatric nurses. This also reduced their interest in working with psychiatry patients [24, 28]. Hence the social stigmatization and misconceptions of people towards mental illnesses and their negative attitude towards psychiatric nurses need to be corrected by educational programmes among the general population by policymakers.

Media-based interventions can help bring this change in public attitudes towards psychiatric patients and their healthcare providers. The same must be inculcated in the working environment of the hospital by the hospital administrators. They need to lead by example by promoting a work culture of transparency, empathy, support, destressing facilities, safety, duty rotation policies, and adequate leave opportunities for nurses posted in psychiatry wards [29].

A future area of research would be to implement all these suggested interventions and conduct an experimental study among the same population. Then assess whether there has been any significant reduction in their occupational burnout and stress.

From the findings from this study, we conclude that the majority of the nurses working in the psychiatric wards in this study reported a low level of occupational burnout.

Among the various components of occupational burnout, the depersonalization sub-scale was negatively correlated with the years of work experience of participants. This implies that the longer their work experience, the better their ability to understand and empathize more with the patients and build a better nurse-patient relationship.

Two components of occupational burnout were found to be higher among nurses working in the government hospital. The main causes of occupational stress among the participants were poor infrastructure and treatment facilities. The low level of occupational burnout experienced by the majority of the nurses might be due to

the various coping strategies. The most common being recreational activities like reading books and meditation.

LIMITATION

There is a possibility of non-reporting of information by participants in this study. This because the healthcare providers may fear disclosure of information and seeking of mental healthcare as a threat to their careers. The participants in this study were enrolled non-randomly. Added to this, the sample size was small. Therefore, the results of the study may not be generalizable to other settings.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE:

This was obtained from the institutional ethics committee of Kasturba Medical College, Magalore, Manipal Academy of Higher Education, Manipal, India, with reference number IEC KMC MLR 11-19/538 dated 20th November 2019. Written informed consent to participate was taken from the participants.

AVAILABILITY OF DATA AND MATERIALS:

The excel sheet containing the data of this research study is available at the following repository:

Figshare. 'Assessment of occupational burnout and its determinants, causes of occupational stress, and its coping strategies among nurses working in the psychiatric wards: A mixed-method study'
https://figshare.com/s/a6dd19305390571a0ea6

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RESEARCH ARTICLE

THE EFFECT OF LEADER-MEMBER EXCHANGE ON JOB CRAFTING IN NURSING: THE MEDIATING ROLE OF PSYCHOLOGICAL SAFETY

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ABSTRACT

BACKGROUND

Nurses are expected to make prompt and accurate decisions, have high crisis management skills, and exhibit proactive behaviors due to the nature of their service. Nevertheless, this situation is thought to be affected by the directors' approach and the working environment's structure. Therefore, this study aims to determine the mediating role of psychological safety in the effect of leader-member exchange on job crafting.

METHODS

This study is a descriptive cross-sectional study. The study was conducted with 782 nurses in Istanbul, Turkey. Structural equation modeling was used in the study. AMOS software was used for model analysis, and SPSS software was used for descriptive statistics and correlation analysis.

RESULTS

The results indicate that the effects of leader-member exchange on job crafting (β = .541, p < .05) and psychological safety (β = .430, p < .05) are statistically significant. Moreover, the effect of psychological safety on job crafting is statistically significant (β = .453, p < .05). Based on the path analysis, it was determined that psychological safety has a mediating role in the relationship between leader-member exchange and job crafting (Confidence Interval; LB=0.059, UB=0.172).

CONCLUSION

This study revealed that psychological safety is a mechanism that contributes to the explanation of the relationship between leader-member exchange and job crafting. The findings will create ideas for directors to provide a healthier working environment. This situation is predicted to bring more positive results for employees and patients.

KEYWORDS

leader-member exchange, job crafting, psychological safety, nursing

INTRODUCTION

The health sector is a complex area of business that provides 24/7 service with intense specialization and effort. It has a multidisciplinary structure that requires a high degree of coordination between employees and has a high division of labor. Therefore, the relations of employees with each other and their superiors are of utmost importance. One of the points to be mentioned here is leader-member exchange (LMX). Basically, LMX defines the bilateral process between the leader and each subordinate in which roles and expectations are developed. According to the theory, there is a social exchange between the leader and the employee, and the exchange relationship quality varies from employee to employee [1]. Employees with high-quality relationships are referred to as the "in-group." The leader shares more mutual support, frequent interaction, loyalty, commitment, respect, love, and trust with the employees in the in-group [2]. The employees outside this group are called the "out-group." The leader establishes more formal and formalized relations with this group of employees. This relationship is downward and unidirectional. There are defined roles, low trust, limited interaction, and less support and rewards [3].

Job crafting (JC) is one of the variables analyzed in this study. The concept of JC is defined by Wrzesniewski & Dutton [4] as the process by means of which members in an organization autonomously and proactively transform their tasks and make their jobs more meaningful. In other words, employees try to harmonize their work with their interests and values. For this reason, employees redesign their jobs by changing from passive to active in an informal process [5]. This situation points to a bottom-up approach as opposed to the classical top-down job design. Therefore, the employee redefines, organizes, and proactively leads his/her work. Although JC includes forms of proactive behavior, it differs from the pure proactive behavior concept. Because it involves coping strategies gathered in three main categories to respond to the changing demands of the work context [6]. These strategies include changes in the quantity, scope, or type of work tasks (task crafting), changes in the quality or quantity of social interactions at work (relational crafting), and changes in the way one perceives work (cognitive crafting) [7]. The leader's approach has a significant impact on employees' JC. The leader's rewards and incentives may encourage or discourage individuals to change relational and task boundaries in their work. Also important is how the leader organizes the organization. The current form of organization may allow employees to exhibit proactive behavior and increase their desire and ability for JC. Conversely, it may be organized in such a way as to inhibit these activities of the employee [1]. Based on this, the study hypothesis is as follows:

Hypothesis 1: LMX is positively related to JC.

Another variable addressed within the scope of the study is psychological safety (PS). PS means that the individual has a sense of confidence that he/she will not be embarrassed, ridiculed, or punished by other individuals in the organization as a result of every activity he/she performs in the organization [8]. The directors' approach is as critical as colleagues' behavior in making employees feel safe and comfortable [9]. Directors' clear and comprehensible policies and supportive and flexible approach towards employees make individuals feel safe and thus enable them to play an active role. Excessive authoritarian, oppressive, and harsh behaviors of the directors restrict the mobility of the employees and prevent them from speaking and expressing their opinions [10]. Hence, the leadership behavior applied by the director has a determining effect on employees' perceptions of PS [11]. Based on this, the study hypothesis is as follows:

Hypothesis 2: LMX is positively related to PS.

PS contributes to employees' initiative and highlights their innovative aspects [12]. Psychologically secure employees do not show resistance to change. They feel more committed to their jobs, and they speak up and develop suggestions to make improvements for the organization [13]. In this way, in organizations with high PS, employees can freely express their opinions, are not afraid of taking risks, and exhibit creative and proactive behaviors [14]. Accordingly, it can be expected that employees' JC will also be high in organizations where PS is high. In addition, LMX may have a direct effect on JC as well as an indirect effect through PS. Based on this, the study hypotheses are as follows:

Hypothesis 3: PS is positively related to JC.

Hypothesis 4: PS mediates the relationship between LMX and JC.

Based on the above information, the variables discussed are important for the health sector. In particular, it can play a critical role for nurses, who are the main providers of care services. JC could be beneficial in factors such as the fact that nurses have many role definitions, health care services require immediate decision-making, and overcoming organizational problems. However, the points to be noted

here are; exchange between the leader and the nurse (LMX) and the suitability of the environment. It is thought that nurses should feel PS for high JC. Nurses are in constant contact with patients, colleagues and managers due to their jobs. In this way, it is assumed that the constant exchange of nurses with their environment may affect their perceptions of PS. Studies reveal that PS affects nurse behaviors [15]. In addition, it is stated in the literature that PS affects not only nurses but also the quality of health services provided [16].

In summary, this study has two main objectives. The first is to examine the relationship between LMX and JC in the health sector, and the latter is to reveal the mediating role of PS in this relationship.

METHODS

SAMPLING AND DATA COLLECTION
The study was descriptive regarding the objective and cross-sectional regarding the time dimension. The study population is the nurses working in private hospitals in Istanbul, Turkey. A disproportional stratified sampling method was employed in the study to reveal the general situation in the hospitals since the hospitals in the population did not have homogeneous characteristics in terms of human and other resources.

In the light of the hospital classification criteria of the Ministry of Health, the private hospitals on the website of the Istanbul Provincial Health Directorate are divided into 3 layers as A, B and C. Layer A is hospitals with more than 100 beds and equipped with intensive technology. It offers luxury and advanced medical care. Layer B is hospitals with 50 to 100 beds. It has relatively lower technological equipment than the hospitals in Layer A and can provide all kinds of medical services except advanced medical care. Layer C is hospitals with less than 50 beds. It is limited in terms of personnel volume and technological possibilities. Provides only basic medical care.

The procedures were reviewed and approved by the Marmara University ethics committee with a decision no: 2021/114. The data were collected between June and August 2022 using a face-to-face survey method.

MEASURES
The study used a four-part questionnaire form as a data collection tool. The first part of the form includes the "JC Scale," the second part consists of the "PS Scale," the third part contains the "LMX Scale," and the last part includes the "Personal Information Form" to obtain descriptive information of the participants.

JC Scale:
The scale was introduced to the literature by Slemp & Vella-Brodrick [17]. Adaptation of the scale into Turkish was conducted by Kerse [18]. The scale is a five-point likert type and consists of a total of 19 questions. The Cronbach's alpha coefficient of the scale was found to be 0.91 for the whole scale, 0.75 for the "task crafting" dimension, 0.86 for the "cognitive crafting" dimension, and 0.84 for the "relational crafting" dimension.

PS Scale:
The scale was introduced to the literature by Edmondson [8]. Adaptation of the scale into Turkish was conducted by Yener [19]. The scale is a five-point Likert type and consists of seven questions in total. Having one dimension in the original, the scale was collected in two dimensions as a result of the analyses. The Cronbach's alpha coefficient of the scale was found to be 0.81 for the whole scale, 0.86 for the "tolerance" dimension, and 0.76 for the "initiative" dimension.

LMX Scale:
The scale was introduced to the literature by Liden & Maslyn [20]. Adaptation of the scale into Turkish was conducted by Bas et al. [21]. The scale is a five-point Likert type and consists of a total of 12 questions. As a result of the factor analysis, the scale is analyzed in four dimensions. The Cronbach's alpha coefficient of the scale was found to be 0.93 for the whole scale, 0.92 for the "impact" dimension, 0.86 for the "loyalty" dimension, 0.70 for the "contribution" dimension, and 0.90 for the "professional respect" dimension.

STATISTICAL ANALYSES
The data obtained in the study were analyzed using AMOS 23.0 software. "Reliability Analysis" was conducted to test the reliability of the scales, and "Confirmatory Factor Analysis (CFA)" was conducted using the AMOS program to test the construct validity. The constructed model was tested through path analysis. For the structural equation modeling, the data set should provide a multivariate normal distribution. In this regard, multivariate outliers were analyzed with Mahalanobis distance values. Besides, SPSS for Windows 25.0 program was used for descriptive statistics and correlation analysis.

DATA ANALYSIS

DESCRIPTIVE STATISTICS AND INTERNAL CONSISTENCY OF THE MEASUREMENT SCALES

A total of 900 questionnaires were distributed, 300 per layer, and 804 people returned the questionnaire; the response rate was 87%. 22 questionnaires were excluded from the study due to incomplete and invalid responses. As a result, 782 questionnaires were evaluated within the scope of the sample. Most of the nurses participating in the study were female (78.8%, n=616) and single (74%, n=579). The nurses have been working in their hospitals for an average of three years and in their profession for an average of five years. The nurses participating in the study were between 19-55 years of age, with an average age of 26. Most participants (90.3%, n=706) had no administrative duties. Descriptive statistics and internal consistency of the variables of the study are shown in Table 1.

TABLE 1. DESCRIPTIVE STATISTICS AND INTERNAL CONSISTENCY OF ALL MEASURES USED IN THE STUDY

	Mean	SD	Cronbach's alpha	Number of items
Job Crafting	3.65	0.79	.89	19
task crafting	4.04	0.56	.77	7
cognitive crafting	4.30	0.58	.79	5
relational crafting	3.78	0.79	.84	7
Leader-Member Exchange	4.12	0.73	.93	12
affect	4.21	0.85	.91	3
loyalty	3.93	0.92	.84	3
contribution	4.06	0.85	.80	3
professional respect	4.29	0.80	.90	3
Psychological Safety	3.70	0.69	.81	7
indulgence	3.78	0.79	.71	3
initiative	3.65	0.79	.80	4

Note: SD, Standard deviation. The possible score range for all measures is 0–5.

Cronbach's a was used to evaluate the internal consistency of each scale. For the JC scale, the cronbach's a was 0.82 and ranged between 0.77 and 0.84 for the three dimensions. For the LMX scale, the cronbach's a was 0.93 and ranged between 0.80 and 0.91 for the four dimensions. For the PS scale, the cronbach's a was 0.81 and ranged between 0.71 and 0.80 for the two dimensions. Cronbach's a value of all variables above 0.70 indicates that the scales are reliable.

CORRELATIONAL ANALYSIS OF VARIABLES

Before applying the correlation test, the normality test was performed. The test results are shown in Table 2.

The normal distribution of the data depends on the skewness and kurtosis values being between ±3 [22]. From this point of view, the results obtained show that this study data has a normal distribution.

Parametric tests were used in this study as the data showed a normal distribution. Therefore, pearson correlation was applied to test the relationship between the scales used in the study. The correlation coefficients are shown in table 3.

The results show that, LMX had a positive moderately correlated with JC (r = 0.45, p < .05) and positive weakly correlated with PS (r = 0.34, p < .05). The results obtained are statistically significant for both variables. In addition, PS was positive weakly correlated and statistically significant with JC (r = 0.31, p < .05).

HYPOTHESIS TESTING

The effects were tested in a model with no mediator, with results are shown in Table 4.

TABLE 2. NORMALITY TEST OF THE SCALES

Scale Dimensions	Skewness	Kurtosis	Result
Job Crafting	-1.073	2.032	Normal
Task Crafting	-0.651	0.723	Normal
Cognitive Crafting	-1.088	1.651	Normal
Relational Crafting	-1.114	1.932	Normal
Leader-Member Exchange	-1.205	1.773	Normal
Affect	-1.338	1.941	Normal
Loyalty	-0.881	0.545	Normal
Contribution	-1.003	0.753	Normal
Professional Respect	-1.524	1.785	Normal
Psychological Safety	-0.620	0.329	Normal
Indulgence	-0.849	0.633	Normal
Initiative	-0.838	0.695	Normal

TABLE 3. CORRELATIONS AMONG STUDY VARIABLES

		1	2	3	4	5	6	7	8	9	10	11
1	TC											
2	CC	.50**										
3	RC	.54**	.59**									
4	JC	.82**	.79**	.87**								
5	AF	.32**	.33**	.36**	.40**							
6	LY	.28**	.28**	.36**	.37**	.67**						
7	CN	.29**	.29**	.34**	.37**	.61**	.60**					
8	PR	.29**	.35**	.33**	.38**	.72**	.59**	.64**				
9	LMX	.34**	.37**	.41**	.45**	.88**	.85**	.83**	.85**			
10	ID	.13**	.19**	.28**	.24**	.23**	.23**	.14**	.20**	.23**		
11	IN	.17**	.24**	.31**	.29**	.31**	.31**	.25**	.27**	.34**	.48**	
12	PS	.18**	.25**	.34**	.31**	.32**	.32**	.24**	.28**	.34**	.81**	.90**

Abbreviations: TC, task crafting; CC, cognitive crafting; RC, relational crafting; JC, job crafting; AF, affect; LY, loyalty; CN, contribution; PR, Professional Respect; LMX, Leader-member exchange; ID, Indulgence; IN, initiative; PS, psychological safety. (**p < .05).

TABLE 4. PATH MODEL WITHOUT MEDIATOR

| Path	β	t Values	P Values	Result
LMX ⟶ JC	0.541	10.834	**	Hypothesis 1 Supported
LMX ⟶ PS	0.430	6.592	**	Hypothesis 2 Supported
PS ⟶ JC	0.453	7.157	**	Hypothesis 3 Supported

Note: β = path coefficient; LMX, Leader-member exchange; JC, job crafting; PS, psychological safety. (** p < .05).

The results show that, the effects of LMX on JC (β = .541, p < .05) and PS (β = .430, p < .05) was statistically significant.

In addition, the effect of PS on JC was statistically significant. (β = .453, p < .05). Therefore, the hypotheses were accepted.

Finally, we tested a mediating effect model to verify whether PS mediates the relationship between LMX and JC (Figure 1). The analysis results obtained are shown in Table 5.

FİGURE 1. FULL STRUCTURAL MODEL WITH THE MEDIATOR
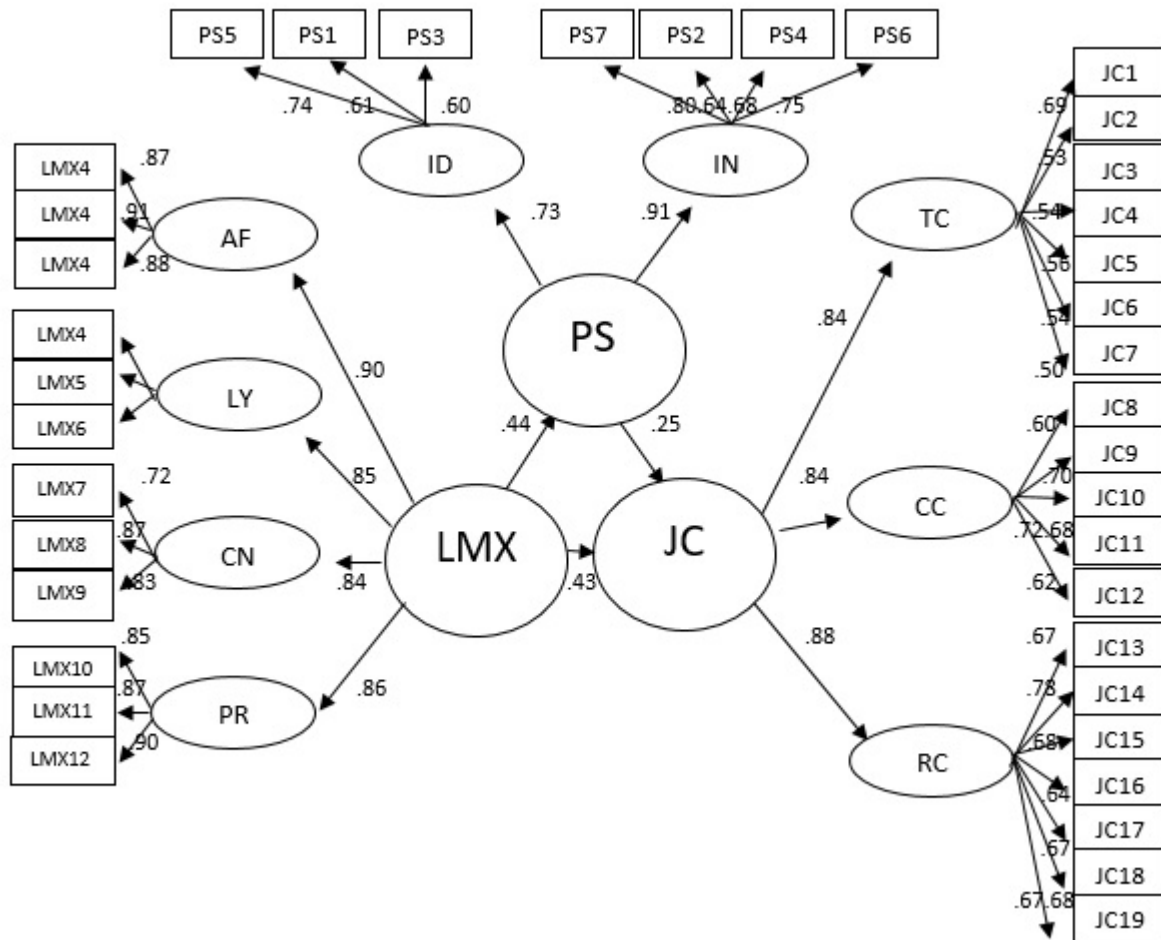
Note: LMX1-LMX12, twelve indicators of LMX; AF, affect; LY, loyalty; CN, contribution; PR, Professional Respect; LMX, Leader-member exchange; JC1-JC19, nineteen indicators of JC; TC, task crafting; CC, cognitive crafting; RC, relational crafting; JC, job crafting; PS1-PS7, seven indicators of PS; ID, Indulgence; IN, initiative; PS, psychological safety.

TABLE 5. THE EFFECT OF LMX ON JC THROUGH WITH MEDIATING EFFECT OF PS

		(β)	Std. Error	t	p	Result
LMX JC →		0.541	0.025	10.834	**	Accepted
LMX → PS → JC	Direct Effect	0.430	0.025	8.378	**	Accepted
	Indirect Effect	0.111	Confidence Interval (LB=0.059, UB=0.172)			Hypothesis 4 Supported
Goodness-of-fit						
CMIN/DF ≤5.00		3.286				
RMSEA (≤0.08)		0.054				
GFI (≥0.80)		0.858				
CFI (≥0.80)		0.898				
TLI (≥0.80)		0.890				
SRMR (≤0.08)		0.048				

Note: β = path coefficient; LMX, Leader-member exchange; JC, job crafting; PS, psychological safety; LB, Lower Bound; UB, Upper Bound. (** p < .05).

Before examining the mediating role in the created model, it was examined whether the independent variable had an effect on the dependent variable. When the effect of LMX on JC is examined, it is seen that it has a statistically significant and positive effect. While the effect of the independent variable on the dependent variable was significant, it was examined whether there was a mediator role in this effect. The fact that the values in the 95% confidence interval do not include "0" according to the results of the model shows that it has a mediator role in the model (LB=0.059, UB=0.172). In addition, goodness-of-fit is within the range accepted in the literature [23]. After deciding that there is a mediator role, it was examined whether the direct effect was significant in order to decide on the type of this mediator role. As a result, it was concluded that the direct effect was significant, but the value of the effect coefficient decreased (β=0.430, p<0.05) and it was decided that the mediator was a partial mediator.

DISCUSSION

This study examined the relationship between LMX and JC in nurses and the mediating role of PS in this relationship. Based on the study findings, nurses' JC levels also increase as LMX increases. Therefore, they exhibit more proactive behaviors and can make their work compatible with their interests and values. There are different studies in the literature examining the effect of LMX on JC. In research conducted by Lee [24] on shipbuilding company employees, for instance, it was found that LMX positively affects JC, and employees having a good relationship with their leaders perform more JC. Another study was conducted with private company employees' participation and found that LMX positively affects JC [25]. Also, in another study, the effect of LMX on teachers' JC was analyzed, and it was found to have a positive effect [26]. In a meta-analysis investigating the social factors affecting JC, it was found that LMX is an important factor and is strongly correlated with JC [27]. Along with this, the number of studies examining the effect of LMX on JC in the health field is quite limited. Demiray & Irge [28] found a significant positive relationship between LMX and JC in a study on healthcare professionals working in public hospitals. Pan et al. [29] emphasized that LMX has a significant effect on JC in their study on nurses. Based on this, these studies in the literature support our research findings.

The study's findings show a significant positive relationship between LMX and PS. This situation makes nurses confident they will not be ridiculed and punished even if their activities result in negative consequences. When the literature is examined, it is generally seen that PS mediates LMX. For example, the mediating role of PS in the relationship between LMX and information-concealing behavior in service sector employees was examined. A significant positive relationship was found between LMX and PS [30]. In another study, the mediating role of PS in the relationship between LMX and job commitment in the manufacturing sector was analyzed, and it was found that LMX had a significant effect on PS [31]. In the studies examining the mediating role of PS in the relationship between LMX and vocal behavior, it was stated that LMX is one of the main precursors of PS [32]. There are limited studies examining the relationship between LMX and PS in the health field. Khalil et al. [33] found a significant positive relationship between LMX and PS in research conducted on pharmacists during the COVID-19 period. These studies support our research findings.

In this study, a significant positive relationship was found between PS and JC. Therefore, nurses who feel psychologically comfortable and secure exhibit more proactive behaviors. It is possible for them to lead their work by taking actions that will make their work meaningful for them. When the literature is reviewed, there need to be more studies examining the relationship between PS and JC. For instance, in a study conducted on office workers, it was found that providing a psychologically safe environment encourages employees to exhibit proactive behaviors [34]. In a study including health sector employees in the sampling, it was found that PS is an important factor in promoting JC and is negatively related to crafting hindrance situations [35]. In a study conducted during the COVID-19 period, it was mentioned that JC is a useful practice to overcome the increasing uncertainties in extraordinary situations, and for this purpose, employees should feel psychologically safe [36]. These studies support our research findings.

Finally, the mediating role of PS in the relationship between LMX and JC was tested in this study. The findings show that PS mediates this relationship. To the best of our knowledge, this is the first study to consider the role of PS in the relationship between LMX and JC. The mediating role of PS in this relationship shows that PS is remarkable as an explanatory mechanism.

IMPLICATIONS OF THE STUDY

THEORY IMPLICATION

LMX is known to affect JC at various levels and in various ways. However, the number of studies examining the relationship between these two variables in the health field is quite limited. Therefore, this study on nurses contributes to expanding the literature on LMX and JC. Even if the effect of LMX on JC is known, this relationship needs to be further explained. It is known that the general environment and social conditions are effective factors in the relationship between the two variables. For this reason, the mediating role of the PS concept, which is effective in making employees feel safe and comfortable, was tested for the first time in this study. The indirect effect of LMX on JC through PS was positive and significant. Particularly in hospitals, a social environment where human relations are intensive, this result provides a different perspective on LMX and JC.

PRACTICAL IMPLICATION

Most healthcare workers face many negative situations, such as burnout, intention to leave the job, and low motivation. These negative situations occur mostly among nurses. This is because nurses have the largest proportion among healthcare workers and are the primary group responsible for healthcare services. These negative situations may affect not only the welfare of nurses but also the quality of health care provided [37]. Studies have shown that nurses work under physical, cognitive, and perceptual loads. Therefore, these problems in working conditions should be eliminated for the safety of both nurses and patients [38]. In addition, the health sector is a specialized field containing many uncertainties; anything can happen at any time and requires vital decisions to be made in the event of a crisis. The COVID-19 pandemic is one of the best examples of these difficult situations. Encountering many patients who died, caused a heavy mental destruction in the employees. In addition, workloads of all employees have increased and working conditions have become more difficult. This situation requires nurses to exhibit proactive behaviors. Therefore, providing an environment suitable for JC in hospitals can reduce the negative situations nurses face and enable them to exhibit proactive behaviors. Based on the study results, it is recommended that leaders/directors should provide a suitable environment for the realization of JC by exhibiting policies and behaviors enabling nurses to feel psychologically comfortable and safe.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

The findings obtained due to the cross-sectional design of the study reveal the situation in a certain period. Thus, testing this model with a longitudinal design will be beneficial in terms of supporting the research findings. This study was conducted on private hospitals. As a different perspective, the situation in public hospitals can also be presented. Even public and private hospitals are comparable. On the other hand, the sample of the current study included nurses. Examining other professional groups in future studies shall contribute to generalizing the results obtained for health professionals.

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RESEARCH ARTICLE

COUNSELING SKILL, KNOWLEDGE, AND SELF-CONFIDENCE OF ADOLESCENT HEALTH COUNSELORS WORKING IN WEST BENGAL, INDIA

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ABSTRACT

INTRODUCTION

The impact of counseling on adolescent health and well-being has been well documented. The task-shifting in India's Adolescent health program, from medical to non-medical cadres, necessitates understanding and capacity building of workers' knowledge and skills.

OBJECTIVE

To assess distribution and determinants of self-rated knowledge, skill and confidence of counseling among adolescent counselors and to explore the demand for learning new skills.

METHODS

This was an observational study of cross-sectional design on adolescent counselors working under the National adolescent health program. Participants completed a self-administered electronic survey form, where they self-rated their knowledge, counseling skill and confidence on a six-point Likert scale. Mean ratings were dichotomized into high (≥4) or low (<4). Nominal regression analysis was performed to identify predictors of high rating. Counselors were also asked to identify areas where they require additional training.

RESULTS

The mean age of counselors was 36.22 years (SD 6.08) and mean service duration was 7.37 years (SD 4.51); 80.2% had completed refresher training. Post-graduation level of education has been achieved by 87.2% of counselors and 86% gave high rating for all domains. High rating was associated with the participant's mother tongue, place of service and education level by univariate analysis but on nominal regression, it was associated with education level only. The need for additional training was expressed by 67.4% of participants, among which the most common was mental health.

CONCLUSION

The rating of knowledge, counseling skill and confidence was high. Recruiting qualified counselors and clearly defined procedures appears to help in smooth task shifting.

KEYWORDS

adolescent health, counselors, health promotion, mental health, national health program.

INTRODUCTION

India is home to 253 million adolescents, comprising more than 20% of the world's adolescent population. In 2014, The Ministry of Health and Family Welfare, Government of India, under the National Health Mission (NHM) launched the Rashtriya Kishor Swasthya Karyakram (RKSK), a comprehensive adolescent health program, to achieve better health outcomes for all adolescents. The key intervention under this program is to provide quality information and counseling opportunities through adolescent-friendly health clinics (AFHC). [1] The impact of counseling on adolescent health and wellbeing has been shown in several studies from India and outside India. [2, 3] In the RKSK program there is task shifting from medical to non-medical staff, so new opportunities and challenges have emerged. The World Health Organization (WHO) recommends task-shifting as a strategy to tide over the shortage of health manpower and rational redistribution of tasks among health workforce teams. [4] While counselors can make healthcare services for adolescents more accessible, the quality of service provided needs to be assured.

LITERATURE REVIEW

A literature review was conducted by searching PUBMED, DOAJ and Google Scholar. Search terms used were adolescent counselor, task shifting, counseling skill, adolescent health program and RKSK program. A study on pre-refresher training evaluation of knowledge among HIV lay counselors in Zambia, reported poor knowledge on standard precautions and post-exposure prophylaxis (PEP).[5] In Uganda, health-workers providing pediatric HIV counseling mentioned challenges of poor counseling skill and difficulty in coping with knowledge demand.[6] A rapid review of RKSK has pointed out a lack of system to measure quality and content of counseling.[7] Self-evaluation of knowledge and skills can help to identify training needs of counselors which may provide useful inputs to capacity building and designing more client-centered programs. This study was therefore planned with the following objectives to -

- assess self-rated knowledge, skill and confidence of counseling on issues included in RKSK modules among adolescent counselors
- explore demographic, academic and service-related determinants for higher self- rating
- find out the training demand for new skills

METHODS

This is an observational study of cross-sectional design that adhered to the STROBE guidelines. RKSK counselors working in the state of West Bengal, India and who had completed induction training were eligible to participate. Data collection was by self-administered online survey forms between October to November 2021.

The study protocol was approved by the institutional ethics committee of the Medical College Kolkata with ref no.MC/KOL/IEC/NON-SPON/1202/10/21. Informed consent to participate was provided by all participants. The survey form auto-generated the raw data sheet which did not include any personal identifier.

RKSK PROGRAM AND TRAINING

Adolescent counselors were posted at the AFHCs and were trained to deliver services as per RKSK modules, which include - nutrition, sexual and reproductive health, addiction and substance misuse, violence and injury including gender-based violence, non-communicable diseases (NCD) prevention and mental health. Counselors initially received a six-day induction training which has been followed up with refresher training after a gap of at-least two years. The content, duration and methodology of both training were same. Training sessions were participatory. Pre- and post-training knowledge improvement was checked by a standard questionnaire which was included with the facilitator's module.

STUDY DESIGN

By checking training schedules, it was found that there were 440 trained counselors. The study target was to recruit 20% of the counselors or around 90 participants. Considering generally high non-response rates for online surveys, participant recruitment target was kept at 30% or higher. [8] Participants were recruited by stratified sampling, where strata were the post-test training scores. Eligible counselors were categorized into tertiles according to their post-test score of last training. From each of highest, middle and lowest tertiles 40 counselors were randomly invited to participate in this study. All the invitees were sent a link to the survey form at their mail ids. The survey form was developed from training elements of the RKSK module and content was validated by three experts in public health and sociology.

Variables included for data collection were demographic variables like age, sex, education and mother tongue;

service-related variables like duration of service, level of institution and area of service; and finally the primary outcome of interest was self-rating of knowledge, skill and confidence of counseling. Rating was done on a six-point Likert scale, one being poorest and six being best. Participants were also asked to identify adolescent health issues on which they need more training.

STATISTICS

Statistical Package for Social Sciences (SPSS) IBM Corp. Released 2010 (IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp. United States of America) was used for statistical analyses. Distribution of variables is shown by frequencies, percentages for categorical and mean (SD) for continuous data. Mean rating for knowledge, skill and confidence was separately calculated. Participants, whose mean rating was ≥4 for all three domains, were considered to have high self-rating. The alternate category was low self-rating. Nominal regression analysis was done to predict factors for differential self-rating.

RESULTS

Results were analyzed for 86 completed questionnaires (response rate 71.6%). The mean age of counselors was 36.22 years (SD 6.08) and mean service duration was 7.37 years (SD 4.51). The majority of the respondents (60.5%) were above or equal to thirty-five years of age and female (80.2%). More than half of the respondents (55.8%) had service experience of more than and equal to five years and received both induction and refresher training (80.2%). Most counselors (84.9%) worked in rural areas; hence, most had no experience working in a tertiary care setup. Most of them acquired post-graduation qualifications in humanities. (Table 1)

Knowledge and counseling skills were assessed based on the different areas of their training module. Table 2 describes the mean and standard deviation of self-rated knowledge and counseling skill of RKSK counselors on adolescent health issues. Though in almost all the domains they had higher knowledge and skill (>=4), the highest knowledge and skill was acquired in menstrual hygiene followed by Body Mass Index (BMI) calculation and the lowest knowledge was in internet use and cyber safety related issues (<4) as per the working definition of the study.

In all the domains their confidence in handling the clients was high as per the study definition. (Table. 3) Participants expressed that they felt maximum confidence in maintaining privacy and confidentiality (mean score 5.19 and SD 1.17), which is crucial for handling delicate clients like adolescents. Whereas their confidence was minimum in handling clients of third gender (mean score 4.05 and SD 1.31). A high rating in all three domains, namely knowledge, counseling skill and confidence was given by 74 (86%) respondents.

Finally, the predictors of high rating among the counselors by nominal regression analysis were assessed. Participant's mother tongue, service area, as well as education level, were associated with the rating pattern. Education level alone came as the strongest predictor during multiple regression analysis. (Table 4).

Additional training need was expressed by 58 out of 86 (67.4%) of participants. The major requirements of training were mental health (40.7%), cyber-security and internet usage (29.1%), life skills (18.6%), addiction (16.3%), sexuality and gender roles (11.6%), injury and violence (10.5%) and learning problems (9.3%)

TABLE 1. DISTRIBUTION OF COUNSELORS ACCORDING TO THEIR DEMOGRAPHIC, ACADEMIC AND SERVICE-RELATED PROFILES (N=86)

Variables	Frequency (%)
Age	
<35years	34(39.5)
≥ 35 years	52(60.5)
Sex	
Male	17 (19.8)
Female	69 (80.2)
Mother tongue	
Bengali	83 (96.5)
Others	3 (3.5)

Duration of service	
<5years	38 (44.2)
≥ 5 years	48 (55.8)
Training received	
Induction	17 (19.8)
Refresher	69 (80.2)
Service area	
Rural	73 (84.9)
Urban	8 (9.3)
Both	5 (5.8)
Whether working at tertiary level	
Yes	20 (23.3)
No	66 (76.7)
Education level	
Graduation	11 (12.8)
Post-graduation	75 (87.2)
Branch of study	
Science	11 (12.8)
Humanities	75 (87.0)

TABLE 2. MEAN SELF-RATED KNOWLEDGE AND COUNSELLING SKILL OF ADOLESCENT HEALTH COUNSELORS ON ADOLESCENT HEALTH ISSUES (N=86)

Items	Knowledge mean (SD)	Counselling Skill mean (SD)
Adolescent growth & puberty	4.90 (1.05)	4.92(1.04)
Menstrual hygiene	5.21 (1.04)	5.22(1.03)
Contraceptive choice	4.86 (1.13)	4.88(1.10)
Adolescent pregnancy	4.83 (1.17)	4.94 (1.09)
Safe abortion	4.34 (1.00)	4.44 (1.02)
Prevention of RTI/STI	4.86 (1.15)	4.93 (1.18)
NCD risk factors	4.71 (1.23)	4.72 (1.24)
BMI calculation	5.16 (1.09)	5.10 (1.09)
Balanced diet	4.94 (1.10)	4.84 (1.16)
Harmful use of substances	4.90 (1.12)	4.79 (1.07)
Violence and injury	4.47 (1.03)	4.28 (0.98)
Gender roles	4.63 (1.13)	4.56 (1.21)
Internet use & Cyber safety	3.86 (1.05)	3.83 (1.15)
Mental health issues	4.38 (1.09)	4.22(0.99)
Severity categorization of mental health problems	4.15 (1.08)	4.12 (1.02)
Health promotion	4.36 (1.03)	4.35 (1.00)

Counseling Skill, Knowledge, And Self-Confidence of Adolescent Health Counselors Working In West Bengal, India   **4**

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TABLE 3. MEAN SELF-RATING OF COUNSELING CONFIDENCE OF ADOLESCENT HEALTH COUNSELORS (N=86)

Confidence in conducting counseling sessions in given situations	Mean (SD)
Clients of the opposite gender	4.70 (1.21)
Clients of the third gender	4.05 (1.31)
Counseling parents	4.50 (1.24)
Discussing sensitive issues in school-based counseling	4.92 (1.14)
Maintaining privacy and confidentiality	5.19 (1.17)
Overcoming language barrier	4.73 (1.13)
Retaining clients	4.64 (1.05)

TABLE 4. PREDICTORS OF HIGH RATING AMONG THE COUNSELORS BY NOMINAL REGRESSION ANALYSIS (N=86)

Variable	Percentage of high rating	Likelihood ratio test		Exp (B)	Sig
		Chi-square	Sig		
Age					
<35years	94	0.25	0.62	0.60	0.62
≥ 35 years#	81				
Sex					
Female	86	1.06	0.30	0.32	0.29
Male #	88				
Mother tongue					
Bengali	86	5.54	0.02*	2.936E8	--
Others#	100				
Duration of service					
<5years	92	3.60	0.06	0.10	0.09
≥ 5 years#	81				
Training received					
Induction	82	1.49	0.22	3.09	0.21
Refresher#	87				
Service area					
Both	100	14.19	0.001†	2.66E-17	0.99
Rural	86			2.721E-9	0.99
Urban#	75				
Whether working at tertiary level					
No	83	12.87	<0.001†	3.827E8	0.99
Yes#	95				
Education level					
Graduation	81	5.74	0.02*	52.80	0.04*
Post-graduation#	87				
Branch of study					
Humanities	84	3.36	0.07	1.246E7	0.99
Science	100				

Reference category; *p<0.05, † p<0.01

DISCUSSION

As opposed to community or school-based projects for adolescent health promotion, RKSK is a country wide national program with much larger coverage and impact. Rewarding cost effectiveness is expected with investment in adolescent health.[9] This study is probably the first to explore the perception of prime driver to adolescent health care delivery in India-RKSK counselors. Since its inception seven years ago, RKSK program is still in a stage of evolution. An intervention study conducted on adolescent health services in six states of India, reported availability of trained counselors in only 27% of adolescent friendly health clinics at baseline which improved to 54% post intervention. [10] After an extensive literature search in PubMed, Embase, DOAJ and Google Scholar using an advanced search strategy, no yield was obtained which specifically assessed counseling skill and knowledge of adolescent counselors. The mean age and service duration of present study participants agreed with a study done on Ugandan HIV providers. [11] Mean age also agreed with a study on adolescent HIV providers of Kenya, however participants of our study had higher education levels and service experience as only 27.5% of respondents in the Kenyan study started a degree program and had median service experience of four years. [12] In the Kenyan study the median competence score was high, and it was statistically significant for training and years of experience in adolescent HIV care. Our study too reported high rating but it did not vary with type of training or years of service experience and education level emerged as the most important predictor in our study. Differences in results can be accounted by higher education level and homogenous group of counselors against a heterogeneous group of health workers in the Kenyan study. [12] In the Ugandan study perceived self-efficacy was high (mean 7.6 on a ten-point response scale), which compares favorably with current study. In both studies higher self-confidence rating was for items that had clearly defined procedures like maintaining confidentiality in current study and counseling people living with HIV (PLHIV) to start ART early, in the comparator study. [11] Almost two-third of respondents in the present study expressed need for further training which compares well with the Kenyan study where 55% respondents who had training in adolescent HIV care expressed need for refresher training. [12] Higher training need was reported for relatively poorly rated skills like mental health and cyber safety. It is estimated that 10% of children and young people suffer from mental health problems. [13] Cyber victimization is a new phenomenon without any agreed upon definition. However, studies around the world report high prevalence of this emerging phenomenon and its association with adverse mental health outcome among adolescents. [14-16] Relatively poor knowledge and skill of counselors to address this issue is of concern.

LIMITATIONS

This study adds new information which can be successfully used in planning adolescent health care; however, some limitations of this study are high non-response and unknown self-selection pattern of online responses, reliance on self-reported data and newly developed measures.

CONCLUSION

From the study results it can be concluded, qualified counselors will help in smooth task shifting, while clearly defined procedures may improve counseling quality. It is both reassuring and of concern that most counselors identified specific areas for further training, especially in adolescent mental health issues and cyber safety which are critical areas gaining momentum in the lives of present-day adolescents.

Given the future impact of adolescent health counseling, it is recommended that counselors with post-graduate qualifications are to be recruited. Along with present induction and refresher training, focused training is required on mental health and cyber-safety issues.

SIGNIFICANCE OF THE STUDY

This is possibly the only study conducted in India to understand the capacity and training needs of adolescent counselors. Findings of this study will likely improve the reach and depth of RKSK program and in turn the nation's health.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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THE ANALYSIS OF MATERNAL CHARACTERISTICS AND REGULATION OF ANTENATAL CARE ON PREGNANCY RISK STATUS BASED ON THE INDEPENDENT FAMILY HEALTH EVALUATION

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ABSTRACT

BACKGROUND:

High-risk pregnancy is a serious problem and needs to be detected early. Pregnant women with risk categories have a direct impact on the fetus. This study aimed to analyze maternal characteristics and the consistency of antenatal care visits in relation to the pregnancy risk status of pregnant women using the Independent Family Health Evaluation (IFHE)

METHODS:

This study used a cross-sectional study with a correlational design. The sample was the third-trimester pregnant women who have a maternal and child health record booklet, with a total sample of 128 respondents in Indonesia. The instrument used was a questionnaire adopted from the identification of family health in the IFHE application system. Data analysis was carried out using multiple logistics regression.

RESULTS:

The results showed that age (p = 0.004), height (p = 0.027), number of pregnancies (p = 0.0001), history of pregnancy (p = 0.0001), history of childbirth (p = 0.001), having children under 2 years of age (p = 0.001), pregnancy complications (p = 0.0001), and history of regular antenatal care (p = 0.0001) had a significant effect on pregnancy risk status. While history of tetanus toxoid immunization showed no relationship with pregnancy risk (p = 0.332). The final modelling of multiple logistic regression showed that the influential variables were age, the number of pregnancies and consistency of antenatal care. The number of pregnancies was the variable that had the strongest influence on pregnancy risk status (OR= 40.192).

CONCLUSION:

This research contributes valuable insights into the factors influencing pregnancy risk, providing a foundation for more effective antenatal care and ultimately better health for expectant mothers and their infants. Healthcare providers can use this information to identify pregnant women at higher risk and implement targeted interventions, thereby improving maternal and fetal outcomes.

KEYWORDS

antenatal care, family, maternal characteristics, risk pregnancy

INTRODUCTION

Pregnancy is a physiological condition in accordance with the stages of individual development. During pregnancy, pregnant women need the support from their partner, family, and health workers [1]. The condition of the pregnant woman can be physiological or pathological. Pregnancy with complications, of course, requires more serious attention [2]. Various efforts have been made to prevent pregnancy complications, including identifying the risks of pregnancies by recognizing and identifying the risk factors existing in pregnant women [3]. Pregnancy screening in recognizing risk factors should be carried out during antenatal care (ANC). Therefore, routine ANC is crucial to identify the condition of the mother and the fetus [4].

Maternal characteristics are one of the factors related to maternal health during the perinatal period and pregnancy [5]. This maternal characteristic is crucial as it can provide an overview of possible risk factors and help to analyze whether this pregnant woman is included in the safe, low, moderate or high-risk pregnancy [6]. Based on that category, health workers and the pregnant woman's family worked together to reduce the existing risk factors. In addition, preventive efforts were carried out to reduce morbidity and mortality in mothers and babies [7].

The Maternal Mortality Rate (MMR) is one of the global Sustainable Development Goals (SDGs) targets to reduce the MMR to 70 per 100,000 live births by 2030 [8]. The maternal mortality rate is one indicator of the success of maternal health efforts. MMR is the ratio of maternal deaths during pregnancy, childbirth and the puerperium caused by pregnancy, childbirth and the postpartum period or its management but not due to other causes such as accidents or incidents in every 100,000 live births [9]. In addition to assessing maternal health programs, this indicator can also assess the rank of public health due to its sensitivity to improve health services quality in terms of accessibility and quality [10]. Based on 2018-2019 provincial report data, the number of maternal deaths in Indonesia has decreased from 4,226 to 4,221. In 2019, the most common causes of maternal death were bleeding (1,280 cases), hypertension (1,066 cases), and infection (207 cases) [11].

The MMR per Regency/City in East Java in 2019 is as follows: the highest MMR in 2019 was in Situbondo, which was 198 per 100,000 live births. Jember was in fourth place, with 133 MMR per 100,000 live births. The proportion of infant mortality is still large (3/4) occurring in the neonatal period (0 – 28 days), which happens every year from 2015 to 2019. Therefore, there is a tendency for a stagnant Infant Mortality Rate. In 2019, the Infant Mortality Rate in Indonesia was estimated at 23 per 1,000 live births, based on data from the Central Statistics Agency. Moreover, as of 2019, East Java's Infant Mortality Rate was already below the national target [12].

It is crucial to know the maternal characteristics of pregnant women so that the risk of pregnancy can be detected early [13]. This is also an important factor for health workers to determine preventive measures in reducing pregnancy risk, which can impact the mother's and her fetus's health [14]. Independent Family Health Evaluation (IFHE) is a media where the family is expected to check the pregnant woman's health status independently. Using an online-based family health identification formula, the maternal characteristics of pregnant women can be identified. Several literatures confirmed that multi factors influence the health status of pregnant women. Despite efforts to reduce maternal mortality and improve maternal and child health, there remains a need to examine the role of maternal characteristics and ANC regularity in the context of pregnancy risk assessment, specifically utilizing IFHE. This study seeks to address this research gap by investigating these interconnections and their implications for maternal and fetal health. Thus, this study aimed to analyze the relationship between maternal characteristics and ANC regularity with pregnancy risk status based on IFHE.

METHODS

This study used a cross-sectional quantitative study with a correlational design. The population 188 pregnant women with criteria was the third-trimester pregnant women in Jember Regency, Indonesia, who had a maternal and child health record booklet, taken from January-September 2021. In our study, we used the Slovin formula to determine the sample size, obtained 128 samples. Given the constraints in resources and time, the Slovin formula provided a practical method for estimating an appropriate sample size from the population of third-trimester pregnant women in Jember Regency, Indonesia. Simple random sampling technique was used, with maternal characteristics including age, height, number of

pregnancies, history of pregnancy, history of childbirth, having children under two years of age, history of tetanus toxoid (TT) immunization, pregnancy complications, and regularity of ANC as the independent variables.

"Pregnancy Complications" in this study refer to medical conditions or issues that occur during pregnancy, potentially posing risks to the mother or fetus. Pregnant women are categorized as "Yes" if they experience these complications, and "No" if they do not encounter any of these issues [15], [16]. "Regular Antenatal Care" in this context signifies pregnant women attending scheduled medical check-ups consistently and as per healthcare provider recommendations, typically in alignment with WHO's suggestion of at least four ANC visits during pregnancy. Conversely, "Irregular Antenatal Care" denotes infrequent or inconsistent attendance at these appointments [17]. "Healthy Pregnancy Risk Status" is a comprehensive assessment of a pregnant woman's overall health during her pregnancy journey. The classification of a pregnancy as "Non-Risk" or "Risk" depends on a combination of factors and is determined by healthcare providers. Healthcare providers use their expertise and these criteria to assess and classify the risk status of each pregnancy [18].

The dependent variable was pregnancy risk status. To assess these variables, the researchers employed a questionnaire adapted from the IFHE application system. The IFHE application system was originally developed to enhance the health status of the community in Tutul Village. It serves as a comprehensive tool for collecting family health data, including information on pregnant women, which is reported continuously. Besides its capacity to identify pregnant women's health status, the IFHE system offers additional features, such as a health discussion forum. To ensure its suitability for the specific study context, a pilot testing process was conducted.

The study was conducted in Tutul Village, Jember, East Java in April-September 2021. Prior to data collection, ethical approval was obtained from the Faculty of Health Science, Universitas Muhammadiyah Jember (Reference number: 057/KEPK/FIKES/IV/2021). The data collection process adhered to ethical guidelines, ensuring the privacy and rights of the participants. Participants were provided

with clear and understandable information about the research, their rights, and the voluntary nature of their participation. Participants who agreed to participate provided written informed consent. After obtaining informed consent, participants completed the questionnaire, which was adapted from the Independent Family Health Evaluation (IFHE) application system. This questionnaire included questions related to maternal characteristics, ANC, and pregnancy risk status. The collected data were kept confidential, with personal identifiers removed to ensure anonymity.

Data analysis included univariate, bivariate and multivariate. Univariate analysis using frequency distribution. Bivariate analysis used the "Enter" method in logistic regression for age, the number of pregnancies, history of childbirth, number of children, administration of TT immunization, complications of pregnancy with health status. While history of pregnancy with health status using Chi Square. Variables height, history of ANC using Fisher Exact Test. Multivariate analysis using Multiple Regression Logistic, with an alpha value of 5% (0.05).

RESULTS

Based on a sample of 128 pregnant women, the following describes the research results obtained. From table 1, the majority of respondents were 20-35 years old (109 people or 85.2%), the majority of respondents' height was more than 145 cm (121 people or 94.5%), and the highest number of respondents' pregnancies was a second pregnancy (61 people or 47.7%). The majority of respondents' pregnancy history was normal (98 people or 76.6%), and most of their birth history was also normal (105 people or 82%). The majority of pregnant women did not have children aged under two years of age (107 people or 83.6%), the majority of the history of tetanus toxoid immunization was taken twice with a total of 103 people or 80.5%, and during this pregnancy, most of the respondents (97 people or 75.8%) did not have any complications. Most respondents have a history of regular antenatal care (108 people or 84.4%). The table above shows that the health status of pregnant women (80 people or 62.5%) in Tutul Village is mostly not at risk.

TABLE 1: MATERNAL CHARACTERISTICS AND RELATIONSHIP BETWEEN REGULARITY OF ANTENATAL CARE AND PREGNANCY RISK STATUS (N=128)

| Variables | Pregnancy Risk Status | | | | | | p-value |
| | No-risk pregnancy | | Risky Pregnancy | | Total | | |
	n	%	n	%	n	%	
Age							0.004*
20-35 years old	74	67.9	35	32.1	109	100	
< 20 or > 35 years old	6	31.6	13	68.4	19	100	
Height							0.027***
≤ 145 cm	79	65.3	42	34.7	121	100	
>145 cm	1	14.3	6	85.7	7	100	
Number of Pregnancy							0.0001*
First	53	100	0	0	53	100	
Second	23	37.7	38	62.3	61	100	
Third or more	4	28.6	10	71.4	14	100	
History of Pregnancy							0.0001**
Normal	73	74.5	25	25.5	98	100	
Abnormal (pathological)	7	23.3	23	76.7	30	100	
History of Childbirth							0.0001*
Normal	76	72,4	29	27.6	105	100	
Abnormal (pathological)	4	17.4	19	82.6	23	100	
Having Children < 2 Years Old							0.001*
No	74	69.2	33	30.8	107	100	
Yes	6	28.6	15	71.4	21	100	
Tetanus Toxoid Immunization History							0.332*
Never	66	64.1	37	35.9	103	100	
Once	13	59.1	9	40.9	22	100	
Twice	1	33.3	2	66.7	3	100	
Pregnancy Complications							0.0001*
No	73	75.3	24	24.7	97	100	
Yes	7	22.6	24	77.4	31	100	
The Regularity of ANC							0.0001***
Regular	78	72,2	30	27,8	108	100	
Irregular	2	10	18	90	20	100	

Note:

*The statistical test used Logistic Regression;** The statistical test used Chi Square;*** The statistical test used Fisher Exact; Significant level set 0.05

Table 1 also showed the relationship between maternal characteristics: age, height, number of pregnancies, history of pregnancy, history of childbirth, regularity of antenatal care, having children under two years old, and pregnancy complications have a significant relationship with the health status of pregnant women based on IFHE, with p < 0.05. So, it can be said that maternal characteristics: age, height, number of pregnancies, history of pregnancy, history of childbirth, having children under two years of age and pregnancy complications are associated with the risk of pregnancy. There was no relationship between maternal characteristics of a history of tetanus toxoid immunization with the risk of pregnancy (p=0.136). However, based on table 2, it can be said that there is a significant relationship between the regularity of antenatal care and the risk of pregnancy (p = 0.0001).

IDENTIFICATION OF SIGNIFICANT VARIABLES RELATED TO PREGNANCY RISK STATUS

To identify the variables significantly related to pregnancy risk status, a stepwise multiple logistic regression analysis was conducted. This process involved systematically removing non-significant variables to arrive at a final model. The final model, presented in Table 2, reveals the variables that exhibited significant associations with pregnancy risk status, along with their coefficients, p-values, and odds ratios.

TABLE 2: FINAL MODELING OF MULTIPLE LOGISTIC REGRESSION MATERNAL CHARACTERISTICS AND REGULARITY OF ANTENATAL CARE ON PREGNANCY RISK STATUS (N=128)

Model Variables	Unstandardized Coefficient		Wald	Sig.	Exp (B)	CI 95%
	B	S.E				
Age	2.380	1.041	5.229	0.022	0.093	0.012-0.712
Number of Pregnancy	3.694	0.799	21.394	0.0001	40.192	8.402-192.257
Regularity of ANC	3.309	1.040	10.120	0.001	27.359	3.562-210.154
Constant	8.364	1.771	22.297	0.000	0.000	

Table 2 have shown the variables that were significantly related to the risk of pregnancy: the age of the pregnant women (p= 0.022), number of pregnancy (p= 0.0001) and the regularity of Antenatal Care (p= 0.001). The results of the analysis showed that the Odds Ratio of the variable number of pregnancies was 40.192, meaning that pregnant women with an increasing number of pregnancy (multigravida and grand multigravida) had a risk of 40.192 times to experience the risk of pregnancy compared to mothers in their first pregnancy (primigravida). Therefore, it leads to the conclusion that the variable number of pregnancies was the variable that had the greatest influence on the risk of pregnancy. Variables that did not demonstrate significant associations with pregnancy risk status in the multivariate analysis were excluded from the final model. These non-significant variables included height, history of pregnancy, history of childbirth, complications of pregnancy, complications of childbirth, and having children under 2 years old were confounding variables. While these variables were considered, they did not contribute significantly to the prediction of pregnancy risk in this study. they did not independently contribute to explaining pregnancy risk status but had the potential to introduce bias or distortion in the interpretation of the significant variables.

Furthermore, variables not included in the final modeling in the multivariate test, namely height, history of pregnancy, history of childbirth, complication of pregnancy, complications of childbirth and having children < 2 years old were confounding variables.

DISCUSSION

Pregnancy is a crucial period for families, especially if the presence of children is a long-awaited hope. During pregnancy, various conditions are very likely to occur. Therefore, optimal support for the pregnant woman, both physically and emotionally, is needed. The lower family socioeconomic status is associated with a higher risk of depression in pregnant women [19]. On the other hand, pregnant women who receive informational, instrumental, and emotional support have a positive attitude towards pregnancy [20]. Families need consistent health information from health workers to support pregnancy conditions [21]. There are significant things about fathers' involvement in supporting pregnant women from pregnancy to delivery [22].

During pregnancy, it is essential to identify the well-being of the mother and the fetus through antenatal care examinations [23]. Health workers may support antenatal care and increase competence by providing antenatal care services through training and improving the support system [24]. Barriers to using ANC services are not solely rooted in individuals but are multifactorial: barriers related to health care providers, culture and religion. Therefore, a multisectoral approach to increase the utilization of regular antenatal care services is highly recommended [25]. Pregnancy complications, the education status of the parents-to-be, the family residence, economic status, and media exposure related to the use of antenatal care. During the antenatal care examination, health workers also

educate pregnant women about the perinatal period: pregnancy, delivery and postpartum [26]. Birth preparation classes are also enacted to improve antenatal and postnatal services, adherence to micronutrient supplementation, and awareness of risks in pregnancy [27]. Training for health workers, strengthening counselling, and increasing women's economic empowerment to increase the use of quality antenatal services are highly recommended. Based on antenatal care activities, health workers also conduct assessments based on anamnesis, physical examination, and diagnostic examinations. Through the results of this study, it will also be possible to identify the risk factors in pregnancy.

Maternal characteristics are the characteristics of factors related to maternal health during pregnancy. Several maternal characteristics identified during antenatal care examinations include age, height, number of pregnancies, pregnancy history, delivery history, antenatal care compliance, history of tetanus toxoid immunization, and current pregnancy conditions or pregnancy complications. Maternal age is associated with a high risk of pregnancy. Based on several related studies, it was found that women under 20 or over 35 years old had a higher risk of pregnancy as the reproductive system of women under 20 is not yet optimal, while those over 35 will begin to experience a decreasing reproductive function. This study's results indicate that most pregnant women (85.2% of them) are between 20-35 years old. According to [28], women under 20 and over 35 have a higher risk of pregnancy and delivery.

In addition, height is also one of the crucial factors since it is directly related to the mother's pelvic area as one of the factors for normal vaginal delivery. This study's results indicated that most pregnant women's height is more than 145 cm (94.5%). This indicates that the height is considered normal. Lower risk of cesarean section in women of higher height [29]. However, this effect persisted due to other risk factors for a caesarean section, such as maternal age, BMI, gestational age, parity, and birth weight. BMI and maternal age are the risk factors in clinical assessment related to delivery. In addition, height is a positive indicator of successful vaginal delivery and increases pregnant women's confidence in a normal delivery, with a possible positive impact on reducing caesarean section rates.

The number of pregnancies was also closely related to the risk status of pregnancy. Number of pregnancy (multigravida and grand multigravida) had a risk of 40.192

times to experience the risk of pregnancy compared to mothers in their first pregnancy (primigravida). The number of births affects the stress level of pregnant woman, especially number of live children [30]. The more often mothers give birth, the health status of pregnant women will be more at risk [31], [32]. Grand multiparity, which is defined as having given birth five or more times, is associated with an increased prevalence of maternal and neonatal complications. Some of the complications associated with grand multiparity include abnormal placentation, abruption placenta, gestational diabetes, anemia, placenta previa, malpresentation, low birth weight, and macrosomia [32], [33]. However, it is important to note that some studies have associated high parity with an elevated risk to the pregnancy without adjusting for age in the analysis [34]. Therefore, maternal age must be examined as a confounder while interpreting the risk of maternal and neonatal complications in multiparous women.

Other maternal characteristics that are also important are pregnancy history, delivery history and current pregnancy conditions. This history provides an overview of the risk for complications so that it might become preventive efforts against the pregnancy risk for the mother and the fetus. The results showed that most pregnant women had a history of normal pregnancy (76.6%) and normal delivery (82%). Complications in pregnancy are a risk for both the mother and the fetus. For example, pregnant women with complications of pulmonary tuberculosis increase the risks of both mother and fetus to perinatal death, premature birth, and low birth weight babies [35]. Therefore, detecting and managing antenatal risk factors is critical for quality care [36]. Most of the pregnant women (96%) feel that they should be asked and informed about risk factors at least once (i.e. at the first visit), and screening for asymptomatic antenatal bacteriuria and treatment in the detected group resulted in a reduction in prematurity and low birth weight [37].

Pregnancy complications are factors that also contribute to pregnancy risk status. Pregnant women who have pregnancy complications have a higher risk compared to pregnant women who do not have pregnancy complications [38]. Pregnancy complications will pose health risks to pregnant women and baby. Healthy pregnant women have a healthy body, so that it has an impact on the health status of the mother and baby.

As for compliance with antenatal care in pregnant women, 84.4% of the research subjects regularly performed

the ANC. ANC allows pregnant women to undergo prenatal care to identify the well-being of the mother and fetus. Regular antenatal care will make it easier for health workers to detect the risk factors early. Various factors cause pregnant women to undergo antenatal care regularly/irregularly. The acceptance of pregnancy, education, parity and barriers during contact with health workers are related to the first antenatal care visit [1]. Pregnant women's capacity to utilize antenatal care varies significantly based on their socioeconomic status, level of autonomy and partner support [39]. In addition, health care providers should develop strong relationships with patients through attitudes, behaviours, and fair treatment.

The history of tetanus toxoid immunization is also important to identify. Tetanus toxoid immunization is a preventive measure for the incidence of neonatal tetanus. Considering the importance of immunization and the positive impact on pregnant women who have done a complete tetanus toxoid immunization (which is twice), the data on maternal characteristics is essential to fulfilling the immunization coverage. Previous research implied that tetanus-diphtheria toxoid and acellular pertussis (Tdap) vaccination during pregnancy can reduce the incidence of ARI in infants until the first two months of their life [40]. The response of the vaccine tetanus-diphtheria toxoid antigen and Tdap is strong [41]. immunization against tetanus-diphtheria toxoid and Tdap in the third trimester of pregnant women results in high levels of infant antibodies [42]. Immunization is the best strategy for increasing maternal and infant antibodies. Therefore, tetanus toxoid vaccination is essential, although almost half of postpartum mothers are not vaccinated against tetanus during pregnancy. The authorities still face challenges in expanding vaccine coverage and strengthening the national immunization program to help increase tetanus vaccination rates in pregnant women [43]. The previous study showed that vaccines recommended during pregnancy are influenza, pertussis, COVID-19, tetanus toxoid, and meningococcal [44].

After identifying the data using the IFHE application system on the independent variable of maternal characteristics and the dependent variable of pregnancy risk status, it was found that most of the pregnancy risk showed no risk (62.5%), and the rest showed risk (37.5%). Through the identification of data on the health status of pregnant women, preventive measures can be carried out to reduce or prevent further risks. The final result is expected to reduce the risk in pregnancy to prevent the incidence of illness and

death of the mother and the fetus. Lower blood pressure achieved during pregnancy in pregnant women with chronic non-severe hypertension could improve fetal/neonatal and maternal outcomes compared to mothers with higher blood pressure [45]. In addition, pregnancy is one of the important stages for women [46]. Since some complications arise during pregnancy, it can pose a high risk to both the mother and the fetus. One of them is the incidence of hypertension associated with pregnancy which causes an increase in maternal and fetal mortality during pregnancy and childbirth.

Based on the screening for risk factors in pregnancy, these maternal characteristics have the possibility of determining whether pregnant women have a risk of pregnancy or not. As for maternal characteristics: a history of tetanus toxoid immunization did not have a significant relationship with pregnancy risk status. The administration of tetanus toxoid immunization may prevent the occurrence of neonatal tetanus at the time of delivery so that the immune factor formed will enter the uteroplacental circulation to the fetus so that the fetus is expected to have immunity against tetanus. The results of multivariate data analysis showed that three variables significantly affected pregnancy risk status: age, number of pregnancies and antenatal care regularity. The number of pregnancies is the variable that has the most dominant influence on pregnancy risk status. Based on previous research, parity status is related to the final pregnancy outcome, but it is not only because of parity status [47]. If the primigravida mother is over 35 years of age, this also becomes a risk in the outcome of pregnancy. In an independent relationship between nullipara and spontaneous preterm birth at <37, <32 and <28 weeks, the increased risk of spontaneous preterm birth in women who were pregnant with their fifth pregnancy was higher than in those who were pregnant for the first time [48]. The number of pregnancies impacts the risk of pregnancy that needs to be considered.

These findings carry significant practical implications. Healthcare providers should tailor their care to the specific needs of pregnant women based on their maternal characteristics. For instance, younger or older pregnant women may require more focused attention and monitoring. Additionally, healthcare systems should prioritize accessibility and affordability, addressing the barriers that pregnant women may face in accessing antenatal care. Policymakers can use these insights to inform healthcare policies and allocate resources effectively. By understanding the relationship between

maternal characteristics and pregnancy risk, policymakers can develop targeted interventions to reduce maternal and fetal risks. These interventions may include improved education programs, support systems for pregnant women, and initiatives to increase immunization coverage.

The study has several limitations that need to be acknowledged, including the relatively small sample size. The small sample size may have contributed to the limited number of variables that emerged as statistically significant in the regression analysis, potentially overlooking the significance of other variables, such as the history of pregnancy, history of childbirth, and pregnancy complications. Therefore, these findings should be interpreted with caution, recognizing the constraints imposed by the sample size. Future research with larger and more diverse samples is warranted to further explore the relationships between maternal characteristics and pregnancy risk comprehensively.

CONCLUSION

Our study highlights maternal characteristics such as age, height, number of pregnancies, pregnancy history, childbirth history, having young children, and pregnancy complications as factors influencing pregnancy risk. Antenatal care regularity is also a significant determinant of pregnancy risk, with the number of pregnancies having the greatest impact. Maternal age and antenatal care regularity play crucial roles in assessing pregnancy risk. These findings offer valuable insights for healthcare providers and policymakers. Tailored antenatal care and targeted interventions can address specific risk factors, ultimately improving maternal and fetal health outcomes. Future research should delve into the mechanisms of these characteristics and assess the long-term consequences, while evaluating interventions to mitigate risks. Understanding these maternal factors empowers us to enhance the well-being of pregnant women and promote healthier outcomes for both mothers and infants.

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RESEARCH ARTICLE

THE EFFECT OF PSYCHOLOGICAL EMPOWERMENT ON JOB SATISFACTION: REGULATORY ROLE OF GENERATIONS X AND Y

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ABSTRACT

The objective of this study is to determine the moderator role of generation gap in the effect of psychological empowerment perception on job satisfaction. The population (N: 200) and sample (n=136) of the study consists of health professionals working in the Karaman Provincial Health Directorate, Türkiye. In the research, data were collected with a questionnaire technique and the hypotheses were tested through the SPSS Macro Process program. The significance of the regulatory role (statistically) was calculated by the bootstrap test. As a result of the analyzes made, it was found that the moderator effect of psychological empowerment perception on job satisfaction differed between the X and Y generations.

While the effect of the psychological empowerment perceptions of the X Generation employees on job satisfaction did not show a statistically significant difference, this effect was found to be statistically significant in the Y Generation employees. It has been found that generations have a moderator effect on the effect of psychological empowerment perceptions of health workers on job satisfaction (X and Y).

KEYWORDS

job satisfaction, psychological empowerment, generation X, generation Y

INTRODUCTION

Today, organizations need more flexible organizational structures where employees can participate in decision-making instead of traditional, hierarchical organizational structures. As a result of the ever-changing environmental conditions, both the change in organizational structures and the increasing importance of quickly responding to customer needs, it has become imperative to empower employees in organizations. Empowerment is a dynamic management concept that meets the expectations of employees and the needs of customers. While what

managers need to do to have empowered employees is related to the structural empowerment approach, how managers' empowerment activities are perceived by the employees is related to the psychological empowerment approach.

According to Halse and Mallinson [1] the personality and characters of generations are formed as a result of homogeneous experiences and sharing that people in the same generation have in many common denominators, such as socio-economic conditions. The name of the generations, that change in a period of approximately 25-

30 years, depends on what the individuals who are the members of the generation in question are after [2, p.68] According to the definition obtained from the study of Williams and Page [3, p.201] "generation or generation is a group of people who were born at the same time in general, shared the social, political, historical and economic conditions of that period, that is, faced similar problems and assumed similar responsibilities" [4, p. 20] Generational classification was made by researchers in different ways based on different years. In this study, the classification made by Kerse [5] was used. Kerse classified those born between 1965-1980 as Generation X, and those born between 1981-2000 as Generation Y.

In this study, psychological empowerment, which is the cognitive dimension of empowerment, will be discussed. After the outcome of a literature review on psychological empowerment, information will be given on job satisfaction, which is of great importance for today's employees. Then, in line with the purpose of the study, these concepts will be discussed in terms of generations. Finally, the research findings will be presented and the results will be interpreted.

PSYCHOLOGICAL (COGNITIVE) EMPOWERMENT

Psychological empowerment, which is associated with the concept of "self-efficacy" introduced by Bandura [44], is a process in which employees' belief in their own competence is increased. According to the definition in their study titled "Cognitive Elements of Empowerment: An Interpretive Model of Intrinsic Task Motivations" published by Thomas and Velthouse [6, p. 666-681], "to empower is to give power to someone else". Empowered employees: have the ability to affect their work and work environment in a meaningful way, to feel competent about their work, to use initiative, to facilitate proactive behaviors and to do their jobs independently [3, 4]. Four dimensions (meaning, competence, autonomy and impact) are required for employees to be psychologically empowered. Although the under-perception of these dimensions does not completely eliminate the empowerment, it reduces the degree of empowerment [6, 7].

Meaning dimension: Spreitzer et al. [8] see this dimension as the most important element of staff empowerment. In cases where the work of the employees is not meaningful to them, the employees will be indifferent to the issues related to the organization and will not be able to deal with their work, as a result, their work motivation will decrease [6] According to Hochwalder and Brucefors [9], employees compare their roles in the workplace with the values and standards they have, and the more similar their expectations to their actual jobs, the more empowered they feel.

Competence dimension: Is the belief and confidence that employees have in themselves about doing their jobs as they should. On the other hand, if the employees do not trust their skills and competencies related to the work they do, or if the employees do not have self-confidence about their work, they will avoid jobs that require the use of skills related to their work. The competence dimension of empowerment is an element that drives the employee to action as a result of his evaluation of his current potential. The higher the employee's belief that he/she can do the job in question, the more confident he/she is about the competence related to this job, the higher the probability of doing the job [6].

Autonomy dimension: While the competence dimension is related to the expertise, competence and mastery of the employee; the autonomy dimension is related to the ability to make decisions and use initiative on business processes such as starting, stopping, continuing or correcting the work [10].

Impact size: Autonomy is the dimension that expresses the freedom of employees regarding their own work areas, while influence is a dimension related to employees having control over organizational outputs. To illustrate the difference between competence and impact dimensions with an example, would be if employees accept that they have an impact on work-related activities (impact dimension), they will not be sufficiently empowered if they feel that they do not have enough ability (competence dimension) to do the job well. Deficient perception of one of these dimensions will not completely eliminate reinforcement, but will only reduce its degree [11].

JOB SATISFACTION

Job satisfaction, which has been the subject of many research studies in the organizational behavior literature since the 1930s, has entered the literature with motivation theories. According to Hoppock [12], job satisfaction is "the sum of physiological, psychological and environmental

conditions that provide employee satisfaction with his job". According to Hackman and Oldman [13], job satisfaction is "the degree to which employees are satisfied with their job and the key features of the job (occupational health and safety, pay, and opportunities for personal development)". In short, job satisfaction is the positive view that employees have as a result of reviewing their work or work-related experience.

The concept of job satisfaction was first used in the organizational behavior literature as a result of the research of Elton Mayo and his colleagues in the Tavistock coal mine [45]. Thanks to this study, an important step has been taken in terms of human resources management by considering the fact that physical conditions, in which employees have feelings and emotions, can affect the productivity of employees, contrary to previous ideas that considered human beings as a mechanical element.

RELATIONSHIP BETWEEN PSYCHOLOGICAL EMPOWERMENT AND JOB SATISFACTION

The degree of empowerment felt by employees in organizations is expected to affect their job satisfaction. It has been confirmed by many studies that the employee's job-related competence and acquisition, taking responsibility for their job and seeing themselves as the owner of the job, and using initiative in decision-making about their job increase the level of job satisfaction of the employees [14,15, 8, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27]. With psychological empowerment, employees gain skills and competencies related to their jobs, take responsibility for the job, and see themselves as the owner of the job. Thanks to empowerment, it is expected that the job satisfaction of employees who can use initiative in the decision-making phase will increase. The higher the job satisfaction level of the employees, the more positive attitudes they show towards their jobs, and the negative organizational results such as leaving the job or looking for a new job will decrease [28] Based on this information, the H1 hypothesis was formed.

H1: Psychological empowerment affects job satisfaction positively and significantly.

PSYCHOLOGICAL EMPOWERMENT AND JOB SATISFACTION BY GENERATIONS

According to Kupperschmidt [29], it has been noted that generational communities differ in their values. For example, Generation X individuals are a hard-working generation that cares about career, as it is a generation that witnessed the oil crisis that affected the world. The Generation Y, on the other hand, is a generation that cares about time and wants quick answers and results, as it has witnessed the development of technology. Echo Boomers", "MTV Generation", "Generation Next", "Next Generation", "Peter Pan Generation" also known by the names of Generation Y and "baby fall-baby bust" and "lost generation", the regulatory effect of Generation X. Before moving on to the findings of this study, it will be appropriate to give the results of the study that deals with how the birth interval of the employees affects the variables of psychological empowerment and job satisfaction. According to the results of Sparks [30] study in which Baby Bommer employees and Generation X employees measured psychological empowerment and job satisfaction levels, while Baby Boomer employees had higher psychological empowerment than Generation X employees, no difference was found in job satisfaction scores according to generations. Kong et al. [31] in their study, the four dimensions of psychological empowerment, namely impact, competence, autonomy and meaning, contributed positively to the job satisfaction of Generation Y. In the study of [26], it was found that the perceptions of job satisfaction and psychological empowerment of employees younger than 26 years old are lower than those of older age groups. According to the results of this study, it can be said that higher age groups have higher job satisfaction and psychological empowerment levels. Onen [32] found that as age increases, job satisfaction also increases. Herzberg explained the relationship between job satisfaction and age, which he expressed as a U-shaped curve, as job satisfaction is high in employees who start their business life early, decreases towards the age of 30, and increases again as age progresses [33]. Based on this information, the H2 hypothesis was formed.

H2: The positive effect of psychological empowerment on job satisfaction differs in Generation X and Y employees.

METHOD

In this part of the study, which was designed to investigate the moderator role of X and Y generations in the effect of perceived psychological empowerment on job satisfaction in health directorate employees, information about the research model, environment, sample and measurement tools used in the study are given.

MODEL OF THE STUDY

In this study, the aim was to determine the moderator role of the Xx and Y generations in the effect of psychological empowerment on job satisfaction. The effect of the independent variable on the dependent variable may vary according to many individual characteristics. One of these individual characteristics is the generation of people according to their year of birth, as one of these individual characteristics. It is thought that the age of the individuals may be the moderator variable in many effects. Regulatory variable (W); It is the variable that has the power to affect the direction and severity of the relationship between dependent (Y) and independent (X) variables [34, 81-83]. In social sciences, the power of the independent variable to affect the dependent variable depends on the individual's gender, age, marital status, etc. may vary accordingly. The moderator variable in this study is the X and generation Y. Since the effect of generations on psychological empowerment and job satisfaction has been revealed by the results of previous studies, it is thought that psychological empowerment will also play a moderator role in the effect of job satisfaction. Based on this idea, the model to test the regulatory effect of generations is given in Figure 1.

FIGURE 1. RESEARCH MODEL
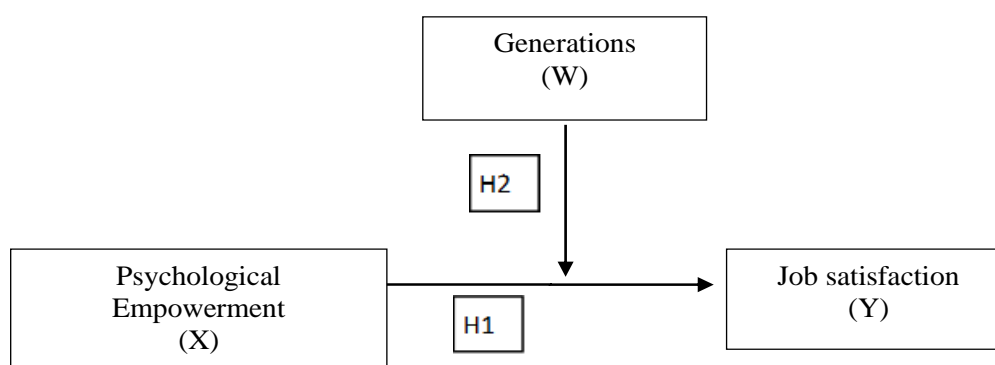
ETHICAL CONSENT

Ethical consent was obtained from the Scientific Research and Publication Ethics Committee of Karamanoglu Mehmetbey University with their letter dated 13.09.2019 and numbered 25409. Research data were collected in 2020 (January-June period).

SAMPLE ENVIRONMENT

The study environment consisted of the employees of the Karaman Provincial Health Directorate, Türkiye. According to the information received from the personnel services department of the Provincial Health Directorate, 200 people worked in the organization in the relevant period. Participants in the study were determined by simple random sampling method. In the research, the data were collected by the method of leaving the research form by hand. In the research, all the employees of the provincial health directorate were included in the research and the participants were given the right to participate voluntarily. The sample size of the research that could represent the study setting consisting of 200 people (with an error margin of 5% at the 95 confidence level) was determined as 132 [35].

DATA COLLECTION TOOLS

In order to determine the psychological empowerment and job satisfaction levels of the employees in the study, measurement tools whose validity and reliability were tested were selected. The psychological empowerment scale used in the study was developed by Spreitzer [7] and its Turkish adaptation and validity-reliability study was performed by Uner and Turan [36]. The scale consists of 12 items and 4 sub-factors (meaning, adequacy, autonomy, effect). Uner and Turan [36] found the reliability (Cronbach's Alpha coefficient) of the scale to be 0.83 for the nurse sample and 0.88 for the physician sample.

The Job Satisfaction Scale used in the study is a one-dimensional 5-item scale adapted by Basim and Sesen [37] from the Job Characteristics Questionnaire of Hackman and Oldhamn [13] The reliability of the scale was calculated as 0.78 using Basim and Sesen.

ANALYSIS OF DATA

The SPSS program was used in the analysis of the research data. SPSS is one of the most widely used quantitative data analysis programs in social sciences in the world (46). Exploratory factor analysis and reliability analysis (Cronbach Alpha coefficient) were performed to reveal the validity and reliability of the scales. The hypotheses of the research were tested and interpreted using Hayes' SPSS Process Macro program. Process Macro is a SPSS plug-in where agent and moderator variable analysis are performed. In the Process Macro application, hypotheses regarding the mediating and regulatory effect are tested according to the confidence intervals obtained by the Bootstrap technique. Analyzes based on this technique give more valid and reliable results in mediation models

[34]. Bootstrap, which is a useful technique in determining whether the effect of the independent variable on the dependent variable changes at different levels of the regulatory effect, gives information about whether the hypotheses are supported at the 95% confidence interval [41].

FINDINGS

DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS

The data regarding the status of the employees participating in the research are given in Table 1.

TABLE 1. DEMOGRAPHIC FINDINGS

Characteristics	Variables	F	%
Gender	Male	79	58.1
	Female	57	41.9
Education level	High School-Associate Degree	37	27.2
	Bachelor-Master	99	72.8
Generation	Generation X (41 - 56 years old)	47	34.6
	Generation Y (21-40 years old)		
		89	65.4
Job Definition	Health Officer	44	32,4
	Nurse/Midwife	36	26,5
	Officer	56	41,1
Total		136	100

According to Table 1, 58.1% of the employees participating in the study are male, 41.9% are female, 27.2% have high school and associate degree, and 72.8% have undergraduate and graduate education levels. 47 of the employees are in the Generation X and 89 are in the generation Y. 32.4% of the participants work as health officers, 26.5% as nurses/midwives and 41.1% as civil servants.

STRUCTURAL VALIDITY AND RELIABILITY ANALYSIS OF SCALES

Psychological Empowerment Scale

Since the variables must show a normal distribution in order to apply the factor analysis, first of all, it was checked whether the data belonging to the scales showed normal distribution. Since the skewness (-0.475) and kurtosis values of the psychological empowerment scale (-0.425) and the skewness (-0.198) and kurtosis values of the job satisfaction

scale (-0.945) were between -1 and +1, it was assumed that the data were normally distributed [40].

In order to test the structural validity of the scales, principal components analysis (principal component) and exploratory factor analysis (EFA) were performed using the direct oblimin axis rotation technique, and Cronbach Alpha Reliability Analysis was performed to measure the internal consistency of the items. Factor analysis is one of the statistical techniques that turns a large number of related variables into a small number of significant and independent factors. Principal Component Analysis, on the other hand, is the most widely used analysis to obtain factors Barlet test and KMO are used to evaluate whether the data set is suitable for factor analysis (47). Cronbach's Alpha, which is frequently used in Likert-type scales, is a coefficient used to question the homogeneous structure of the scale items.

As a result of the EFA being applied to the psychological empowerment scale, the sample adequacy value of Kaiser-Meyer-Olkin (KMO) was found to be 0.736, and it was decided that the sample size was sufficient for factor analysis. Since the Barlett test of sphericity was significant (p<.000), it was determined that the correlations between the items were suitable for factor analysis [38]. Eigenvalues greater than 1 formed the factors. As a result of the EFA being applied to the psychological empowerment scale, the 4-factor structure of the scale was revealed. As a result of the EFA, it was found that the 12-item scale had a 4-factor structure, the factors explained 83,614% of the total variance, the factor loads of the items were above 0.5, and the Cronbach Alpha coefficient of the scale was 0.854 as a result of the reliability analysis.

Since the Kaiser-Meyer-Olkin (KMO) sample adequacy value of the job satisfaction scale used in the study was 0.774, the sample size was sufficient for factor analysis, and since the Barlett sphericity test was significant (p<.000), correlations between the items were found to be suitable for factor analysis [38]. The single-factor structure of the scale, which consists of 5 items with eigenvalues greater than 1, was revealed. As a result of the EFA, it was found that the 5-item scale had a 1-factor structure, a single factor explained 65.159% of the total variance, the factor loads of the items were above 0.5, and as a result of the reliability analysis, the Cronbach's Alpha coefficient of the scale was 0.836.

Testing Hypotheses

The Process Macro (for SPSS) program developed by Hayes was used to test the hypotheses of the study. The program uses the bootstrap technique to calculate the modifier effect. [34] Confidence interval (95%) values (CI values)

obtained by the bootstrap technique are important to determine whether the relationship between variables is supported or not [39] If the confidence interval values do not contain zero, it can be said that the hypotheses are fully supported [41].

In order to test the moderator role of generations (x and y) in the effect of psychological empowerment perceptions of Provincial Health Directorate employees on job satisfaction, a regression analysis was performed using the Bootstrap technique-based Process Macro program, and the results are given in Table 2.

According to the results of the regression analysis, it was seen that all estimation variables included in the analysis explained 20% (R^2= .205) of the change on job satisfaction. According to Table 2, the effect of psychological empowerment on job satisfaction (path b1) was found to be statistically significant and this effect was positive. (b =- .399; 95% CI [.2380; .5595]; t =-4.9064; p > 0.00). According to this result, the hypothesis of "psychological empowerment affects job satisfaction positively and significantly", which is the H1 hypothesis, was accepted. Another result obtained as a result of the analysis is related to the effect of generational difference on job satisfaction. According to the results of the analysis, the effect of generations on job satisfaction (path b2) is statistically insignificant (b= -.030; 95% CI [-.1931; 1334; t =-.3619; p >0.05). The result of the interaction (X.W) of psychological empowerment (X=independent variable) and generation (W=modulatory variable) variable expressing the B3 pathway was found to be significant (b =.1866; 95% CI [,0298; ,0185], t = 2.1963, p < 05). When the effect slope graph in Figure 2 is examined, it is understood that the regulatory effect and Hypothesis 2 are supported more clearly.

TABLE 2. RESULTS OF REGRESSION ANALYSIS BETWEEN VARIABLES

	b	SH	*t*	*p*	LLCU	ULCI
Dependent Variable: Job Satisfaction						
Psychological Empowerment (X) (path b1)	.3987	.0813	4.9064	.0000	.2380	.5595
Generation (W) (path b2)	-.0299	.0825	-.3618	.7181	-.1931	.1334
X.W. (Path b3)	.1866	.0850	2.1963	.0298	.0185	.3547
Conditional Impact = Generations						
Generation X (1)	.1428	.1503	.9507	.3435	-.1543	.4400
Generation Y (2)	.5339	.0955	5.5881	.0000	.3449	.7228

R= .4523, R²= .2046, n=136, LLCI: lowest confidence interval, ULCI: highest confidence interval

FIGURE 2. THE REGULATORY ROLE OF GENERATIONS (SLOPE GRAPH)
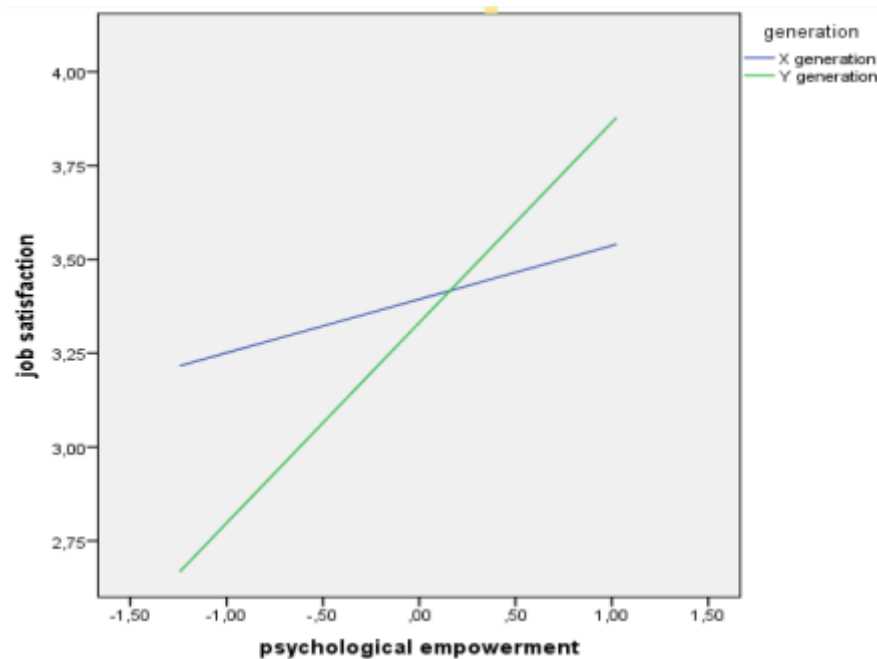
When the regulatory effect of the generations is examined, the positive effect of psychological empowerment on job satisfaction differs according to the Generation X and Generation Y employees. The effect of psychological empowerment on job satisfaction was not significant in Generation X employees (b=, 1428; 95% CI [-.1543; 4400]; t =.9507, p > 0.05). In Generation Y employees, the effect of psychological empowerment on job satisfaction was found to be significant (b=, 5339; 95% CI [.3449; 7228], t =5.5881, p < .001).

CONCLUSION

In this study, the moderator role of generations in the effect of psychological empowerment on job satisfaction was tried to be determined with two hypotheses. For this purpose, data were collected from the employees of Karaman Provincial Health Directorate. The results and interpretations of the research findings are presented below.

As a result of the study, it was found that the psychological empowerment perceptions of the Provincial Health Directorate employees affected the job satisfaction statistically and positively. This result is consistent with many studies in the literature [14, 15, 8, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27]. In previous studies, the moderator effect of psychological empowerment on job satisfaction has not been investigated. This study investigated the effect of previous psychological empowerment on job satisfaction

[14, 15, 8, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27] and it adds a perspective to many studies with positive results as to whether this effect differs according to the generations of the employees.

As a result of the study, the moderator effect of the psychological empowerment and generation variables of the provincial health directorate employees on job satisfaction was found to be significant. According to this result, the positive effect of psychological empowerment on job satisfaction differs according to X and Y generations. While the effect of psychological empowerment on job satisfaction was not statistically significant in X generation employees, the effect of psychological empowerment on job satisfaction was found to be significant in Y generation employees.

According to Generation Y employees, managers should be flexible and able to delegate authority when necessary. They can only obey generations older than themselves for a short time, and in the long run, dissatisfaction and resistance develop due to their fondness for their independence [42]. Çevik Tekin and Akgemci researched the business values of Generation Y in 2016, and the fact that "oppression" is the least they agree with in the Status-Oriented Business Approach shows that this generation does not like being governed by pressure and authority. The fact that the values they care most about in professional İGA are "giving importance to competence" and "inquiry", which shows that they expect mentorship

from their managers rather than authority. Employees of Generation Y care about being able to make decisions on their own. The effect of their psychological empowerment on their job satisfaction can be explained by this generation's understanding of work values. Generation X, on the other hand, is a generation that respects authority, has high work motivation, is loyal and contented ([42]. For this reason, while the psychological empowerment of the X Generation does not affect their job satisfaction statistically significantly, the statistically significant positive effect of the Y Generation's psychological empowerment on their job satisfaction can be explained by the aforementioned job values of the Y Generation.

More studies on the relationship between psychological empowerment and job satisfaction have been conducted in the literature, and the moderator variables that may affect the relationship between these two concepts have not been investigated much. Since there is no other study investigating the moderator effect of X and Y generations on the relationship between psychological empowerment and job satisfaction in the literature, it is thought that this study will make an important contribution to the literature. However, since the study includes health workers working in the Karaman Provincial Health Directorate, conducting a study in different sectors may lead to different results. Therefore, it is recommended that the study be carried out in different sectors. Since the pandemic had not yet started in Turkey while obtaining work permits, it is not aimed to measure the effects of the pandemic. During the time when the study data were collected, a pandemic began to occur. Therefore, it is recommended to consider this variable when evaluating the results of the study.

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RESEARCH ARTICLE

EVALUATION OF PATIENT DISCHARGE INFORMATION BETWEEN WHAT IS SAID AND WHAT IS WRITTEN

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ABSTRACT

BACKGROUND:

A patient's discharge from the hospital is considered a crucial transition. Appropriate patient education about their condition and its treatment can reduce adverse events and improve health outcomes.

OBJECTIVE:

Identifying high-risk patients for adverse events after hospital discharge and evaluating patient discharge information to ensure patients are safely discharged.

METHOD:

Between January 2019 and February 2020, a retrospective cross-sectional study examined hospital discharge notes. A random sample of 600 hospital discharges was audited, and a convenience sample of 150 patients was used to gauge patient satisfaction.

RESULTS:

The patient's age, medical history, the presence of a physical limitation, and the presence of a surgical wound were all significantly related to readmission at $p < .05$. In addition, there was a significant correlation between emergency room visits, medical history, and physical or mental impairment $p < .05$. Lastly, the presence of complications was associated with physical restriction and surgical wound $p < .05$. The findings revealed that 84.6% (n = 127) of patients did not appear to pay attention to the information on their discharge summaries, but they kept them as a reminder of their follow-up appointments. There were medical abbreviations in all of the discharge summaries (n = 150). Almost all discharge summaries contained at least 70% of the required information (diagnosis, past history, allergies, procedures, laboratory results, medications, and appointments). In contrast, the patient's level of satisfaction was lowest with respect to crucial aspects such as warning signs, recommendations, and educational materials. They were neither verbally nor in writing summarized.

CONCLUSION:

Patient-specific discharge information and summaries should be provided. It should be suitable for the patient's physical, educational, and psychological conditions. Important parts of post-discharge instructions should be provided in a straightforward, written format to improve health outcomes and reduce adverse events.

KEYWORDS

discharge summary, discharge planning, discharge information, readmission to hospital, patient's satisfaction, patient's self-care

INTRODUCTION

The discharge of patients from hospitals is one of the greatest challenges in health care settings, as it represents a crucial transition for patients [1]. Discharge planning is the creation of a patient-centered plan for each hospital-bound patient [2]. Discharge information and coordination for integrated health care following discharge are the primary components of discharge planning and should be tailored to the patient's health needs [2]. Information regarding a patient's condition, treatment, and follow-up provided at discharge can reduce readmissions and improve health outcomes. This discharge information improves the patient's self-care activities regarding a healthy lifestyle, medications, and wound care to reduce mortality and morbidity risks [2].

When discharge instructions are delivered in a manner that is inappropriate for the patient's physical, educational, and psychological differences, many patients find it difficult to understand and follow them [3]. This is of particular concern for older patients with low literacy skills, chronic diseases, and postoperative status, for whom medication adherence, lifestyle changes, and follow-up are essential [3,4].

Considering the discharge information as a whole, the discharge summary is the most crucial element of this circle. The discharge summary is the most prevalent method for documenting a patient's diagnostic findings, medical management, and follow-up appointments [2]. Effective and comprehensive discharge summaries reduce adverse drug reactions, unplanned readmission, complications, and mortality, and increase patient and provider satisfaction [2]. Conversely, an incomplete discharge summary may result in re-hospitalization, unwelcome events, and dissatisfied patients [2,5].

Numerous studies have examined the caliber of discharge summaries. They evaluated three pertinent areas: [1] content, [2] organization, and (3) readability or comprehension. They discovered that the discharge summaries were disorganized, contained poor information, and were written at a sixth-grade level or higher; therefore, they required revision [13–16].

There are three primary medical health sectors in Jordan: government, private, and military. The policies of each area determine the format of the discharge summary or information. In all cases, these summaries adhere to a specific format that is unique to each one; the patient will receive the information upon discharge and can fill it out by hand or have it printed by a computer.

There are no official, unified guidelines for discharge planning and information in Jordan, nor for the writing of discharge summaries. In addition, no research has been conducted to evaluate or enhance hospital discharge information and summaries. Existing papers contained statistics and periodic reviews of quality programs, but they did not reveal their flaws or underlying development mechanism. Consequently, this study will be the first in Jordan to evaluate hospital discharge information and summaries in relation to the patient's level of satisfaction. This study's findings may encourage health institutions and care providers to adopt the best evidence-based practice for hospital discharge summaries and information.

The objective of this study was to identify patients at high risk for adverse events following hospital discharge and to evaluate patient discharge information to ensure that patients are discharged safely.

METHODS

RESEARCH DESIGN

This retrospective cross-sectional study examined the discharges and summaries generated at Jordan University Hospital (JUH) from January 2019 to February 2020. Patients and discharge summaries were selected within a year of data collection so that the patient could recollect and understand what transpired. This period was chosen to avoid the widespread effects of the Corona pandemic on the medical industry.

SETTING

This research was conducted at JUH in Amman, Jordan's capital. It is the first teaching hospital in Jordan with a 670-bed capacity [11]. This hospital has received numerous international accreditations. JUH's mission is to promote quality management and scientific investigation. This hospital serves all segments of society from various governorates in the Kingdom. It houses all medical specialties and conducts numerous major and minor surgical procedures. It is the destination for all patients with different health insurance plans.

SAMPLE AND SAMPLING METHOD

The study's target population comprised all hospitalized and discharged Jordanian patients. The accessible population consisted of all JUH patients who were admitted and discharged. The first sample in this study was comprised of 600 discharge notes was selected for auditing between and discharge (10 patients were randomly selected for each specialist doctor, knowing that the number of specialists was 60 from various medical specialties). The inclusion criteria included patients admitted to JUH who were Jordanians. Both males and females had a minimum age of 18 years

The second sample was quantitative interviews and questionnaires which were conducted with 150 patients admitted and discharged between January 2019 and February 2020. Patients admitted to JUH who spoke and read Arabic were included in the inclusion criteria. Both males and females had a minimum age of 18 years. Patients with cognitive impairment, dementia, or head trauma were excluded, as were admissions for ongoing routine day procedures, such as chemotherapy, hemodialysis, and wound dressing.

INSTRUMENTS

Researchers divided the auditing and follow-up sheet of discharges into two sections: (1) demographic characteristics and admission data; and (2) follow-up data (if patient readmitted or visited emergency within 30 days of discharge or had complication reported in a clinic appointments).

The Patient Continuity of Care Questionnaire (PCCQ) used was the initial version of the instrument, consisting of 41 items rated on a 5-point Likert scale. Two distinct sections of the questionnaire addressed aspects of care prior to discharge (27 items) and after discharge (14 items). It included perceptions of the following six subscales: (1) relationships with care providers during hospitalization; (2) information transfer and exchange with patients; (3) relationships with care providers in the community; (4) management of written discharge forms; (5) management of appointments and follow-up; and (6) management of communication among providers. The means of subscale scores are reported, but no total score is provided. Using Cronbach alpha coefficients, scales' reliability and internal consistency were evaluated. The subscale Cronbach alpha coefficients for the revised instrument were acceptable and ranged between 0.78 and 0.83 [17,18]. The questionnaire was translated into Arabic, and a pilot study was conducted to determine whether or not this questionnaire can be used in our community. Cronbach's alpha of the PCCQ scale in this study was found to be 0.86.

ETHICAL CONSIDERATIONS

Prior to data collection, the Institutional Review Board (IRB) at JUH granted ethical approval. Participants were given a sheet of information detailing the purpose of the study and their rights. Participants were also informed that their information would be kept confidential and used solely for research.

DATA COLLECTION PROCEDURE

We utilized the PCCQ to investigate the patients' satisfaction and experiences with care prior to and after discharge. The researchers interviewed them during follow-up appointments in outpatient clinics.

DATA ANALYSIS

Version 24 of the Statistical Package for the Social Sciences (SPSS) was used to enter and analyze the data. The collected data were filtered and examined for consistency and completeness. The characteristics of the sample were analyzed using descriptive statistics. The Chi square statistic was used to determine the relationships between variables. A t-test was utilized to examine the differences.

RESULTS

REVISED AND FOLLOWED UP PATIENT DISCHARGES

The outcomes of our review of the discharge summaries of 600 patients are shown in Table 1. The discovery revealed that 23.5% (n=141) of the patients are elderly. More than 52% (n=316) of patients had a medical history. 87.6% (n=526) of patients exhibit the prevalent behavior of taking at least one type of medication after discharge. In addition, almost half of patients were discharged with surgical wounds (47.5%; n=285).

A contingency table to show the relationship between follow up variables and demographic variables is shown in Table 2.

TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF REVISED DISCHARGES

Variable	n	%
Age		
18-64 years	459	76.5
≥ 65 years	141	23.5
Had medical history		
No	284	47.3
Yes	316	52.7
Had physical limitation		
No	565	94.2
Yes	35	5.8
Had mental & cognitive impairment		
No	587	97.8
Yes	13	2.2
Had previous admissions		
No	156	26
Yes	444	74
Number of medications after discharge		
Zero medication	74	12.3
1-3 types	294	49
≥ 4 types	232	38.7
Had high alert medication after discharge		
No	483	80.5
Yes	117	19.5
Had surgical wound after discharge		
No	315	52.5
Yes	285	47.5
Readmitted within 30 days after discharge		
No	541	90.2
Yes	59	9.8
Visited emergency within 30 days after discharge		
No	547	91.2
Yes	53	8.8
Had complication reported in a clinic appointment		
No	527	87.8
Yes	73	12.2

TABLE 2: CONTINGENCY TABLE

Demographic characters	Follow up variables					
	Readmitted within 30 days		Visited emergency within 30 days		Had complication reported in a clinic appointment	
	No	Yes	No	Yes	No	Yes
Age						
18-64 years	422	37	423	36	406	53
≥ 65 years	119	22	124	17	121	20
Had medical history						
No	270	14	270	14	251	33
Yes	271	45	277	39	276	40
Had physical limitation						
No	518	47	523	42	503	62
Yes	23	12	24	11	24	11
Had mental & cognitive impairment						
No	529	58	538	49	516	71
Yes	12	1	9	4	11	2
Had high alert medication						
No	436	47	444	39	422	61
Yes	105	12	103	14	105	12
Had surgical wound						
No	275	40	283	32	292	23
Yes	266	19	264	21	235	50

The findings revealed that there was a significant relationship between readmission within 30 days after discharge and the patient' age X2(1) =6.92 p=.009, medical history X2(1) =14.6, p=.000, presence of physical limitation X2(1) = 25, p=.000, and presence of a surgical wound X2(1) =6.14, p=.013.

The finding revealed that there was a significant relationship between visiting the emergency department within 30 days after discharge and medical history X2(1) =10.2, p=.001, presence of physical limitation X2(1)=23.5, p<.001, presence of mental & cognitive impairment X2(1) =7.9, p =.005.
Finally, the findings revealed that there was a significant relationship between having complications which reported during clinic appointments, such as wound infection and physical limitation X2(1) =12.9, p<.001, and the presence of surgical wound X2(1) =14.6, p<.001.

PATIENT SATISFACTION AND EXPERIENCE
We conducted interviews with 150 patients and compared what they were told about their condition to what was written in their discharge summaries. Socio-demographic characteristics of patients are shown in Table 3. According to the findings 58.7% (n=88) of patients only completed a secondary education. Two-thirds of the patients had comorbid conditions (hypertension, diabetes, heart disease, chronic kidney disease, and chronic obstructive pulmonary disease) 61.3% (n=92). More than half of patients 66% (n=99) received ≥ four types of medication after discharge.

TABLE 3: DEMOGRAPHIC CHARACTERISTICS OF PATIENTS

Variable	n	%
Age		
18-64 years	121	80.7
≥ 65 years	29	19.3
Gender		
Male	58	38.7
Female	92	61.3
Place of living		
North of Jordan	70	46.7
Middle of Jordan	73	48.7
South of Jordan	7	4.6
Activities of daily living		
Self-care	113	75.3
Need help & assistance	37	24.7
Level of education		
At least secondary	88	58.7
Diploma or higher	62	41.3
Number of comorbid disease		
No comorbid disease	58	38.7
≥ 1 of comorbid disease	92	61.3
Number of medications before admission		
Zero medication	31	20.7
1-3 types of medications	54	36.0
≥ 4 types of medication	65	43.3
Number of medications after admission		
Zero medication	2	1.3
1-3 types of medications	49	32.7
≥ 4 types of medication	99	66.0
Receiving medical care out of JUH		
No	138	92.0
Yes	12	8.0

The PCCQ was developed to evaluate patient perceptions and experiences with various aspects of care before and after hospital discharge. The PCCQ scale is comprised of 41 items. The responses ("strongly agree" and "somewhat agree") were deemed extremely satisfactory, whereas the responses ("strongly disagree" and "somewhat disagree") were deemed unsatisfactory. Unhappiness with these aspects of their experience is likely to leave them with the impression that they lack the knowledge and resources to effectively manage their condition. According to Table (4), patients were least satisfied with information regarding urgent and non-urgent symptoms and how to manage them. Also, patients were less likely to be satisfied with medication, diet, and physical activity information.

TABLE (4): PATIENTS' SATISFACTION WITH THE ASPECTS OF CARE PRIOR TO AND AFTER DISCHARGE

Subscale / item	n	%
Relationships in Hospital		
Item 17- Providers understood my expectations/beliefs/preferences	111	74
Item 19- Had confidence in my providers	129	86
Item 20- Satisfied with information from my providers	110	73.3
Item 21- Satisfied with emotional support from my providers	110	73.3

Item 22- Satisfied with opportunity for questions with providers	126	84
Item 27- Felt adequately prepared for discharge	140	93.3
Information Transfer		
Item 1- Provided with clear information on my diagnosis	125	83.3
Item 2- Provided with clear information on my prognosis	126	84
Item 3- Told about non-urgent symptoms and how to cope with them	74	49.3
Item 4- Given information on urgent symptoms and who to contact	78	52
Item 5- Informed of follow-up tests that are required	65	43.3
Item 6- Given information on my medications	23	15.3
Item 7- Given information on healthy eating	51	34
Item 8- Given information on physical activity & restrictions	66	44
Item 16- My family or close friends had the necessary information to help me	39	26
Management of Follow-up		
Item 10- Given information on follow-up appointments	149	99.3
Management of Forms		
Item 39- Forms were all completed	135	90

Calculating the total mean PCCQ for each patient yields a mean of 3.49 and a standard deviation of 0.50. Using the t-test, we compared the total mean on the PCCQ for each patient and the mean of each PCCQ item with demographic information to determine the differences between them. The mean score of patients with at least a secondary education and those with at least a diploma did not differ significantly. There were no statistically significant differences between the mean score of patients with a disease history and those who were disease-free. There were no statistically significant differences between the mean score of patients with at least one co-morbid disease and those without any. There were no statistically significant differences between the mean score of patients with physical impairment and those without impairment. There were no significant differences in mean score between patients who provided their own care and those who required family assistance. There were no significant differences in the mean score between patients who were discharged with at least three types of medications and those who were discharged with four types of medications or more.

The findings revealed that 84.6% (n=127) of patients did not appear to pay attention to what was written on their discharge summaries but kept them as a reminder of follow-up appointments. One hundred percent of the discharge summaries (n=150) contained medical abbreviations. Almost all discharge summaries included 70% of the basic data (primary diagnosis, secondary diagnosis, past medical history, past surgical history, allergy,

procedures, laboratory results, name of medications after discharge, and follow-up appointments). In contrast, more than 4% of patients did not include vital information such as alarming signs and symptoms, recommendations (diet, wound, or work), nursing education, and educational materials, and they were not verbally informed about these points. According to patient feedback, 90% (n=135) of patients recommended filling out this section in simple language, especially for alarming signs and symptoms, recommendations (diet, wound, or work), nursing education, and educational materials.

Following discharge, 14.6% (n=22) of these patients visited the emergency department, according to follow-up and post-discharge experiences. Additionally, 6.6% (n=10) of patients called or attempted to call a doctor to inquire about their health. Finally, 1.3% (n=2) of patients arrived at the clinics prior to their scheduled appointment to inquire about their condition.

DISCUSSION

REVISED AND FOLLOW UP PATIENT'S DISCHARGES
The current findings revealed that there was a significant association between unwanted events (readmission, emergency room visits, and reporting complications during clinic appointments) that can occur within 30 days after discharge and the patient's age, medical history (diabetes, hypertension, liver disease, and heart disease), presence of physical limitation (hearing or vision impairment), presence of mental and cognitive impairment (dementia, Alzheimer's disease), and presence of physical limitation (hearing or vision impairment).

These unanticipated and unplanned occurrences are one of the obstacles that cause additional stress and a substantial waste of medical resources. However, some of these undesirable events can be predicted and prevented; prior to discharge, it is necessary to identify patients at high risk (older age, physical or mental impairment) to reduce the likelihood of these events [10]. These findings highlight the need to provide information based on the patient's needs and help us to concentrate on specific needs, such as aging, health issues, physical or mental challenges, and surgical wounds [12,13]. According to the findings of an observational and retrospective auditing study, the discharge plan should be based on the patient's needs [9]. A systematic review found that a comprehensive discharge plan reduced the length of stay and the risk of hospital readmission, particularly for older patients with medical conditions [10]. Another systematic review of the efficacy of discharge planning and transitional care interventions revealed that discharge planning reduces the elderly readmission rate [11]. In conclusion, these findings were consistent with an earlier qualitative study aimed at enhancing patients' ability to recognize postoperative complications that can occur after hospital discharge [12].

PATIENT SATISFACTION WITH THE ASPECTS OF CARE PRIOR TO AND AFTER DISCHARGE

Patients were satisfied with the information they received regarding their diagnosis, prognosis, and follow-up appointments, according to the current study. The patients were least pleased with the information regarding alarming symptoms, lifestyle modification, and medication. Numerous pieces of information were absent or insufficient, and the patient was not provided with them verbally or in writing prior to or after discharge. Similar to the findings of previous studies, which indicated that clear explanations may increase patient satisfaction with the discharge process, these findings indicated that clear explanations may increase patient satisfaction with the discharge process. Continual education, preparation for discharge, and post-discharge monitoring may contribute to enhancing patient satisfaction and reducing adverse effects [6,7,19,20].

The current study determined that the discharge summaries provided to 150 patients included basic information such as demographics (primary diagnosis, secondary diagnosis, past medical history, past surgical history, allergy, procedures, laboratory results, name of medications after discharge, and follow up appointments).

These summaries were written in English and included medical acronyms. On the other hand, more than 4% of patients lacked important information such as alarming signs and symptoms, recommendations (diet, wound, or work), nursing education, and educational materials, and were not verbally informed about these points. These results are also consistent with the findings of numerous studies that found discharge summaries to be disorganized, deficient in content, and written above the sixth grade reading level [13,21, 24]. There should be 13 elements in discharge summaries (patient details, admission and discharge diagnoses, investigations, laboratory and imaging tests, surgical procedures, hospital course, allergies, adverse reactions, discharge medications, stopped and changed medications, pending laboratory tests, medical problems at discharge, and follow-up details) [15,16,23, 25].

Patients visited the emergency department, attempted to call a doctor to inquire about their health condition, or came to the clinics before their scheduled appointments, according to the current findings of follow-up after discharge. These practices are all concerning for patients and their families. This may have occurred as a result of insufficient or improperly presented information. This may have occurred due to a failure to consider the patient's circumstances (physical and psychological conditions); therefore, we prefer to document this information or inform the patient's family. Consistent with a prospective observational study which reported that complete and readable written discharge instructions were associated with a reduction in the number of telephone calls and readmissions, these results indicated that complete and readable written discharge instructions were associated with a reduction in the number of telephone calls and readmissions [21, 26, 27].

THE STUDY IMPLICATION

According to the knowledge of the researchers, this was the first study to evaluate hospital discharge information and summaries and link them to the patient's satisfaction level in Jordan. This study contributes to our understanding of the significant effects of discharge information and discharge summaries on patients. In order to improve the discharge information and summary in Jordanian hospitals, it is necessary to establish unified guidelines based on evidence-based medical practice. Effective person-centered communication and the transfer of vital

information to patients based on their needs should be taught to health care professionals. Changes in practice should begin with physicians, nurses, and pharmacists in order to improve their coordination in providing patients with effective and useful information. The nursing evaluation and educational interventions should be incorporated into the discharge procedure and discharge summary. Complete and straightforward discharge papers are necessary to encourage patients to read these vital documents. Using a well-designed information technology solution may enhance communication with medical professionals (mobile applications).

LIMITATIONS

Due to the fact that the research was only carried out at one location, its findings cannot be generalized.

RECOMMENDATIONS

To generalize the findings, additional research should be conducted in other areas. Create an official guideline for discharge summaries in all Jordanian hospitals in order to enhance the quality of the discharge process, discharge information, and discharge summary.

CONCLUSION

The current study found that unwanted and unplanned events could be predicted and prevented; it is necessary to identify patients at high risk (older age, physical or mental impairment) prior to discharge to reduce the likelihood of these occurrences. Accordingly, the discharge information and summaries should be tailored to the needs of the patients. It should be suitable for the patients' physical, educational, and psychological conditions. Important information and instructions for post-discharge care should be provided in a simple, written language in order to improve health outcomes, increase patient satisfaction, and reduce the number of adverse events.

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PATIENTS' ZONE OF TOLERANCE IN THE SERVICE PROCESS AND SERVICE QUALITY AT A MULTI-SPECIALTY HOSPITAL

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ABSTRACT

OBJECTIVE

The purpose of the study is to examine patients' Zone of Tolerance by measuring the gap between perceived and expected service quality and the waiting time to complete the service process during the provision of Master Health Checkups (MHC).

METHOD

Service Quality was tested by using a questionnaire among patients who underwent an MHC in a multi-speciality hospital, in Chennai, India. The observation checklist was used to measure the waiting time.

RESULTS

The F test results revealed that demographic factors may affect the zone of tolerance. The empathy of health care professionals may affect qualified and employed groups' Zone of Tolerance. The patients who were dissatisfied with time were satisfied and delighted with overall services.

CONCLUSION

Patients who come for MHC will have certain expectations. The mean score results indicate that patients are delighted with the empathy of healthcare professionals during the test procedure patients' weighting time was highlighted as the main problem of many patients, which needs to be fixed but the customer perceived opinion on overall services may compensate for the time issue. If healthcare professionals and management can adhere to patients' expectations, the organization will be able to satisfy them, and if they go above and beyond, they will be able to delight them.

KEYWORDS

hospital, master health checkup, service process, service quality, SERVQUAL, zone of tolerance.

INTRODUCTION

Everyone deserves a healthy mind and body. These days every individual has great concern for their health and is profoundly bothered about future health issues. The hospital in this study provides healthcare packages to get a comprehensive health check which include Master Health Check, Executive Health Check, Diabetic Package, Geriatric Health Check (above 60 years), Well Women Health Check, Executive Heart Check, Whole Body Health Check, Teenage Health Check and Pre-Employment Health Check of various diagnostics and tests with doctor consultation for a special price. A routine medical checkup plays a significant role in preventive health care and provides critical baseline data for future comparison in the event of the occurrence of a new disease. Medicines are constantly evolving, and newer and improved ones are constantly being introduced to the market. A Master Health Checkup (MHC) will aid in the detection of early symptoms of a chronic illness so that it can be treated appropriately with suitable medicine.

A multispecialty hospital, which is the single largest healthcare facility in Chennai, India and one of the largest in South Asia, which offers comprehensive healthcare packages to suit the varied needs of patients was chosen for the study. This study is to analyze the Zone of Tolerance of patients concerning the service process and service quality. It focused on functional quality. Functional quality deals with the manners of health care delivery to patients. [1] The Zone of Tolerance is based on the patient's view of service quality results by comparing their expectations before receiving service to their service experience itself. Zeithaml et al [2] recognized the existence of a Zone of Tolerance between desired service and adequate service The desired service refers to the expectation of the customers. Adequate service refers to the services that are received by the customer. The gap between the desired and adequate service will lead to a Zone of Tolerance. [3] If a patient's perceived services were matched by his/her expectations, then the customer is satisfied with the service. If the experience was better than expected, then perceived service quality is high and the outcome is a state of delight. If the experience did not meet expectations, then service quality is perceived to be poor, and the outcome is dissatisfactory. "An outcome which is neither dissatisfying nor delighting is, defined as being within the customer's outcome zone of tolerance". [4 p.4]

The Zone of Tolerance theory focuses on understanding and meeting customer service expectations by calculating the range between the desired level and the minimally acceptable level. [3] The highest expected service is what the consumer intends to receive and is referred to as the desired service. The degree of service that customers tend to accept is adequate service. [5] Perceived service is what the patient believes or perceives to have received from the hospital (after the service experience). SERVQUAL's gap can be measured by using perceived service quality minus expected service quality. [6,7] Zone of Tolerance is defined as the desired service and adequate service levels which represents the range of performance of service to a customer. [8] The mindset of users cannot predict the Zone of Tolerance, but many will tolerate it without quitting. [9]

Zeithaml et al [2] identified the gap model which consists of a scale measuring service quality (SERVQUAL) with ten dimensions and then was reduced to five dimensions namely reliability, assurance, tangibility, empathy, and responsiveness. The Zone of Tolerance is analyzed through dimensions of the SERVQUAL gap model. [10] Customers' assessments include expectations and experience across five dimensions. This study focused only on three dimensions such as responsiveness, assurance, and empathy which are indicating "responsiveness –willingness to help the customer and provide prompt service, assurance-knowledge, and courtesy of employees and their ability to inspire trust and confidence and empathy – caring the individualized attention the firm provides its customer" [1 p.769] are tested to measure the zone of tolerance of a patient and directly related to patient satisfaction. The goal of the zone of tolerance is to explore the relationships between consumers' satisfaction with particular transactions or customer service interactions and their satisfaction with the service overall.[11] The conceptual framework of the study was developed based on the literature reviews and is given in Figure 1.

FIGURE 1 CONCEPTUAL FRAMEWORK OF ZONE OF TOLERANCE AND ITS OUTCOMES
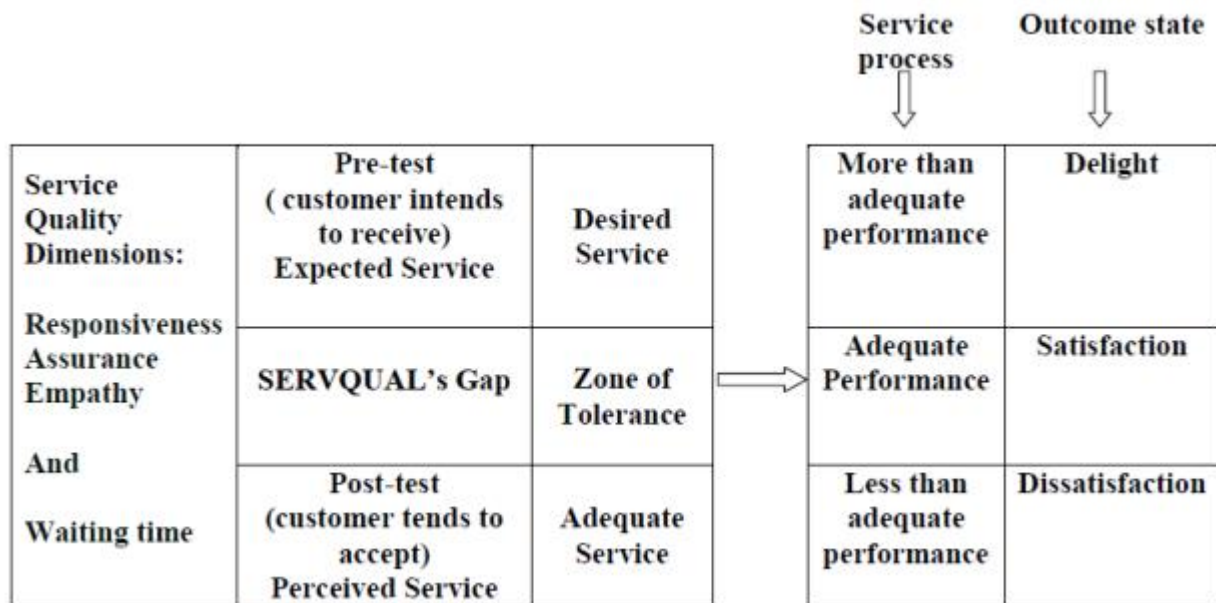
The study objective is to measure the Zone of Tolerance of patients measured by using service process and service quality dimensions. The service process was measured by using an observation checklist and service quality was tested by using a questionnaire among patients who underwent an MHC in a tertiary care hospital.

METHODS

Patients who visited the hospital for taking an MHC were approached. Informed consent was used to get acceptance from patients.

SAMPLING TECHNIQUES & SAMPLE SIZE

A purposive sampling technique was used to collect the data sample. The sample size was calculated for infinite population by using the following formula: $n = (p[1-p][z2]/e2$, p = probability of success expected to be 50%, z=1.645(z value at 10% level of significance) and e =.10 (margin of error), the sample size was calculated to be 67. For collected accurate information 80 patients were approached out of which 74 patients' responses were taken for analysis. Incomplete responses from 6 patients were eliminated. The observation checklist was used to measure the waiting time for 17 tests. 18 patients were observed separately for measuring the average waiting for each test. A total of 92 patients were involved in this study. The questionnaire was used to measure the perception of the patient's expectations and post-test opinion of the patient concerning the desire and adequate service.

DATA COLLECTION & MANAGEMENT

Two bilingual (English and Tamil) questionnaires were administered for collecting data. The first questionnaire, called Pre-test, was designed to measure patients' expectations before the participated in MHC tests. The Pre-test questionnaire was used to collect the data between 7.00am and 9.00am. The second questionnaire was called a post-test questionnaire designed to measure the effect of service patients received (adequate service) during the MHC, which was used to collect data afternoon. Patients who completed the Pre-test questionnaire were asked to complete the Post-test questionnaire. Pre-test and Post-test titles were included on the questionnaires together with serial numbers. It was feasible to compare the opinions of the same patients regarding their expectations and experiences with the hospital's services. The questionnaire was distributed to patients who registered their names with for an MHC and expressed a desire to take part in the study.

Questions were related to three service quality dimensions namely responsiveness, assurance, and empathy. Five-point Likert scales were used to measure the responses. Content validity of the questionnaire was checked by the Medical Director, Dean of Medical College, Medical Superintendent, and Dean of Faculties. The reliability of the questionnaire was tested using Cronbach's Alpha. The pre-test questionnaire's estimated test result was 0.947 and the post-test questionnaire test result was 0.932 ensuring good statistical reliability.

Service quality dimensions were calculated with a "gap analysis" as the difference between expected (pre-test) and perceived (post-test) using statistical analysis of weighted average, standard deviation, and ANOVA. Time factors were measured using the Programme Evaluation and Review Technique (PERT).

The study's scope was limited to how patients perceived the level of service and wait time. Hospital executives' opinions may still be included in future research, despite being excluded.

SERVICE PROCESS

In the selected multi-speciality hospital, an MHC starts at 7.00am up until 12noon and are available on all days except public holidays. On average, 10 patients arrive before 12 noon every day. However, only those who visit between 7.00am and 9.00am are allowed to take the MHC and whoever comes after 9.00 am will get the details regarding the MHC from the secretary at the registration counter and will be instructed to come on another day for a checkup. But those who visit between 7.00 and 9.00am will consult the MHC secretary regarding various health checkup packages to fix the suitable one. This registration and billing process will take at least 40 minutes to 1 hour. The MHC covers hemogram, lipid profile, liver function test,

biochemical parameters, and general [Blood Grouping-RH typing, Complete urine analysis, Stool Test for Occult Blood, Pap Smear (for Women), oPSA (Men), ECG (Resting), X-Ray Chest and Ultrasonogram of the abdomen (Screening)].

ETHICAL CONSIDERATION

Ethical clearance was obtained from the Institutional Ethics Committee of Sri Ramachandra Institute of Higher Education and Research (Deemed to be University), Chennai. (REF.IEC-NI/18/NOV/67/87). All the participants were informed about the purpose of the study and the confidentiality of the data collected for which written informed consent was used for involving patients in this study.

RESULTS

Waiting time analysis for undertaking various tests in an MHC other than the actual testing time) showed several results.

There were 17 MHC-specific tests, and a checklist was used to record the waiting time for each test details are given in Table 1.

TABLE 1: PROGRAM EVALUATION AND REVIEW TECHNIQUE- SERVICE PROCESS WAITING TIME ANALYSIS (IN MINUTES)

S.No.	Procedure	Minimum Time (To)	Maximum Time (Tp)	Avg Time (Tm)	Total Estimated time (Te)=(To+4Tm+Tp)/6
1	Blood & ECG	15	47	31	31
2	Echo	2	51	27	27
3	X-ray	1	12	7	7
4	Dexa	2	18	10	10
5	USG	1	35	18	18
6	Urine & Stool sample	1	17	9	9
7	Primary Consult	1	17	9	9
8	Dental	1	18	10	10
9	Cardiac	1	54	28	28
10	PFT	3	40	22	22
11	Mammo	4	41	23	23
12	Mammo Sono	4	25	15	15
13	Ophthal	7	20	14	14
14	ENT	2	55	29	29
15	TMT	3	13	8	8
16	Nutrition	5	15	10	10
17	Secondary Consult	5	50	28	28
In Mins	Total Wait Time	58	528	293	296
In Hrs	Total Wait Time	1	9	5	5

Source: Primary Data

Program Evaluation and Review Technique (PERT) was used to measure the duration of each activity. Table 1 shows the average waiting for each test of 18 patients. There are three types of time estimates. The optimistic time estimate (To) is the minimum time of each activity, the pessimistic time estimate (Tp) which is the maximum time of each activity and the most likely time estimate (Tm) which is the average time of each activity. The total expected time of each activity was calculated based on the formula (which is mentioned in Table 1), and the total time estimate was calculated. The test result shows that the patient is expected to wait for 5 hours. If it is considered as benchmark time, then if the patients happen to wait more than 5 hours is an indicator that they are in the zone of tolerance. The organization should take steps to protect those patients by providing adequate facilities and proper explanations for exceeding the time limit. Otherwise, long waiting time will have an adverse effect on patient flow in the future.

Respondents' opinions on Pre-test and Post-test Waiting Time and the level of satisfaction.

TABLE 2: RESPONDENTS' OPINION ON WAITING TIME AND THE LEVEL OF SATISFACTION

waiting time	Pre-test Total	Per cent	Post-test total	Per cent	Highly Dissatisfied	Dissatisfied	Neutral	Satisfied	Highly Satisfied
No idea	15	20.3	8	10.8	1	0	2	4	1
2 hours	1	1.4	4	5.4	0	2	0	0	2
3 hours	2	2.7	2	2.7	0	0	2	0	0
4 hours	10	13.5	5	6.8	0	0	0	3	2
5 hours	23	31.1	19	25.7	0	0	0	9	10
6 hours	18	24.3	21	28.4	0	3	6	9	3
7 hours	3	4.1	6	8.1	0	2	1	2	1
8 hours	2	2.7	9	12.2	0	0	7	2	0
Total	**74**		**74**		**1**	**7**	**18**	**29**	**19**
Per cent		100		100	1.4	9.5	24.3	39.2	25.7

Source: Primary data

Table 2 shows the patients' opinions on waiting time. 20.3 % of respondents who visited the hospital for MHC without having any expectations concerning waiting time, and 10.8% of respondents had no idea about waiting time even after the test. These groups mostly visit the hospital again and again because time is not at all an issue for them. It shows that they have a very strong opinion on some other factors relating to medical tests. 31.1% of respondent exactly assumes the benchmark average waiting time. These groups might have good knowledge of the service process of the hospital. The management must be very careful to deal with this group. The result shows that 25.7% of respondents had got treated within that time limit as per their expectations. Patients who have come with the expectation of 6 to 8 hours were 31.1% but the post-test opinion of patients concerning time was 48.7% which indicates that many who come with the expectation of fewer than six hours have felt that they spent extra time to complete the test process. The reason for this perception needs to be confirmed with the patient case records kept by the hospital and should be the focus of future research because some patients' perceived waiting times were longer than expected. The impact of time could be seen in the opinion of the patient's satisfaction rating. 1.4% were highly dissatisfied with 9.5% dissatisfied and 24.3% not ready to say anything, which indicates they have some issue otherwise they would have expressed their satisfaction. Patients who come to the hospital without being aware of the waiting period and are extremely disappointed may decide not to return unless they have no other choice. Patients who expected a waiting time of six hours were dissatisfied or neutral which indicates they were not only

dissatisfied with the waiting time there may be some other factors disturbing them to feel satisfied with the service process. These groups were willing to spend more than the average benchmarking timing, so management has to monitor the service process and sort out the issues now and then to retain these groups of patients. 30.2% of patients who were satisfied with the treatment process indicate that they are loyal patients. They will come again for treatment. 25.7% were highly satisfied indicating that they will come back and there are chances they may also refer others for this MHC.

EXPECTED AND PERCEIVED OPINION OF RESPONDENTS CONCERNING SERVICE QUALITY

Table 3 weighted means score results reveal that expectation on responsiveness is 4.24 which has slightly reduced after completing test 4.21 whereas Assurance results remain the same for pre and post-test. The result of the weighted mean score on the empathy of the pre-test was low (4.17) than the post-test (4.23). The mean score results indicate that patients are delighted with the empathy of healthcare professionals during the test procedure, but their opinions on responsiveness had some issues, which are reflected in the post-test mean score.

DEMOGRAPHIC RESPONDENTS' OPINION ON SERVICE QUALITY

Hypothesis: There exists a significant difference between demographic respondents (age, gender, occupation, monthly income, qualification, and the number of visits) and their opinion on responsiveness, assurance, and empathy.

TABLE 3 WEIGHTED AVERAGE ANALYSIS OF SERVICE QUALITY

	Responsiveness		Assurance		Empathy	
	Expected (Pretest)	Perceived (Post-test)	Expected (Pretest)	Perceived (Post-test)	Expected (Pretest)	Perceived (Post-test)
Mean	4.24	4.21	4.31	4.31	4.17	4.23
SD	0.787	0.688	0.659	0.656	0.797	0.642

Source: Primary data

TABLE 4: ANOVA AND T-TEST ANALYSIS

Socio-Demographic Characteristics	Freque ncy	Per cent	Responsiveness		Assurance		Empathy	
			Expected (Pretest)	Perceived (Post-test)	Expected (Pretest)	Perceived (Post-test)	Expected (Pretest)	Perceived (Post-test)
Gender			T-test (Sig)	T-test (Sig)	T-test (Sig)	T-test (Sig)	T-test (Sig)	T-test (Sig)
Male	43	58	0.409 (0.684)	1.759 (0.083)	1.847 (0.069)	1.889 (0.063)	1.006 (0.318)	0.835 (0.407)
Female	31	42						
Total	74	100						
Age			F(Sig)	F(Sig)	F(Sig)	F(Sig)	F(Sig)	F(Sig)
Below 20	2	3						
20-30 years	19	26						
30-40 years	17	23	2.073 (.094)	2.307 (.067)	0.843 (0.503)	2.808 (0.032)*	2.605 (0.043)*	1.267 (0.291)
40-50 years	19	26						
Above 50	17	23						
Total	74	100						
Occupation								
Private	29	39						
Public	7	9						
Self-employed	17	23	1.619 (0.179)	2.382 (0.060)	2.780 (0.33)*	4.192 (0.004)**	2.278 (0.70)	4.432 (0.003)**
Homemaker	14	19						
Retired	7	9						

Total	74	100						
Monthly Income								
No Income	7	9						
Less than Rs10,000	8	11						
Rs.10,000-20,000	13	18						
Rs.20,000-30,000	15	20	1.362 (0.250)	1.369 (0.247)	2.381 (0.047)*	1.356 (0.252)	2.446 (0.042)*	2.032 (0.085)
Rs.30,000-Rs.40,000	10	14						
Above Rs.40,000	21	28						
Total	74	100						
Qualification								
Professionals	17	23						
Degree Holders	37	50						
Diploma	9	12	0.080 (0.988)	1.186 (0.325)	0.981 (0.424)	1.570 (0.192)	0.317 (0.866)	2.538 (0.048)*
Schooling	8	11						
No Academic	3	4						
Total	74	100						
No. of Visits								
First	49	66						
Second	16	22						
Third	1	2	3.631 (0.017)*	7.630 (0.000)**	2.126 (0.105)	4.126 (0.009)**	1.408 (0.248)	5.111 (0.003)**
Four and above	8	10						
Total	74	100						

Source: Primary data

Note * significant at 5 % level

** significant at 1% level

Table 4 shows that there exists a significant difference between age group respondents' opinions on assurance concerning perceived service which revealed that there are differences of opinion among age group respondents on assurance on their perceived service. The same age group respondents have significant differences in empathy before taking the test (F=2.605, P =0.043*) but there exists no significant difference after the test which indicates age group respondents have the same opinion on empathy which is perceived well. The results show that gender groups have no significant difference concerning responsiveness, assurance, and empathy. There is a significant difference among occupational groups between expected (2.780, p=0.33*), and perceived (4.192, p=0.004**) opinions on Assurance given by health workers relating to MHC. The results relating to a perceived opinion on empathy show that there are significant differences among occupational groups (4.432, P=0.003**). Qualification groups have a significant difference in perceived opinion on empathy (2.538, p=0.048*). There is a significant difference between the monthly income group's expected opinion on assurance (2.381, p=0.047*), and empathy (2.446, p=0.042*). The results relating to the number of visits shows that there are significant differences among the groups on expected and perceived opinion on responsiveness, But there is a significant difference between the respondents perceived opinion on assurance(4.126, p=0.009**) and empathy (5.111, p=0.003**) which indicates that after getting the treatment they have some issues.

TABLE 5: TIME AND OVERALL OPINION ON SERVICE QUALITY

Level of Satisfaction with waiting time	Overall opinion on Service Quality			Total	Per cent
	Delight Per cent	Satisfied Per cent	Dissatisfied Per cent		
Highly Dissatisfied	0.0	1.4	0	1	1.4
Dissatisfied	4.1	5.4	0	7	9.5
Neutral	1.4	23.0	0	18	24.3

Satisfied	10.8	28.4	0	29	39.2
Highly Satisfied	14.9	10.8	0	19	25.7
Total	31.1	68.9	0	74	100

Source: Primary data

Table 5 shows that the highly satisfied respondents (25.7 %) with waiting time but comparatively less (14.9 %) were delighted with the overall opinion on service and the remaining (10.8 %) respondents were satisfied with the overall service which indicates that they have some issues preventing them to feel delighted while getting treatment other than waiting time. 24.3 %, 9.5% and 1.4% (26 patients out of 74) were neutral, dissatisfied and highly dissatisfied respective concerning time, which indicates that some time factors prevent them to feel satisfaction at the time of MHC. This needs to be identified and addressed otherwise their level of tolerance may go adverse.

DISCUSSION

While considering treatment, it is quite natural that each person has their own opinion and assumption about service quality but after taking treatment if the patients have differences of opinion, then there are some other factors, they need to pay attention to so as to improve. The overall weighted mean results revealed that perceived opinion on responsiveness was slightly lower than the expected result which may lead to crossing the level of the zone of tolerance and there are chances patients may stop visiting the hospital for taking MHC due to non-responsiveness. The findings of the F test (Table 4) indicate that the zone of tolerance may be influenced by demographic factors. After receiving medication, 'assurance' differs significantly among age groups, occupational categories, and visit frequency groups. The perceived opinions on 'empathy' vary significantly among occupational and qualification groups. The findings showed that the zone of tolerance for qualified and employed groups may be influenced by the 'empathy' of health care workers. The number of visits results indicates that some issues may cross their zone of tolerance level on all the three factors of responsiveness, assurance, and empathy. This needs to be focused on to sort out the issues, otherwise, there are chances the new or the old patients may not visit again.

Time study and overall opinion on service quality results (Table 5) revealed that the patients who were dissatisfied with time are satisfied and delighted with overall services. Patients who were in the neutral concerning time factors are satisfied with the services and no one is dissatisfied with the overall services. Table 2 also revealed that patients who have visited the hospital with no idea of time for getting treatment are satisfied and highly satisfied with the time. This reveals that waiting or other time issues can be overcome through effective service quality.

CONCLUSION

The indicators of Zone of Tolerance would be measured through the expected and perceived opinions of the respondents and provide an insight into the relative importance of each dimension of SERVQUAL which are useful for developing quality improvement strategies. [12]

Patients who come for MHC will have certain expectations. Occupation and monthly income group respondents expect assured service. Age groups and monthly income groups expect empathy. The numbers of visits groups expect responsiveness.

If healthcare professionals and management are able to adhere to patients' expectations, the organization will be able to satisfy them, and if they go above and beyond, they will be able to delight them. Johnston [4 p.10] stated that "there are weak points or fail points in a service system that may be too expensive or difficult to remove, the service designer or operator could try to compensate for them by including several high spots in the process". Time was highlighted as the main problem of many patients, which needs to be fixed but the customer perceived waiting for time and satisfaction opinion on overall services may compensate for the time issue.

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CORONAVIRUS RELATED HEALTH LITERACY: A CROSS-SECTIONAL STUDY DURING THE COVID-19 INFODEMIC IN IRAN

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ABSTRACT

INTRODUCTION:

Health literacy is the ability to obtain, read, understand and use healthcare information to make appropriate health decisions and follow treatment guidelines. This type of literacy is one of the key issues of the World Health Organization. With the onset of COVID-19 disease, the public needs to have access to new and accurate information. The present study investigated the Coronavirus-related health literacy in COVID-19 patients referred to a teaching hospital in a developing country and its relationship with demographic variables.

METHOD:

This survey research is a descriptive-analytical type. The research instrument includes coronavirus-related health literacy questionnaires (HLS-COVID-Q22) which was approved and used in 2020. Patients with COVID-19 were referred to Imam Reza teaching hospital in Mashhad-Iran from December 5, 2020 to July 5, 2021. The samples were selected using a sample size determination formula of 190 people. Statistical analysis was performed with SPSS26 software.

RESULTS:

The overall average score of health literacy related to coronavirus in patients with COVID-19 at Imam Reza teaching hospital in is 84.31 which is the desired level. Among the dimensions of health literacy, the highest score belonged to "Understanding health information" (D3) with a mean (standard deviation) of 23.38 (5.66) and the lowest score belonged to "Evaluate health information" (D1) with a mean (standard deviation) of 19.03 (4.69). According to the p- value (0.001) of the test, "Age" as a demographic factor, is the only factor that has been associated with health literacy related to the coronavirus.

CONCLUSION:

Although the level of Coronavirus-related health literacy is favorable in this study, the participants in this study were mostly patients who were able to answer the research questions, were not hospitalized, had a sufficient level of literacy to understand the questionnaire questions, and most of them were medical staff who were familiar with the components of health literacy. However, considering that health literacy training related to Coronavirus has an effective role in disease prevention and control, therefore, creating and promoting the necessary platform for teaching the components of health literacy, especially for elders is recommended by trustees and policymakers. Lack of proper evaluation of information sources leads to improper health practice. So, holding training sessions, using social media facilities, holding workshops

and developing programs related to teaching health literacy-related components of COVID-19 in public media will help increase public awareness during the Corona pandemic.

INTRODUCTION

In late 2019, a new strain of Coronavirus called COVID-19 was reported from Wuhan, China, which caused a great deal of anxiety and panic among the people of the world as the disease spread rapidly in China and then to other parts of the world. . The World Health Organization (WHO) said in a statement that the virus was causing a public health emergency around the world. [1]

We all faced "infodemic" related to the COVID-19 epidemic, which led to the release of large amounts of valid and invalid information around the world. Infodemic is an "information epidemic", a phenomenon that depicts the spread and amplification of large amounts of valid and invalid information on the Internet or through other communication technologies. [2]

With the onset of the COVID-19 epidemic, the production and consumption of corona-related information have increased rapidly and significantly. [3]

The rapid spread of the virus, the lack of vaccines, and definitive specific treatment at the time of the outbreak caused countries to face large numbers of infected people and create challenges in various areas of health, economic, political, social, and so on. Some of these challenges are directly and indirectly related to people's health literacy. Improving the level of health literacy can solve or reduce some of these challenges.

Health literacy has been recognized in recent years as one of the most important skills for making appropriate decisions in difficult situations for patients (4). Health literacy means obtaining health information from the right sources and using the information correctly to interpret it to improve our health. [5]

Health literacy helps a person make informed choices and manage their health status more appropriately. [6] Health literacy is not only related to the individual but can also be effective as a social component of health and affect society. [7]

In other words, health literacy is one of the basic skills needed by people to find, understand, evaluate, communicate and use information and health services. [8] It is used in different forms in different environments throughout life to promote a person's health. Increasing health literacy in populations is critical to achieving equal access to health services. [9]

In recent years, improving health literacy related to the specific type of diseases such as Corona [2], hypertension [10], diabetes [11], and some other diseases like these, has become an important skill for patients that can increase their decision-making power in difficult health situations. This matter can reduce health threats, effective prevention of patients, increase the quality of life, and improve the quality of patient care.

Also, promoting health literacy can improve the access and use of health services in different groups of society and prevent the imposition of huge costs of diagnosis and treatment on the country's health system. [12,13]

Reviews in the field of COVID-19 show that Coronavirus-related health literacy has become particularly important with the spread of the disease. [14]

These days information about COVID-19 has been published on most channels and information networks. People empowered with Coronavirus-related health literacy components can distinguish between reliable and inaccurate information about COVID-19. [2,4,15–19]

This matter leads to more effective use of reliable information resources and consequently more effective use of health services and enables people to make informed health decisions and engage in healthy and protective behaviors. [2]

Our investigations showed that no research has been conducted to assess Coronavirus-related health literacy in Iran. This cross-sectional study aims to evaluate coronavirus-related health literacy among patients with COVID-19 referred to a teaching hospital in Iran. The results of this study can clarify the level of health literacy in patients; provide valuable information to health policymakers and administrators for effective and targeted planning to improve Coronavirus-Related Health Literacy.

METHODS

This cross-sectional survey is a descriptive applied study.[20] The population of the study includes all patients diagnosed with COVID-19 referred to Imam Reza teaching hospital of Mashhad-Iran. University of Medical Sciences from December 5, 2020 to July 5, 2021 who were moderately ill at the time of referral and could fill in the questionnaire or reply to the questions of the interviewer.

Considering the minimal value of correlation between the health literacy related to COVID-19 score and demographic variables at the level of 0.20 and the significance level of 0.05 and the power of 80%, the sample size has been calculated using the formula below:

$$n = \left(\frac{z_{1-\frac{\alpha}{2}} + z_{1-\beta}}{0.5\ln(\frac{1+r}{1-r})} \right)^2 + 3$$

Using this sample size formula, 190 patients were studied who all declared their consent to participate in the study 230 questionnaires were distributed among the available statistical population. A total of 190 questionnaires, as many samples as needed, were returned.

The assessment tool used in this study is the Corona Virus-related Health Literacy Questionnaire, which was approved and used in 2020 [2], this tool includes 22 questions in 4 dimensions, including (D1) evaluate health information (5 questions), (D2)Access health information (6 questions),(D3) Understanding health information (6 questions) and (D4) apply health information (5 questions).These questions were answered on a 5-point Likert scale (5 = Always, 4 = Most of the time, 3 = Sometimes, 2 = Seldom, 1 = Never). The adequate level of health literacy is between 81-110, the borderline level is between 52-80, and the inadequate level is between 22-51. The internal consistency of the questionnaire was confirmed with Cronbach's alpha coefficient of 0.94%; its reliability calculated with a correlation coefficient of 0.96% was confirmed. [2]

Data were analyzed using SPSS26 software. Descriptive statistics including frequency, percentage, mean, median and standard deviation are used to perform descriptive statistics. Pearson's correlation coefficient was used in the inferential statistics section.

RESULTS

DEMOGRAPHICS:

Responses show that 52.1% of the participants were female (n=99) and 47.9% of them were male (n=91). Most of the participants were between 30 - 50 years old (54.2%) , under-educated (41.6%) and employed medical staff (86.3%) . The monthly income of most participants was between 30-60 million Rials (64.2%). The level of English proficiency among the participants was moderate (54.2%).

TABLE 1: DEMOGRAPHIC INFORMATION OF THE PARTICIPANTS

Variables	(n=190)	Frequency	Percentage %
Gender	Male	91	47.9
	Female	99	52.1
Age	< 30	72	37.9
	30-50	103	54.2
	>50	15	52.1
Education	Diploma and less	79	41.6
	Associate	11	5.8
	Bachelor	73	38.4
	Master and higher	13	6.9
Work status	Unemployed	3	1.6

	Homemaker	9	4.7
	Retired	4	2.1
	Student	10	5.3
	Employed medical staff	164	86.3
Household income	Below 30 million Rials	7	3.7
	30 – 60 million Rials	122	64.2
	60 million Rials +	27	14.2
English language proficiency	Very High	17	8.9
	High	55	28.9
	Moderate	103	54.2
	Low	11	5.8
	Very Low	2	1.1

TABLE 2: TYPES OF HEALTH INFORMATION SOURCES RELATED TO COVID-19

	Variables	Variable levels	Frequency	Percentage %
1	Physicians and health staff	No	61	32.1
		Yes	129	67.9
2	Internet	No	104	54.7
		Yes	86	45.3
3	Interactive Voice Response	No	184	96.8
		Yes	6	3.2
4	Radio/ Television	No	147	77.4
		Yes	43	22.6
5	Magazine/ Newspaper	No	171	90
		Yes	19	10
6	Friends and acquaintances	No	157	82.6
		Yes	33	17.4
7	Brochure/Booklet/Leaflet	No	163	85.8
		Yes	27	14.2
8	Search engines (Google, Yahoo, Bing)	No	93	48.9
		Yes	97	51.1
9	Life sciences and biomedical information databases	No	131	68.9
		Yes	59	31.1
10	Social Media	No	96	50.5
		Yes	94	49.5
11	Health websites on COVID-19	No	155	81.6
		Yes	35	18.4
12	Website of infectious diseases specialists	No	159	83.7
		Yes	31	16.3
13	Others	No	171	90
		Yes	19	10
14	I do not actively search for information	No	182	95.8
		Yes	8	4.2

Most of the participants obtained the information related to COVID-19 mostly by asking "Physicians and health staff" (67.9%). After this, "Internet" (45.3%), "Radio/ Television" (22.6%), "Friends and acquaintances" (17.4 %) and "Brochure/Booklet/Leaflet" (14.2 %) were each respectively the source of health information related to COVID-19. Also among the internet-based sources of health information related to COVID-19 used among the participants were search engines such as Google, Yahoo, and Bing (51.1) After this, social media (49.5%), life sciences and biomedical information databases (31.1%), health websites on COVID-19 (18.4%), and Website of

infectious diseases specialists (16.3%) were the Internet-based sources for obtaining information related to COVID-19, respectively.

It shows that the mean (standard deviation) of health literacy is 84.31 (18.41). Among the dimensions of heath literacy, the highest score belonged to "Understanding health information" (D3) with a mean (standard deviation) of 23.38 (5.66) and the lowest score belonged to "Evaluate health information" (D1) with a mean (standard deviation) of 19.03 (4.69).

TABLE 3: CORONAVIRUS-RELATED HEALTH LITERACY RATES IN PARTICIPANTS

Variables	Dimensions		Min	Max	Mean	SD
Coronavirus-Related Health Literacy	D1	Evaluate health information	5	25	19.03	4.69
	D2	Access health information	6	30	22.21	4.88
	D3	Understanding health information	6	30	23.38	5.66
	D4	Apply health information	5	25	19.67	4.78
Total (N=190)			22	110	84.31	18.41

TABLE 4: CORONAVIRUS-RELATED HEALTH LITERACY LEVEL BASED ON THE GENDER OF PARTICIPANTS

	Inadequate health literacy		Borderline health literacy		Adequate health literacy		Total	
	Frequency	Percentage %	Frequency	Percentage %	Frequency	Percentage %	Frequency	Percentage %
Female	5	5.1	29	29.3	65	65.7	99	100
Male	7	7.7	22	24.2	62	68.1	91	100
Total	12	6.3	51	26.8	127	66.8	190	100

Results show that 65.7% of women and 68.1% of men in this study had an adequate level of health literacy. 5.1% of women and 7.7% of men had an inadequate level of health literacy.

26.8% of participants had borderline health literacy.

According to the p-value for the test reported, it can be said that only "Age" (p-value 0.001) affects the level of Coronavirus-Related Health Literacy. "Gender" (p-value 0.705), "Education" (p-value 0.14) and "Household income" (p-value 0.871) don't affect the level of Coronavirus-Related Health Literacy.

TABLE 5: THE IMPACT OF AGE, GENDER, EDUCATION AND HOUSEHOLD INCOME ON CORONAVIRUS-RELATED HEALTH LITERACY LEVEL

Age	Min	Max	Mean	SD	p-value
< 30	22	109	85.25	16.36	
30-50	22	110	86.43	16.20	0.001
>50	25	108	65.20	29.63	

Gender	Min	Max	Mean	SD	p-value
Women	22	110	84.79	17.85	0.705
Men	22	110	83.87	19.09	
Education					
Diploma and less	22	110	82.08	18.02	
Associate	59	109	89.18	17.18	0.14
Bachelor	22	109	88.26	15.75	
Master and higher	25	109	86.76	22.80	
Household income					
Below 30 million Rials	72	109	89.14	14.73	
30 – 60 million Rials	22	110	87.24	16.55	0.871
60 million Rials +	60	109	89.29	13.95	

P-value<0.05

TABLE 6: INFERENTIAL STATISTICS OF THE PAIRWISE COMPARISON OF CORONAVIRUS-RELATED HEALTH LITERACY LEVEL BY AGE

Age	Variables	Min	Max	MD	SD	p-value
<30	30-50	-7.72	5.35	-1.18	2.70	1.00
	>50	7.96	32.13	20.05	5.00	0.001
30-50	>50	9.46	33.00	21.23	4.87	0.001

It is seen that there is no significant difference in Coronavirus-Related Health Literacy levels in the group of less than 30 years and 30 to 50 years, but there is a significant difference in Coronavirus-Related Health Literacy levels in other groups.

DISCUSSION

Health literacy is important for every person if they are to meet the problems related to health or not. We all need to be able to find, understand, and use health information and services. Taking care of our health is part of everyday life, not just when we visit a doctor, clinic, or hospital. Health literacy can help us prevent health problems, protect our health, and better manage health problems when they arise. [21] As a public health strategy, health literacy as a social vaccine enables individuals and communities to reduce the spread of the virus by understanding and applying the information provided through governments and health authorities. [15] The research findings in this study, which was conducted in a teaching hospital, showed that the overall average score of health literacy related to coronavirus in patients with COVID-19 at Imam Reza teaching hospital in is 84.31 which is the desired level. These results are consistent with the research of Okan [2], Li [22], and also the study by Silva et al. [18] It seems that the participants were interested in performing protective

preventive behaviors in the coronavirus epidemic, and the high level of health literacy related to the coronavirus indicates this claim. In the study of McCaffery et al., it is also mentioned that the level of sufficient health literacy causes adherence to preventive behaviors in the face of the coronavirus, and it is in line with the present study. [23] In the study of Niu et al., the average score for performing preventive behaviors is at a favorable level, so it can be said that it is in some way aligned with the results of the present study. [24] The findings of Eronen et al.'s study are also consistent with this research. [25] Of course, it should be kept in mind that the patients with coronavirus in this study were mostly patients who were able to answer the research questions, were not hospitalized, had a sufficient level of literacy to understand the questionnaire questions, and most of them were medical staff who were familiar with the components of health literacy. These factors can have an on increasing the average score of health literacy related to the coronavirus, which is consistent with the findings of Do et al.'s research. [26] Corona patients hospitalized in this hospital were not in a condition to answer the questions of the questionnaire. The more acute disease in this group of patients may be due to the lower level of health literacy and less preventive behavior.

However, 33.2% of the participants in this study had borderline and insufficient health literacy. The average score of health literacy in the dimension of "evaluate

health information" and "Apply health information" is low compared to other dimensions. Health information can be extremely useful, empowering us to make important health decisions. However, health information also can be confusing and overwhelming. Given the wealth of information available through the Internet, journals and other sources, it's important to be able to assess its quality. Therefore, to improve these dimensions, it is suggested to provide effective training in the field of health information and then the effective use of this information in health situations. While the general level of health literacy is high, the participants had difficulties in facing the information about the coronavirus. Since COVID-19 is a global pandemic, the stress and anxiety caused by the disease have caused everyone to seek health information about COVID-19. This requires the formation of targeted public information campaigns and promotion of public health literacy to identify misinformation, and as a result, decisions will be based on correct and reliable information and better performance will take place.

Social media is an effective tool to promote the prevention behaviors of COVID-19 among people. Therefore, effective training in this field can be done through social networks and mass media. The availability of information has an undeniable effect on the health literacy of patients. Also, librarians can be effective in evaluating health information related to the coronavirus by teaching them how to search for information and specialized information.

In this Study, "age" as a demographic factor, is the only factor that has been associated with health literacy related to the coronavirus, which means that increasing age has been associated with a decrease in the level of literacy related to the coronavirus. Therefore, health politicians should prepare related educational programs and design appropriate interventions to improve and increase the level of health literacy related to the coronavirus, especially for elders.

Although we tried our best to make the research as comprehensive as possible, but we had some limitations. The research population was people who were able to complete the questionnaire, were not hospitalized, had a sufficient level of literacy to understand the questionnaire questions, and most of them were medical staff who were familiar with the components of health literacy. We did not have access to the information of people hospitalized.

CONCLUSION

Holding training sessions, using social media facilities, holding workshops, and developing programs related to teaching health literacy-related components of COVID-19 in public media will help increase public awareness during the Corona pandemic.

CONFLICT OF INTEREST
The authors have no conflicts of interest to declare.

AUTHOR CONTRIBUTIONS
Zandkrimi, Sana: writing—original draft preparation
Kazerani, Maryam: methodologist, writing—review and editing, supervisor.
Mottaghi, Mahdieh: data gathering.
Kazerani, Marzieh: infectious disease specialist, advisor
Jambarsang, Sara: statistical advisor

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RESEARCH ARTICLE

A SURVEY OF THE SIDE EFFECTS OF PFIZER/BIONTECH COVID-19 VACCINE AMONG VACCINATED ADULTS IN IRAQ

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ABSTRACT

BACKGROUND:

Pfizer-BioNTech vaccine was one of the first vaccines developed for COVID-19 to be used in Iraq. While the benefits of the vaccine outweigh the risks, potential side effects remain major concerns for people and can increase vaccine hesitancy despite usually being short-lasting and mild. This study aimed to evaluate the side effects of Pfizer-BioNTech vaccination among vaccinated adults in Erbil city, Iraq.

METHODS:

A cross-sectional study was carried out with a convenience sample of 401 subjects who received the Pfizer vaccine in nine public healthcare centres in Erbil, Iraq, on February 20th, 2022, and April 17th 2022. Data were collected through interviews with the patients using a questionnaire designed by the researchers. A p-value ≤ 0.05 was considered statistically significant.

RESULTS:

The prevalence of side effects was 84.4%. Among participants who experienced side effects, the most common was pain at the injection site (93.1% for the first dose and 88% for the second dose). For the first dose, the onset of side effects on the vaccination day (day zero) was reported by 78.9% of those experiencing side effects, and the duration was one day for 45.4% of participants. Severity was rated as mild by 54.3%, and similar results were found for the second dose. Analgesics were used following the first dose by 47% of participants, which resulted in good relief for 96.6% of patients using them, and similar results were found for the second dose.

CONCLUSIONS:

Most participants who received the Pfizer-BioNTech vaccine experienced side effects, the most common of which was pain at the injection site, which was reported for both the first and second doses.

KEYWORDS

COVID-19, vaccine uptake, vaccine effects, Kurdistan, Iraq

INTRODUCTION

SARS-CoV-2 virus (COVID-19) is a viral infectious disease categorised by the World Health Organization as a global pandemic on March 11th, 2020 [1]. To date, over 490 million cases of COVID-19 infection have been recorded by WHO worldwide, along with roughly 6 million death cases [2]. COVID-19 can cause various clinical symptoms ranging from fever, cough, and loss of taste and smell to chest pain [3] and dyspnoea in moderate to severe cases [4]. An important public health intervention to control the spread of COVID-19 infections is vaccination. Massive vaccination campaigns have been carried out all over the world to fight the pandemic [5]. Nearly 190 COVID-19 vaccines are in various stages of preclinical and clinical development, and a cluster has received Emergency Use Authorization (EUA) and are approved by WHO in different states worldwide. The most famous include Moderna mRNA-1273 and Pfizer-BioNTech (BNT162b2), which depend on messenger RNA (mRNA) technology, and Janssen Ad26.CoV2.S and Oxford-AstraZeneca AZD1222, which depend on non-replicatable viral vector platforms [6].

Pfizer-BioNTech's BNT162b2 vaccine is an mRNA-based COVID-19 vaccine invented by Pfizer and the German company BioNTech during a collaborative effort, which was approved for emergency use in many countries in late 2020. There are two generations of this mRNA vaccine, BNT162b1 and BNT162b2, both of which were invented by PfizerBioNTech collaboration. BNT162b1 is a lipid-nanoparticle (LNP)-delivered mRNA vaccine that express the RBD (trimer) of the "S" protein bound by T4 foldon (the natural domain of T4 fibritin trimerisation) (NCT04368728) [7]. In accordance with a report in the New England Journal of Medicine (NEJM), the efficacy of Pfizer and BioNTech vaccines increases significantly from 52% after the first dose to 95% after the second dose; thus, a double dose regimen for COVID-19 is recommended for people aged 16 years and older [8]. Most Pfizer–BioNTech COVID-19 vaccine side effects are mild to moderate in severity and usually go away within a couple of days [9].

During clinical experiments, the most common side effects (found among more than 1 in 10 of patients receiving the vaccine doses) are (in sequence of frequency): pain and swelling at the site of injection, fatigue, headache, muscle aches, chills, joint pain, and fever. Fever is more prevalent after the second dose [10]. Serious hypersensitivity reaction has been noted in nearly eleven cases per million doses of vaccine given. In accordance with an announcement published by the US Centres for Disease Control and Prevention, 71% of the hypersensitivity reactions occurred within 15 minutes after vaccination, and most frequently (81%) within people with a recorded history of hypersensitivity or hypersensitivity reactions [11]. The majority of side effects disappear on their own after a few days. It is recommended by WHO that side effects are handled with rest, sufficient non-alcoholic liquids, and medication to minimise pain and fever, if necessary. WHO does not recommend taking any pain medication before getting vaccinated, as it is unknown how this might influence vaccine efficacy [12].

Research has shown that the side effects of COVID-19 vaccination were most prevalent (about 80%) among individuals who received Pfizer-BioNTech and Moderna vaccines and were least common among those who received Sinopharm and Sinovac vaccines (21%-28%) [13]. Although the side effects after the Pfizer-BioNTech vaccine are common, they are usually mild and self-limited. Local reactions like pain at the injection site are the most common. Other common side effects include fever and headache. Anaphylactic shock or severe reactions are rare [13, 14]. For example, a systematic review has shown that the most frequent side effects of Pfizer-BioNTech were injection site pain (77%), followed by fatigue (43%), muscle pain (40%), local swelling (34%), and headache (33%). Other less common side effects were also reported, including joint pain, chills, fever, itching, lymph nodes swelling, nausea, dyspnoea and diarrhoea. These side effects were more common after the second dose compared with the first dose (84% vs. 79%) and in females compared with males (69.8% vs. 30.2%) [14].

The acceptability of COVID-19 vaccination might be based on the perceived susceptibility to and severity of COVID-19, concerns about vaccine efficacy and safety, and the influence levels of information from various sources [15]. This study is based on the Health Belief Model, which postulates that the likelihood of an individual adopting specific health behaviour is determined by the belief in a personal threat of illness or disease, together with a belief in the effectiveness of the recommended health behaviour. The main constructs targeted by the theoretical model include attitudes toward the perceived threat of infection and attitudes regarding perceived expectations of vaccination. The latter include perceived risks, benefits, and barriers [15, 16]. This study focuses on the perceived risks of vaccination, particularly the side effects.

In general, people have major concerns about the side effects of COVID-19 vaccines, and these concerns made some people refuse to get vaccinated and even adopt stringently anti-vaccine attitudes [17]. It is the responsibility of the scientific community and healthcare providers to educate people with an evidence-based approach about the vaccine's side effects and explain that the benefits of vaccination outweigh the risks, along with the fact that the side effects are generally temporary [10]. Basic information about common side effects can prepare people and minimise interference with daily activities. This study aimed to evaluate the side effects of Pfizer and BioNTech vaccine among vaccinated adults in Erbil City, Iraq.

SUBJECTS AND METHODS

STUDY DESIGN: CROSS-SECTIONAL STUDY.

Study setting: Across nine public vaccination centres in Erbil City, the Capital of the Kurdistan Region, Iraq. Those who attended for vaccination at these centres did so voluntarily.

Time of the study: The study was conducted between January 2022 and June 2022. The data was collected between February 2022 and March 2022.

Study sample (size): The calculated sample size was 384.16, estimated through Cochrane's formula, which we rounded up to 385, adding an additional 30 to the target sample size to overcome non-response. Fourteen individuals with Pfizer-bioNTech refused to participate; thus, the non-response rate was 3.37%. In the end, 401 samples were collected and analysed.

Sampling method: The data was collected through the convenience sampling method.

Data collection and questionnaire: Data was collected through a questionnaire designed by the researchers comprising three parts: (1) sociodemographic characteristics (age, gender, ethnicity, residence, monthly income, occupation, education level); (2) knowledge and medical history; and (3) questions about the participant reported side effects in two different sections, concerning first and second dose experiences. The list of potential side effects was based on

the lists reported by the clinical experiments of the vaccine and previous research studies. It included pain and swelling at the injection site, fatigue, headache, muscle aches, chills, joint pain, and fever. Fever is more prevalent after the second dose [10]. The questionnaire was designed in the Kurdish and Arabic languages and was administered according to the participant's native language or preference.

Ten experts in the field evaluated the content and face validity of the study questionnaire. The calculated content validity index was 0.87, and the content validity ratio was 0.89. The study questionnaire was pilot tested on 12 participants to assess its clarity, comprehensibility, acceptance, and internal consistency. The reliability was assessed using a test-retest approach. Kappa statistic was calculated, which showed a reliability coefficient of 0.77.

Techniques to ensure data quality control and reduce potential biases include having a large sample size, data on a number of confounders, and minimal missing data. Responses with significant missing data were excluded from the analysis to reduce bias caused by missing data.

Statistical analysis: Data entry and analysis were done using SPSS (version 26) software. Data was presented in the form of frequencies and percentages for categorical data. Associations between categorical variables were measured using the Chi-square test. When the expected count for more than 20% of the cells in the contingency table was less than 5, Fisher's exact test was used instead. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

SOCIOECONOMIC CHARACTERISTICS OF PARTICIPANTS

The largest cohort of participants were aged between 20 and 34 (45.5%), and only 0.49% were above or equal to 80 years. Most participants were male (69.1%), and 90.5% were of Kurdish ethnicity. Over a third (34.2%) were public employees, while 4.2% were retired. Around 34% were graduates or postgraduates, while 7.9% were illiterate. Most (87.8%) were residents in urban areas. Most participants were married (65.8%), and a single subject was a widow (0.24%). The majority considered their monthly income sufficient (86%), while 4.3% considered it more than sufficient monthly income (Table 1).

TABLE 1. SOCIODEMOGRAPHIC CHARACTERISTICS OF THE STUDY PARTICIPANTS

Variable	No.	(%)
Age group		
< 20	24	(5.9)
20 – 34	183	(45.6)
35 – 49	110	(27.4)
50 – 64	62	(15.4)
65 – 79	20	(4.9)
≥80	2	(0.49)
Gender		
Male	277	(69.1)
Female	124	(30.9)
Ethnicity		
Kurd	363	(90.5)
Arab	27	(6.7)
Turkmen	11	(2.7)
Occupation		
Student	67	(16.7)
Not employed	28	(7)
Public employee	137	(34.2)
Private sector employee	105	(26.2)
Housewife	47	(11.7)
Retired	17	(4.2)
Educational level		
Illiterate	32	(7.9)
Read and write/Primary	68	(16.9)
Secondary	76	(18.9)
Undergraduate	90	(22.4)
Graduated / postgraduate	135	(33.6)
Residence		
Urban	352	(87.8)
Suburban	49	(12.2)
Marital status		
Single	136	(33.9)
Married	264	(65.8)
Widow	1	(0.24)
Monthly income		
Insufficient	39	(9.7)
Sufficient	345	(86)
More than sufficient	17	(4.3)
Total	**401**	**(100)**

KNOWLEDGE OF PARTICIPANTS ABOUT THE VACCINE AND THEIR MEDICAL HISTORY

The majority (62.6%) of participants considered themselves knowledgeable about the vaccine's side effects. In Regard to reasons why they preferred the Pfizer-bioNtech vaccine over the other types of COVID-19 vaccines, 33.9% stated that they considered it to have better efficacy and fewer side effects, while 7.5% stated this was due to mandatory vaccination from their employers (Table 2).

TABLE 2. REASONS FOR CHOOSING PFIZER-BIONTECH VACCINE

Reasons	No.	(%)
Efficacy and less side effects	136	(33.9)
Popularity	95	(23.6)
Travelling	59	(14.7)
Imposed by employer	30	(7.4)
No specific reason	81	(20.1)
Total	401	(100)

In regard to the medical history of participants, 19.5% had a current chronic disease (including hypertension, diabetes, asthma, cardiovascular, and respiratory conditions), and 8.7% had a positive history of allergy to common allergic agents. Almost half of the participants (49.4%) reported having had a COVID-19 infection before the vaccination (Table 3).

SIDE EFFECTS OF COVID-19 VACCINE

Over a third (n=140, 35%) of participants had received one dose of the vaccine, while 261 participants (65%) had received both doses. The prevalence of side effects among those who had received only one dose was 84.4%. Among those who had received both doses, 58.8% reported side effects, including 19.9% (n=52) after the first dose, 14.2% (n=37) after the second dose, and 56.3% (n=147) after both doses (Table 4).

Results regarding differences in the occurrence of side effects in relation to demographic and medical history variables revealed no significant associations between age (p=0.406), gender (p=0.466), history of allergies (p=0.116), chronic disease (p=0.054), and previous history of COVID-19 (p=0.054) and the occurrence of side effects (Table 5).

TABLE 3. PAST MEDICAL HISTORY REPORTED BY PARTICIPANTS

Past medical history	No.	(%)
Chronic diseases (Hypertension, DM, respiratory diseases)	78	(19.5)
Allergy to common allergens	35	(8.7)
Prior COVID-19 infection	198	(49.4)
Total	311	(77.6)

TABLE 4. SIDE EFFECTS FOR SINGLE AND DOUBLE DOSED PATIENTS REPORTED BY PARTICIPANTS

No. of dose and presence of side effect	No.	(%)
Received one dose		
Had side effects	118	(84.3)
No side effects	22	(15.7)
Total	140	(100)
Received two doses		
Only in the first dose	52	(19.9)
Only in the second dose	37	(14.2)
In both doses	147	(56.3)
No side effects	25	(9.6)
Total	261	(100)

TABLE 5. DIFFERENCES IN SIDE EFFECTS OCCURRENCES RELATIVE TO SOCIOECONOMIC STATUS AND MEDICAL HISTORY

Variable	Side effects				Total		P value
	Had side effects		No side effects				
	No.	(%)	No.	(%)	No.	(%)	
Age group (years)							
< 20	21	(87.5)	3	(12.5)	24	(100)	
20 – 34	167	(91.3)	16	(8.7)	183	(100)	
35- 49	98	(89.1)	12	(10.9)	110	(100)	0.406*
50.- 64	51	(82.3)	11	(17.7)	62	(100)	
65 – 79	16	(80)	4	(20)	20	(100)	
≥ 80	1	(50)	1	(50)	2	(100)	
Gender							
Male	241	(87)	36	(13)	277	(100)	0.466
Female	113	(91.1)	11	(8.9)	124	(100)	
History of allergy							
has history of allergy	33	(94.3)	2	(5.7)	35	(100)	0.116*
no allergy	321	(87.7)	45	(12.3)	366	(100)	
Chronic disease							
has chronic disease	67	(85.9)	11	(14.1)	78	(100)	0.235
no chronic disease	287	(88.9)	36	(11.1)	323	(100)	
Prior COVID-19 infection							
has prior infection	181	(91.4)	17	(8.6)	198	(100)	0.054
no prior infection	173	(85.2)	30	(14.8)	203	(100)	
Total	354	(88.3)	47	(11.7)	401	(100)	

* Fisher's Exact Test is used (for others, Pearson Chi-Square test is used)

The common side effects after the first dose included local pain at the injection site (n=317, 93.1%), and there were two cases of allergic reactions (0.6%). Fatigue, fever, headache, and joint pains were reported less than local pain. The most common side effect after the second dose was again local pain at the injection site (n = 184, 88%), and joint pain (arthralgia) was the least experienced side effect (17.9%) (Table 6).

TABLE 6. SIDE EFFECTS OF FIRST AND SECOND DOSES OF THE VACCINE AMONG THE PARTICIPANTS

Dose	Local pain	Fatigue	Fever	Headache	Joint pain	Allergic reaction
1	295 (93.1)	147 (46.4)	101 (31.9)	101 (31.9)	34 (10.7)	2 (0.6)
2	162 (88)	85 (46.2)	88 (47.8)	69 (37.5)	33 (17.9)	0 (0)

Regarding the onset of the side effects after the first dose, the majority (78.9%) of participants reported that they experienced side effects on the day of vaccination (day zero), while only 0.6% of them reported onset three days after vaccination. For the second dose, similar results were found, with 80% of participants reporting that the onset of side effects occurred on the day of vaccination, while only 1.6% of participants reported it two days after vaccination (Table 7).

Regarding the duration of the side effects, for the first dose, the largest group of those experiencing side effects (45.4%) reported that they lasted only one day, while 3.8% reported four days and 6.3% reported five or more days. Similar figures were found for the second dose, with 45.7% of participants reporting one day of symptoms and 1.1% reporting four days (Table 7).

Regarding the severity of the side effects based on their interference with regular daily activities among those who reported side effects, following the first dose 54.3% reported

mild impacts, followed by moderate (33.1%), while over a tenth reported severe (12.6%). Following the second dose, almost half cited mild symptoms (49.5%), followed by moderate (37.5%) and then severe (13%) (Table 7).

The findings of onset, duration, and severity in regard to differences between the first and second dose were tested to determine any statistically significant difference between them; the results were only significant in duration (p=0.009), while there was no significant difference in severity (p=0.557) and onset (p=0.867 between first and second doses (Table 7).

TABLE 7. SIDE EFFECT ONSET, DURATION, AND SEVERITY WITH FIRST AND SECOND DOSE

Variable	First dose		Second dose		P value
	No.	(%)	No.	(%)	
Onset					
Same day	250	(78.9)	149	(81)	0.867*
After 1 day	60	(18.9)	32	(17.3)	
After 2 days	5	(1.6)	3	(1.6)	
After 3 days	2	(0.6)	0	(0.0)	
Duration					
1 day	144	(45.4)	84	(45.6)	0.009
2 days	94	(29.6)	73	(39.7)	
3 days	47	(14.8)	12	(6.5)	
4 days	12	(3.8)	2	(1)	
≥ 5 days	20	(6.3)	13	(7)	
Severity					
Mild	172	(54.2)	91	(49.4)	0.557
Moderate	105	(33.1)	69	(37.5)	
Severe	40	(12.6)	24	(13)	
Total	317	(100)	184	(100)	

* Fisher's Exact Test is used (for others, Pearson Chi-Square test is used)

DISCUSSION

Vaccines play major roles in preventing and controlling communicable diseases that may cause epidemics, including controlling and eliminating COVID-19. During the COVID-19 pandemic, the scientific community faced significant vaccine hesitancy among the general public [15], which reflected public fears due to the unprecedented public health measures being instituted (i.e., a general climate of fear surrounding the virus itself and lockdown policies) and the perception that novel vaccines (particularly in terms of mRNA technology) were being rushed to market as per emergency use authorisation. Consequently, there was much hesitancy concerning potential side effects, and media sensationalism in reporting rare adverse effects of vaccines such as thrombosis [18], myocarditis [19], and anaphylactic/allergic reactions contributed to vaccine hesitancy and refusal.

In the current study, the side effects were not significantly associated with the demographic and medical history variables of the participants. However, the current study included only a limited number of factors and did not assess the effect of many other potential risk factors.

Other studies have revealed several factors significantly associated with the development of side effects. For example, people not engaged in physical activity are more likely to develop side effects than those involved. The side effects were also more common among those who felt fear when vaccinated than those who did not [20]. Other studies have shown that females and those married are more likely to develop side effects than males and singles [21]. Another study showed that higher odds of side effects were associated with full vaccination dose, vaccine brand, younger age, female sex, and having COVID-19 before vaccination [22].

In this study most participants experienced at least one side effect from the Pfizer-BioNTech vaccine after the first (76.2%) and second (70.5%) doses. These findings are similar to those of a study conducted in the UK, which reported 71.9% (150,023 out of 208,767) for individuals after the first dose and 68.5% (9,025 out of 13,179) after the second dose of Pfizer-BioNTech vaccine [23].

In this study, among participants who reported side effects, the vast majority reported pain at the injection site after the first (93%) and second (88%) doses, which is a universal feature of injectable vaccines [24]. Nevertheless, it is notable that 13 out of 317 subjects with side effects in the first dose did not report localised pain at the injection site, which makes 6.9%, and 22 out of 184 subjects with side effects in the second dose, which makes 12%. This may be attributable to improved vaccine administration techniques and practices among healthcare professionals, leading to fewer adverse reactions and side effects [25]. Another study undertaken in 2020 found that local pain at the site of injection was reported by 83% of the participants after the first dose and 78% after the second dose [26]. Consequently, it is recommended to administer injectable vaccines in the non-dominant arm to decrease the impact of side effects on daily activities. Other side effects, such as fever, fatigue, headache, and joint pain, were all relatively common but not as significant as local pain at the injection site. Participants usually treated their side effects with analgesics or antipyretics for relief.

This study showed two cases of anaphylactic reactions to the vaccine, similar to the results found in a study conducted in Israel [27]. Although this outcome is very rare, the consequences are very serious for the individuals affected, and after vaccination, one should prepare for the potential of such cases.

The onset of most side effects in this study was reported to be on day zero for 78.9% of participants after the first dose, of whom 45.4% reported that they lasted for one day, while 29.7% cited two days. Most participants experiencing side effects after the second dose reported that onset was on day zero (80%); of these participants, 45.7% recalled that symptoms lasted for one day, while 39.7% said they lasted for two days. Of those experiencing side effects after the first dose, 54.3% rated them as mild in severity, and 12.6% reported them to be severe. For those experiencing side effects after the second dose, 49.5% reported mild, and 13% reported severe severity. These findings are similar to the results of a study conducted in Saudi Arabia, in which

the onset of the symptoms was reported mostly to be within 24 hours after vaccination for the majority of those experiencing side effects (66.3%), followed by onset between 24 to 48 hours later (23.2%). The intensity was mainly mild (30%) to moderate (57.9%), with only 12.1% reporting severe symptoms [28].

Research has shown that several factors are associated with hesitancy and vaccination resistance, including side effects [29]. For example, a study showed that more than half of the respondents claimed not taking the first dose even two months after the initiation of vaccination due to fear of some reaction or side effects, safety concerns regarding the vaccine, reservations concerning the success of vaccination, and the efficiency of the vaccine [30].

COVID-19 vaccine concerns among the population should be addressed through communication campaigns to improve COVID-19 vaccine uptake [30]. Educational campaigns and efforts to raise awareness about the safety and efficacy of COVID-19 vaccines must be directed to the population. Health education and measures to prevent the harmful effects of COVID-19 vaccine misinformation could potentially improve the acceptance rate of the COVID-19 vaccine. Providing pre-awareness about the side effects to reduce observed anxiety related to the vaccine is recommended. It is also important to plan monitoring and evaluation of the post-vaccine effect using standard longitudinal study designs to measure the effects directly.

LIMITATIONS OF THE STUDY
This study is cross-sectional, so causality cannot be assessed adequately for some of the above mentioned associations. There is some potential for recall bias for various data points since they were self-reported by participants, and there were at least 21 days between the first and second vaccination doses.

CONCLUSIONS

Most participants who received the Pfizer-BioNTech vaccine experienced side effects, the most common of which was pain at the injection site, which was reported for both the first and second doses. Other symptoms, such as fever, fatigue, headache, and joint pain, were much less common than local pain. The most common time for the onset of side effects was on day zero (the day of vaccination), and in most cases, they were of mild severity and lasted only one day. These findings were similar for

both the first and second doses. Using analgesics can provide relief for the most common side effects.

AVAILABILITY OF DATA AND MATERIALS

The questionnaire and datasets used in this study are available with the corresponding author upon reasonable request.

AUTHOR'S CONTRIBUTIONS

AMS designed the study, collected data, interpreted the results, prepared all tables and figures, wrote the manuscript and reviewed it before submission. NPA contributed to data analysis and writing of the manuscript and reviewed, revised and finalised the manuscript.

ETHICS DECLARATIONS

Ethics approval and consent to participate: This study was approved by the Ethical Committee of the College of Health Sciences, Hawler Medical University, Erbil, Iraq (reference number 6 dated 5th January 2022). Informed consent was obtained from all participants after explaining all the study details to them and from a parent and/or legal guardian for the illiterate population included in the study. All methods were performed in accordance with the relevant guidelines and regulations.

CONSENT FOR PUBLICATION

Not applicable

COMPETING INTEREST

The author declares no competing interest.

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COST ANALYSIS OF PHYSICAL THERAPY CLINIC IN THAILAND: THE IMPACT OF THE COVID-19 OUTBREAK

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ABSTRACT

OBJECTIVE:

The aim of the study was to identify the financial burden and compare the unit costs that Coronavirus disease 2019 (COVID-19) imposed on a physical therapy clinic that are one of the primary forms of healthcare facilities in Thailand.

DESIGN AND SETTING:

The study was a retrospective study conducted at the physical therapy clinic, Khon Kaen University Community Outreach Center (KKUCOMOC) in Thailand. To assess the impact of the outbreak, the service unit was divided into two units: physical therapy (PT) and Thai massage (TM), and the annual report for the 2019-2021 fiscal year was analyzed as representative of before and during an outbreak. The study tool was the Handbook of Unit Cost Analysis from the Office of the Permanent Secretary. Revenue, expenses, and the number of patient visits were all gathered. The data was then analyzed and summarized using Microsoft Excel programs, and descriptive statistics were presented.

RESULTS:

The COVID-19 pandemic not only reduced the number of patient visits but also the revenue. During the pandemic, the percentage of expense to the facility's revenue increased in both units. Labor, material, and capital costs were the major cost components, with labor costs accounting for the majority of direct costs. The first emerged in the 2020 fiscal year, resulting in an increase in PT's and TM's unit costs of 26.66% ($US10.24 to $US12.97) and 22.69% ($US6.92 to $US8.49), respectively. Following that, it continued to rise in both units throughout the subsequent fiscal year. As a result, at the end of the study, the unit costs of PT and TM were $US13.95 and $US9.22 respectively.

CONCLUSIONS:

The COVID-19 pandemic reduced the number of patient visits and revenue. Furthermore, it raised the unit cost of PT and TM to $US13.95 and $US9.22 respectively.

KEYWORDS

COVID-19, physical therapy, clinic, unit cost.

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an emerging disease caused by the SARS-CoV-2 virus. The outbreak was first reported in December 2019 in Wuhan, Hubei Province, People's Republic of China [1]. The disease caused panic among the populations around the world [2]. In Thailand, the first emergence of the pandemic began in March 2020 then following by many epidemic episodes [3-4]. Therefore, to carry out control of the disease effectively, the Center for COVID-19 Situation Administration (CCSA) was established to serve as the headquarters for COVID-19 related policies [3-4]. The social and public health protocols that have been implemented included work-from-home, temporary closure of non-essential facilities, and imposition of national curfews. In addition, the recommendations for hospitals and other health service facilities to reduce and prevent the spread of disease that affects all levels of the health system were also implement [3-5].

When considering the health care system in Thailand, it can be classified according to the geographic information system into three levels: primary, secondary, and tertiary care respectively. Based on this information, a clinic was defined as a primary type of healthcare facility that provided outpatient services. Under Ministerial regulation of Thailand, many types of clinics, such as dental, Thai traditional medicine, or physical therapy provide health services [6-7]. With a focus on the physical therapy clinic, the impact of the COVID-19 pandemic has prompted the Royal College of Physiatrists and the Physical Therapy Council of Thailand to issue a practice guideline to prevent and reduce the transmission and to guide the practices of physical therapists. Examples include arranging the service site, suggesting cleaning protocols using alcohol and disinfectant solution, using personal protection equipment (PPE), and providing tele-rehabilitation service [8-9]. Under this situation, it consumed many resources and brought significant challenges to the physical therapy health care provider. In other words, it has exerted not only clinical pressure on the service system but also financial burden [10].

Understanding service costs and their associated factors have important implications for effective planning and budgeting. In addition, this understanding is also needed to inform many types of policy decisions [11]. Therefore, studies that provide the components of hospitalization costs during the pandemic have been reported [12-14].

However, no study has been carried out in physical therapy clinic to calculate the operating costs as well as the unit costs under the situation of COVID-19 pandemic. Therefore, the aim of the study was to identify the financial burden and compare the unit costs that COVID-19 imposed on a physical therapy clinic, one of the primary forms of healthcare service facilities. The study's findings could be used to revise service planning, set service fees, and establish budgets for running the clinic.

METHODS

STUDY DESIGN
The study was a retrospective cost analysis, using existing data from a public physical therapy clinic in Khon Kaen province, Thailand. It was approved by the Khon Kaen University Ethical Committee (HE652071). Informed consent was waived due to the analysis being performed anonymously, based only on aggregate data, and the authors did not have direct access to personal information of individual patients.

STUDY SETTING
The study was conducted at a physical therapy clinic, the Khon Kaen University Community Outreach Center (KKUCOMOC), Thailand. It was classified as a primary care center that offered outpatient treatment services. It is a two-story commercial structure with 2.5 booths and a total service area of approximately 240 square meters. It is composed of two service units: physical therapy (PT) and Thai massage (TM).

According to its annual report, the clinic's revenue came from only one major source: patient expenses. Additionally, patients were categorized into two groups. Firstly, cash-pay and privately insured patients contributed the majority of total revenue, with their payment received immediately after treatment provision. Secondly, patients with public health insurance whose payments were delayed by approximately three months due to medical bills which had to be audited by relevant agencies before the clinic was reimbursed.

DATA COLLECTION
The research was carried out over three fiscal years, from October 2018 to September 2021, and covered the years before, and during the COVID-19 pandemic. The information was gathered from a variety of existing sources. The first source was the KKUCOMOC's annual report and its business continuity plan. Another source was the clinic's

monthly report, which included a database of patient numbers, revenue, reimbursement, procurement details, and financial management.

COST ANALYSIS

The study uses a traditional costing method developed by Thailand's Ministry of Public Health to assess the effects of the COVID-19 pandemic on the clinic's unit cost from the perspective of providers [15]. The costing process could be broken down into several steps. The first step was to examine and categorize the clinic's organizational structure into two major cost centers: patient care cost centers (PCCs) and supportive cost centers (SCCs). Furthermore, the PCCs were divided into two units: PT and TM units. SCCs that provided administrative, security, and other services to PCCs were also classified. Following that, the total direct cost of each cost center was calculated, including labor, material, and capital costs. Actual prices were used to calculate the material costs. Market prices were used to estimate the values of some durable items and non-durable medical supplies that were donated during the pandemic. The expenses for services provided by external organizations, e.g., cleaning and laundry costs, were included as part of the material cost. Furthermore, the straight-line depreciation method was used to annualize the costs of durable items based on their respective life years and the salvage value of 1 Thai Baht (THB), which was approximately $US0.03. In the following step, the total cost from SCCs was then allocated to PCCs using the allocation factors. The allocation criteria used in the study were floor area (electricity, water, cleaning, and security service), estimated actual use (laundry and maintenance), and administration, office expense, and telephone (number of patients' visits). In the final step, the unit cost, which refers to the cost of providing a single service, was calculated using the formula.

Physical therapy unit cost per visit:
= total cost of physical therapy service/total number of visits
Thai massage unit cost per visit:
= total cost of Thai massage service/ total number of visits

RESULTS

The study evaluated the costs that COVID-19 imposed on the physical therapy clinic in Thailand. Separating into three fiscal years from October 2018 to September 2021, with the first fiscal year representing the year before the pandemic, and the two fiscal years following representing the first and second emerged. Table 1 presents the patient visits during the study period. For PT unit, the first emergence of the COVID-19 pandemic in the 2020 fiscal year resulted in a 14.43% (12,526 to 10,719) decrease in patient visits, which then decreased to 7.03% (10,719 to 9,965) the following fiscal year. The study also discovered that more than 58% of TM's visits (6,686 to 2,791) were significantly reduced when compared to before the pandemic.

Table 2 depicts the revenue and expenses in USD for both service units. The total expenses among the three fiscal years were $US174,777.03, $US173,931.41, and $US164,591.03 respectively. The percentage of expense to the unit's revenue increased during the pandemic. Furthermore, the study discovered that TM's unit has been overspending by 2.56% since before the pandemic, with projections of 54.04% and 36.22% in the two fiscal years following. The percentage of the cost component in Figure 1 indicated that direct costs accounted for the majority of expenses in both service units. According to the data gathered, labor costs accounted for the majority of direct costs (Table 2). The clinic's structure allowed it to hire only four permanent employees: two physical therapists, one finance and accounting officer, and one clerical officer. As a result, part-time employees were hired to enhance the service. According to this fact, labor costs included not only salaries but also performance-based commissions, charted wages, and overtime costs.

Another important component of the expense was material costs (Table 2). Before the pandemic, major material expanse included the costs of non-durable medical supplies, i.e., ultrasonic gel, alcohol, kinesio tape, massage oil, and herbal balls, as well as kitchen work materials and office supplies. Then, on the first emerged of COVID-19, the 2020 fiscal year, the clinic had been temporarily closed for PT (1.5 months) and TM services (2.5 months) according to the guidelines based on regulations issued by the CCSA. Therefore, the material cost that normally accompanied the patient's visit was decreased. In addition, under the pandemic, material costs, notably for PPE—medical masks, gloves, a face shield, a bouffant cap, alcohol gel, and disinfectant liquid—were incurred.

The study also calculated the percentage of expense to the unit's revenue (Table 2). As shown in Table 2, the capital cost was the lowest cost component. The therapeutic equipment was purchased in accordance with the business continuity plan. Furthermore, major capital items, including the cost of equipment and adapting existing space to the rehabilitation services guidelines in the

situation of the COVID-19 outbreak, were also invested in the screening station, waiting area, and treatment area.

The unit costs of both service units are shown in Figure 2. The first emergence of the COVID-19 pandemic in the 2020 fiscal year resulted in a 26.66% ($US10.24 to $US12.97) and 22.69% ($US6.92 to $US8.49) increase in PT's and TM's unit costs, respectively. In addition, it continued to increase by 7.56% ($US12.97 to $US13.95) and 8.60% ($US8.49 to $US9.22) across both units in the following fiscal year. As a result, at the conclusion of the study, the unit cost of PT and TM was $US13.95 and $US9.22, respectively.

TABLE 1: THE NUMBER OF PATIENTS VISITS DURING THE STUDY PERIOD

Fiscal year	Physical therapy's unit	Thai massage's unit
2019	12,526	6,686
2020	10,719	4,092
2021	9,965	2,791

TABLE 2: THE TOTAL REVENUE AND EXPENSES DURING THE STUDY PERIOD

Fiscal year/ service's unit	Revenue	Labor cost (%)	Material cost (%)	Capital cost (%)	Expenses (%)
2019					
: PT	175,431	110,177 (62.80)	13,401 (7.64)	4,865 (2.77)	128,443 (73.22)
: TM	45,179	34,567 (76.51)	9,833 (21.77)	1,934 (4.28)	46,334 (102.56)
2020					
: PT	163,483	115,963 (70.93)	9,527 (5.83)	5,842 (3.57)	139,169 (80.33)
: TM	27,654	37,747 (136.50)	2,982 (10.78)	1,870 (6.76)	34,763 (154.04)
2021					
: PT	167,058	118,571 (70.98)	14,081 (8.43)	6,251 (3.74)	138,903 (83.15)
: TM	18,858	18,737 (99.36)	5,200 (27.57)	1,751 (9.28)	25,688 (136.22)

PT: physical therapy unit, TM: Thai massage unit

Remark: The data is presented in USD. (USD 1 = THB 37)

FIGURE 1: THE PERCENTAGE OF THE COST COMPONENT DURING THE STUDY PERIOD; (A) PHYSICAL THERAPY UNIT, (B) THAI MASSAGE UNIT
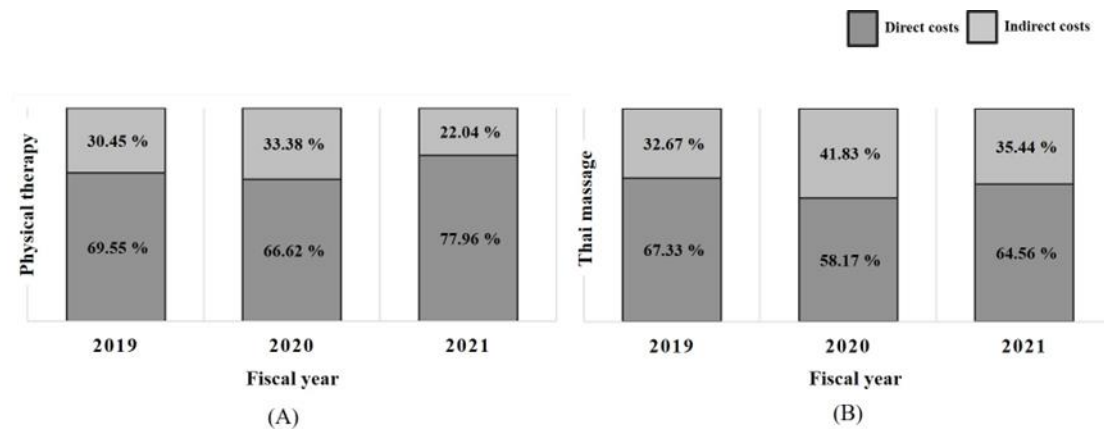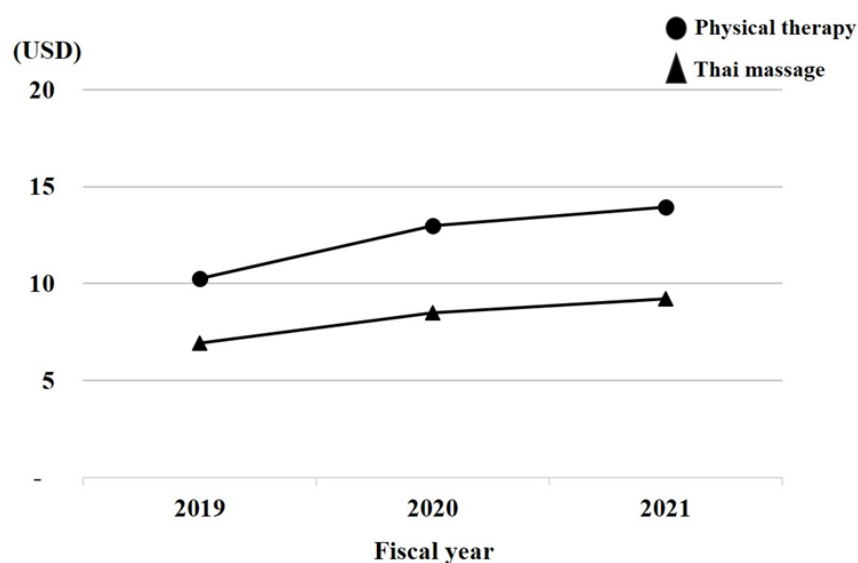

FIGURE 2: THE UNIT COST DURING THE STUDY PERIOD REMARK: USD 1 = THB 37

DISCUSSION

To the authors knowledge, the study was the first to analyze physical therapy clinic costs of COVID-19 in Thailand. It performed costings not only before but also during the pandemic. The results of the study reflect the impact of COVID-19 on physical therapy clinic, KKUCOMOC, as follows:

The first is the impact on a decreasing of revenue and the number of patient visits. This finding was explained by the fact that because the clinic's patients' primary goal was to relieve their pain from musculoskeletal problems. When focus on the pain, based on the classification of urgency in interventional pain procedures was ranged from elective to urgent. The term "elective" means that a patient could normally wait longer than four weeks to undergo the procedure based on the unique circumstances, and no

significant harm to the patient is expected if the procedure is postponed. While the term "urgent" implies that postponing a procedure will result in a significant exacerbation and worsening of the condition [16]. According to this classification, the clinic's intervention for pain relief procedure was primarily served at the elective level. Thus, at a time when the pandemic has begun to emerge, the clinic has had to temporarily halt operations for 1.5 months for PT services and 2.5 months for TM services. As a result, the number of operating days in the 2020 fiscal year is lower than the previous year, which will contribute in part to a decrease in revenue and number of visits provided by both service units. In addition, it should be noted that the panic over COVID-19 may account for a decrease in patient visits as well as the effect of temporarily halting operations, due to a significant decrease in the number of patients per day observed following the clinic's return to service.

The second impact is changing the clinic's physical characteristics. Due to the transmission of COVID-19 is associated with distance in the spread of pathogens. As a result, the CCSA advised healthcare facilities to modify physical attributes to reduce the risk of infection spreading. To comply with the recommendation, the clinic's structure was modified to reduce the number of patients per treatment area. The physical therapy unit was modified by providing more space between treatment beds than ever before. However, because the Thai massage service area was limited by the floor space, every other bed service pattern was provided during the emergency. Furthermore, only patients who were awaiting treatment at the time of their appointment would be permitted to wait in the clinic, while the waiting room for relatives was being prepared outside. The barrier was installed in some service areas, such as reception and the financial service counter, to reduce the possibility of disease spreading. In addition, an air purifier, UV-C disinfection lighting, and a ventilator fan were installed to comply with the Physical Therapy Council of Thailand's guidelines, which classified the clinic's treatment interventions as having low to moderate exposure risk levels [9]. Notably, the physical restructuring, as discussed above, has all affected the clinic's capital costs.

The third impact is on revision of the clinic's service planning. Based on the study's findings, areas where efficiency improvements could result in significant cost savings were identified. Based on the fact that an emergence of COVID-19 causes a shortage of both medical and non-medical supplies, as well as an increase in price. The 2020 fiscal year procurement report identified medical masks, alcohol, gloves, and disinfectant liquid were the most difficult medical and non-medical supplies to find. In addition, its price was higher than three times before the pandemic. Based on the fact that the physical therapy clinic is to be operated as a public clinic, the procurement must follow the procedures and methods prescribed by the Ministry of Finance, which have different methods depending on the type as well as the value of the goods to be purchased [17]. Under the pandemic situation, the methods are complicated and time-consuming to complete, making it impossible to obtain medical supplies in an appropriate, adequate, and reasonable manner. As a result, learning from the COVID-19 pandemic, it might be suggested that further study be conducted to consider an efficiency rationale for purchasing and improving stock supplies. Another issue concerns space utilization. For a private or charity hospital, the land cost was included in the capital cost [18]. In Thailand, public hospitals operate normally without having to pay land rent. Unfortunately, the physical therapy clinic's operation costs are comprised of land and building rental costs. As a result, optimal space utilization must be prioritized, especially on the second floor, which only a few patients in appropriate health can access.

The final impact is on the service charge revision. According to the findings, the PT's and TM's unit costs increased 36.23% ($US10.24 to $US13.95) and 33.24% ($US6.92 to $US9.22), respectively, in the fiscal year 2021, compared to before the pandemic. In Thailand, the Comptroller Generals Department (CGD), Ministry of Finance, fully reimbursed the government officer's physical therapy service charge. Furthermore, employees of state enterprises and local government organizations were also fully reimbursed by their affiliated agencies. In contrast, the Thai massage expense was reimbursed at a rate of $US6.76 per treatment session. As a result, the emergence of the COVID-19 disease has resulted in a lower margin than ever before for the PT's service unit. In addition, it had a greater financial impact and contributed to TM's dire situation because its expenses were massive in comparison to its revenue. To cover its unit cost, the actual service charge for the fiscal year 2021 should be more than $US9.22 per session; however, it cannot be compensated by the CGD and other affiliated agencies. Based on this fact, the cost-to-charge ratio should be further investigated [15, 19]. The finding will suggest that the clinic revise the charge price. Furthermore, if the reimbursed price is limited by the CGD, the clinic may need to charge additional fees to cover the overage expense.

STUDY LIMITATIONS

The findings of the study should be interpreted with caution. First, the data for the study came from a single physical therapy clinic, so the results may not be representative of other clinics in Thailand. Second, despite being a public clinic, the KKUCOMOC ran the clinic as a business. As a result, the clinic's two-story commercial building rental fee is a direct cost, and it was not waived despite the clinic's temporary closure during the 2019 fiscal year. Third, the CGD determines the treatment fee for COVID-19 pandemic treatment sectors in Thailand. In the case of physical therapy, the treatment fee is fully reimbursed as charged by the clinic. In contrast, the treatment fee for Thai massage was reimbursed at a fixed cost of around $US6.76

per session. As a result, it might be different in other countries or under other conditions.

CONCLUSION

Based on the findings, it is possible to conclude that COVID-19 had a negative impact on KKUCOMOC's physical therapy clinic by reducing patient visits and revenue. It also increased the percentage of expenses to the unit's revenue. By the end of fiscal year 2021, the unit costs of PT and TM had risen from $US10.24 to $US6.92 to $US13.95 and $US9.22, respectively.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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RESEARCH ARTICLE

COMMUNICATION FACTORS, DISPOSITIONS, RESOURCES, AND BUREAUCRATIC STRUCTURE HAVE AN EFFECT ON THE IMPLEMENTATION OF CLOSE CONTACT TRACING OF COVID-19 IN BANJAR REGENCY, WITH POLICY AS A MODERATING VARIABLE

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ABSTRACT

BACKGROUND:

Various regions of Indonesia have unfulfilled close contact tracing for COVID-19 responsibilities as prevention and control measures, including Banjar Regency which is part of the contributory factors to the low goal of containment. The four factors of influence are communication, disposition, resource, and bureaucratic structure of tracing as implementation actors of close contact tracing, but other factors can strengthen or weaken policy implementation. This study aims to analyse the factors involved in close contact tracing.

METHODS:

This quantitative study used a cross-sectional approach with the moderator variable being the policy context. The independent variables are communication, disposition, resource, and bureaucratic structure. The dependent variable is the implementation of close contact tracing of COVID-19. The instrument used is a questionnaire with a sample of 119 respondents that were taken with proportional random sampling. Data analysis used SPSS 26 application with moderated regression analysis (MRA).

RESULTS:

The four factors communication, disposition, resource, and bureaucratic structure together affected the implementation of close contact tracing of COVID-19 by 51.8% and the other variables were not observed in this study. The effect increased to 55.7% after introducing the policy context variable. In the partial variable test, there is no effect on the resource, but after the interaction of the moderator variable in the policy context, there is a significant p-value of 0.036 on the resource variable.

CONCLUSIONS:

Communication, disposition, resource, and bureaucratic structure impacted simultaneously on tracers in the implementation of close contact tracing of COVID-19 in Banjar Regency. They increased with a policy context variable as a moderator variable. The policy context variable can increase the effect of the resource factor as a pure moderator.

KEYWORDS

implementation, close contact tracing, COVID-19, moderator variable, policy context the power and interests of stakeholders

Communication Factors, Dispositions, Resources, And Bureaucratic Structure Have An Effect On The Implementation Of Close Contact Tracing Of COVID-19 In Banjar Regency, With Policy As A Moderating Variable
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INTRODUCTION

The Indonesian Government has declared that the Coronavirus Disease-19 (COVID-19) pandemic has ended and it has transitioned into an endemic state on June 21, 2023. This means that the Indonesian Government will no longer intervene in society to handle COVID-19 cases. The change in status is based on the consideration of the daily COVID-19 cases approaching near-zero levels, and the results of an antibody examination survey indicate that 99% of the population has developed antibodies, with 86 out of 100 people having received their first vaccine dose.[1] Although the pandemic status has ended, it cannot be denied that COVID-19 has caused numerous deaths and illnesses in Indonesia and even worldwide. As of April 2, 2023, the cumulative death toll in Indonesia still remains above the global average at 1.39%, and there has been a surge in positive cases by 45% and active cases by 59%. Prevention and control efforts should still be maintained to prevent another surge in cases from occurring.[1]

Some opinions are that contact tracing can help in controlling COVID-19.[2–4] A study in Germany states that intensive testing, contact tracing, and quarantine are important aspects of epidemic control, besides vaccination.[5] The Indonesian Government has established a policy regarding TLI (Testing, Tracing, and Isolation) contained in a Decree of the Minister of Health (Number 4641 of 2021), whose implementation is supported by tracers.[6] However, the implementation of close contact tracing for COVID-19 in various regions of Indonesia has not yet reached the set targets. This raises questions about the accuracy of the government's decision to change the pandemic status. There is a possibility that contact tracing has not been carried out properly, leading to the underreporting and inadequate tracking of active cases in Indonesia. This might create an impression of declining active cases when, in reality, they are not being recorded and traced accurately. Understanding the reasons behind the low achievement in contact tracing targets is essential to devise strategies for improving its implementation.

One specific region in Indonesia that falls below the national target is South Kalimantan, which has only achieved a tracing target of 57.1%. [6,7] Banjar Regency is one of the regencies (administrative regions in Indonesia) in South Kalimantan, contributing to the low tracking target. Almost all public health centres in Banjar haven't

achieved close contact tracing targets. There is limited research that specifically focuses on the context of Banjar Regency. This study aims to fill this gap by providing a localized understanding of the factors that influence the successful implementation of contact tracing measures in this specific region.

A study conducted on close contact tracing volunteers for COVID-19 in the United States, states that the implementation of a contact tracing program for COVID-19 will be successful with good communication, disposition, satisfactory resources, and an appropriate bureaucratic structure.[8] A study in the City of Palembang stated that the implementation of close contact tracing was not going well because several obstacles were found, including less communication, officers who did not understand their duties, a lack of cross-sector collaboration, inadequate human resources, incomplete supporting facilities, a less optimal organizational structure, and unclear instructions for the task.[9] The investigation of communication factors as a key determinant of contact tracing effectiveness is an innovative approach. Effective communication plays a pivotal role in promoting public understanding, cooperation, and compliance with contact tracing protocols. By examining the communication factors that facilitate or hinder the implementation of close contact tracing in Banjar Regency, this research aims to uncover valuable insight that can enhance communication strategies in the context of contact tracing efforts. In advance, the examination of individual dispositions, such as public compliance and risk perception, is a novel aspect of this research. Understanding how these dispositions shape individuals' attitudes and behaviours towards contact tracing can provide critical insights into the challenges faced by public health authorities in implementing effective tracing measures. By examining these factors, this study aims to contribute to the understanding of human behaviour and its implications for contact tracing strategies.

The results of another study suggest that the influence of these four factors is inconsistent with policy implementation. There are both direct and indirect effects of these four factors, and there is a possibility that other factors may also play a role and can either strengthen or weaken the influence of these four factors in policy implementation. [10,11] According to the theory of policy implementation developed by Merilee S. Grindle, the power and interests of stakeholders involved are indeed another factor that influences health policy

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implementation. The power and interests of these stakeholders can play a role in either supporting and promoting the policy or opposing and obstructing its implementation. It is necessary to expand the strategies available to policy implementers to manage stakeholders who resist or hinder implementation and also add strategies for those who support or encourage implementation.[12] Stakeholders need to be involved for a contact tracing program to work. [13,14]

This research is imperative due to the urgent requirement for efficient management of the COVID-19 pandemic in Banjar Regency. As the virus continues to spread, implementing robust contact tracing measures becomes paramount in preventing further transmission and containing outbreaks. The findings of this study can have immediate practical implications for policymakers and public health authorities in Banjar Regency. By identifying the factors that facilitate or hinder the implementation of close contact tracing, this research can provide actionable insights to improve the efficiency and effectiveness of contact tracing efforts. It can inform decision-making processes, resource allocation, and policy development related to contact tracing in Banjar Regency. The urgency of this research is further heightened by the potential to enhance public health response strategies, ultimately reducing the burden on healthcare systems and saving lives.

Furthermore, the investigation of policy (the power and interests of stakeholders) as a moderating variable adds a critical dimension to this research. Policies related to contact tracing have the potential to shape the implementation process and influence its outcomes significantly. Understanding the interplay between policy and the identified factors can guide policymakers in formulating evidence-based policies that maximize the impact of contact tracing efforts.

METHODS

This study is a quantitative approach with an analytic observation design and a cross-sectional approach.[15] This study was conducted in Banjar Regency at 25 public health centres for six months from November 2022 to April 2023. This study uses healthy people as research samples who are one of the implementers in close contacts tracing of COVID-19. The confidentiality of the sample data in this study is maintained and can only be accessed for research purposes. Prospective participants can determine whether they are willing to participate in ongoing research by filling out informed consent.

The study has ethics approval by the Health Study Ethics Commission of the Faculty of Medicine, Lambung Mangkurat University, Indonesia, with the reference number 581/KEPK-FK ULM/EC/XII/2022.

DATA SOURCE

The sources of data in this study are both primary and secondary. Primary data was obtained directly by interview using an instrument in the form of a questionnaire given to the participants. The questionnaire consists of 49 questions, with details as follows: 8 questions for the communication variable, 8 questions for the disposition variable, 7 questions for the resource variable, 8 questions for the bureaucratic structure variable, 8 questions for the policy context variable, and 10 questions for the COVID-19 close contact tracking implementation variable. The interpretation of results utilizes a rating scale, with scores ranging from 1 to 5, where 1 represents the lowest and 5 the highest on the scale for positive questions, or vice versa for negative questions. Secondary data was obtained on the number of cases, the distribution cases, and policy documents regarding COVID-19 to find out the current situation of COVID-19 in Banjar Regency.

Inclusion criteria are tracers who are registered on the SILACAK application or have an assignment decree, and they were eligible to participate the study. Exclusion criteria relate to tracers who up until the end of the data collection schedule could not be contacted or found or have moved their domicile out of Banjar Regency.

The population in this study is all tracers responsible for close contact tracing of COVID-19 in Banjar Regency. The number of tracers is known to be 170 people. The sample used a proportional random sampling method and consisted of 119 people.

STUDY VARIABLE

This study used independent variables consisting of communication, disposition, resources, and bureaucratic structure; the dependent variable is the implementation of close contact tracing for COVID-19; and the moderator variable is the policy context.

The questionnaire instrument in this study has undergone validity and reliability testing. First, content validity was

conducted using expert judgment from three assessors, including two researchers from the National Research and Innovation Agency and one lecturer in health policy administration from the Public Health program at Lambung Mangkurat University. Subsequently, validity and reliability testing of the questionnaire were conducted on a sample of 30 individuals in the city of Banjarbaru, with characteristics similar to those of Banjar District in terms of the number of COVID-19 cases and tracing achievements, both of which were relatively low.

STATISTICAL ANALYSIS

Data analysis used the IBM SPSS (Statistics 26) with Python 6.0 license (Stichting Mathematisch Centrum Amsterdam, The Netherlands) computer program with the Moderated Regression Analysis (MRA) method, or interaction test, which ensures the application of multiple linear regression where the regression equation contains an element of interaction (multiplication of two or more independent variables).

While SEM offers advantages in modelling complex relationship and latent construct, the choice of MRA in this research is driven by the need for a more straightforward analysis approach that aligns with the research objectives and available data. MRA allows for focused examination of predictive relationships, is applicable to smaller sample sizes, and provides interpretable results that can inform decision-making processes in the context of clos contact tracing implementation in Banjar Regency. The hypothesis in this study is that there is an influence between the variables of communication, disposition, resources, and bureaucratic structure on the implementation of COVID-19 close contact tracing, with the policy context being the power and interests of stakeholders as a moderator variable.

MRA is a form of multiple regression with regression-line polynomials that describe the nonlinear effect expressed in the form of the following equation:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5Z + b_6X_1Z + b_7X_2Z + b_8X_3Z + b_9X_4Z + e$$

mean:

Y = Implementation of close contact tracing of COVID-19

A = Constant

b = Regression coefficient

X1 = Communication

X2 = Disposition

X3 = Resource

X4 = Bureaucratic Structure

Z = Policy Context

Before doing statistical tests for MRA, a classic assumption test was done to know if the regression equation obtained has accuracy in estimation, so it is unbiased and consistent. The traditional assumption test in this study includes tests for normality, linearity, multicollinearity, and heteroscedasticity.

RESULTS

DESCRIPTION OF THE STUDY AREA

The study was carried out in Banjar Regency in all work areas of public health centres, with a total of 25 Puskesmas (Pusat Kesehatan Masyarakat [community health centres] abbreviated as Puskesmas are government mandated community health clinics in Indonesia). The population of Banjar Regency in 2021 was 572,109 people. The population density in Banjar Regency is still uneven, due to the topography of the area and the population concentration in the district's capital. The average population density is 112 people per km^2, and the area with the largest population density is the Martapura District, which has 2,933 people per km^2. The population density is in line with the number of COVID-19 cases in the Banjar Regency area; the most confirmed cases of COVID-19 are in areas with high population density. The COVID-19 situation, based on public health centres in Banjar Regency, can be seen in the following Table 1.

Table 1 shows that the total number of confirmed cases in Banjar Regency was 8,249, with the most confirmed cases being in public health centre Martapura 1, which is located in the Martapura District area - which has a high population density; active cases at March 30, 2023, in the work area of the public health centre Kertak hanyar; with close contact data of 0, which means that close contact tracing was not carried out for the confirmed cases found.

SAMPLE CHARACTERISTICS

The descriptive analysis of respondent characteristics in this study is divided into four characteristics: gender, age, education, and length of employment, with the results shown in the following Table 2.

TABLE 1. THE COVID-19 SITUATION IN BANJAR REGENCY PERIOD AT 30TH MARCH 2023

Public health center	Confirmed case today	Total Confirmed Cases	Healed		Active Case	Death		Close Contact	Risk Zone
			Total	Recovery Rate (%)		Total	CFR (%)		
Martapura 1	0	2.594	2.515	96,95	0	79	3,05	0	No cases
Kertak Hanyar	1	1.129	1.108	98,14	1	20	1,77	0	Low
Gambut	0	816	805	98,65	0	11	1,35	0	No cases
Sungai Tabuk 3	0	805	798	99,13	0	7	0,87	0	No cases
Matartapura 2	0	586	576	98,29	0	10	1,71	0	No cases
Sungai Tabuk 1	0	403	392	97,27	0	11	2,73	0	No cases
Mataraman	0	286	278	97,20	0	8	2,80	0	No cases
Astambul	0	194	185	95,36	0	9	4,64	0	No cases
Karang Intan 2	0	259	254	98,07	0	5	1,93	0	No cases
Martapura Timur	0	174	166	95,40	0	8	4,60	0	No cases
Aluh-aluh	0	135	129	95,56	0	6	4,44	0	No cases
Pengaron	0	85	83	97,65	0	2	2,35	0	No cases
Tatah Makmur	0	86	82	95	0	4	5	0	No cases
Martapura Barat	0	113	111	98,23	0	2	1,77	0	No cases
Karang Intan 1	0	109	108	99,08	0	1	0,92	0	No cases
Simpang Empat 1	0	109	106	97,25	0	3	3	0	No cases
Sungai Tabuk 2	0	78	77	98,72	0	1	1	0	No cases
Beruntung Baru	0	57	53	92,98	0	4	7,02	0	No cases
Simpang Empat 2	0	72	71	98,61	0	1	1,39	0	No cases
Sambung Makmur	0	28	28	100	0	0	0	0	No cases
Telaga Bauntung	0	31	31	100	0	0	0	0	No cases
Aranio	0	25	25	100	0	0	0	0	No cases
Sungai Pinang	0	58	58	100	0	0	0	0	No cases
Paramasan	0	1	0	0	0	1	0	0	No cases
Cintapuri Darussalam	0	16	16	0	0	0	0	0	No cases
	1	8.249	8.055	97,66	1	193	2,34	0	Low

TABLE 2. SAMPLE CHARACTERISTICS – PARTICIPANT TRACERS

Variable	Frequency (n=119)	Percentage (%)
Age:		
< 20 years old	2	1.7
20-35 years old	84	70.6
> 35 years old	33	27.7
Gender:		
Male	45	37.8
Female	74	62.2
Education:		
High school	38	31.9
Diploma 3	63	52.9
Bachelor's degree	18	15.1
Length of employment:		
>6 months - 1 year	35	29.4
>1 year - 2 years	53	44.5
>2 years	31	26.1

The data in the respondent characteristics table was analyzed descriptively and divided into four characteristics: gender, age, education, and years of work. The analysis involves describing only the counts or numbers for each of these characteristics.

Based on Table 2 , the samples ages are mostly in the 20-35 years range, accounting for 70.6%. The most prevalent gender is female, at 62.2%. The highest proportion of samples educational level is Diploma 3 graduates, constituting 52.9%. In terms of length of employment as tracers, the majority fall within the range of over 1 year to 2 years, making up 44.5%.

STATISTICAL TEST RESULTS

Based on the results of the data normality test with one sample of Kolmogorov-Smirnov, it is known that the asymp.sig (2-tailed) value is 0.200 > 0.05, so it can be said that the regression model fulfils the normality assumption.

Linearity testing, by performing a test for linearity at a significant level of 0.05, the test results obtained a value of linearity (sig.) of 1.000 > 00.05, so it can be concluded that there is a linear relationship between the independent and dependent variables and the moderator variable. Multicollinearity in the regression model is determined by the tolerance value and the variance inflation factor (VIF). The test results obtained tolerance values for all independent variables and moderator variables > 0.10 with VIF values < 10, which means that the independent variables and moderator variables are free from multicollinearity. In this study, the heteroscedasticity test used the Glejser test, with the result value (sig.) of all independent variables and moderator variables > 0.05, so that it can be concluded that the independent variables and moderator variables are free from heteroscedasticity.

MULTIPLE LINEAR REGRESSION ANALYSIS

This test aims to determine the effect of factors, namely communication, disposition, resource, and bureaucratic structure, on tracers in the implementation of close contact tracing of COVID-19 in Banjar Regency before the interaction of the moderator variable. The statistical test results can be seen in Table 3 below.

TABLE 3. MULTIPLE LINEAR REGRESSION ANALYSIS TEST RESULTS

Variable	Regression Coefficient	t count	Probability p-value	R Square	F count	Sig. F
Constant	-0.309	-0.108	0.914			
Communication (X1)	0.271	2,077	0.040			
Disposition (X2)	0.347	3,608	0.000	0.518	30,679	0.000
Power Source (X3)	0.081	0.960	0.339			
Bureaucratic Structure (X4)	0.426	3,734	0.000			

Based on the test results in Table 3, it can be determined that the regression equation in this study is
Y = -0.309+0.271X1+0.347X2+0.081X3+0.426X4.

With the regression equation above, it can be estimated the magnitude of the implementation of close contact tracing of COVID-19 for communication, disposition, resource, and policy structure. The constant value is negative, namely -0.309, meaning that if communication, disposition, resource, and bureaucratic structure are equal to zero (0), the implementation of close contact tracing of COVID-19 will decrease. The regression coefficient values of the communication variable, disposition, resource, and bureaucratic structure variables are positive, meaning that these variables have a positive effect on tracers in the implementation of close contact tracing of COVID-19 in Banjar Regency. It is known that the value of R Square (coefficient of determination) is 0.518 meaning that simultaneously the variables of communication, disposition, resource and bureaucratic structure influenced tracers in the implementation close contact tracing of COVID-19 by 51.8%, while the remaining 48.2% were influenced by other variables not observed in this study.

Based on Table 3, a p-value (Sig. F) of 0.000 < 0.05 is obtained, which means that simultaneously the independent variables (communication, disposition, resource, and bureaucratic structure) affect tracers in the implementation of close contact tracing of COVID-19 in Banjar Regency. However, in the partial test, there are resource factors that didn't affect the implementation of close contact tracing of COVID-19, with a p-value of 0.339.

MODERATED REGRESSION ANALYSIS (MRA) OF POLICY CONTEXT AS MODERATOR VARIABLES

An interaction test of moderate regression analysis (MRA) will be done on all independent variables X1, X2, X3, and X4, with the policy context variables as the moderator variable (Z). The MRA test results can be seen in Table 4 as follows:

TABLE 4. TEST RESULTS WITH MODERATED REGRESSION ANALYSIS (MRA)

Variable	Regression Coefficient	Probability p-value	R Square before	R Square after	F count	Sig. F
Constant	-36,418	0.071				
Communication (X1)	1310	0.278				
Disposition (X2)	1,562	0.033				
Power Source (X3)	-1,326	0.051				
Bureaucratic Structure (X4)	.475	0.542				
Policy Context the power and interests of stakeholders (Z)	1,481	0.047	0.518	0.557	15,197	0.000
X1Z	-.043	0.345				
X2Z	-.044	0.093				
X3Z	.050	0.036				
X4Z	-.002	0.951				

Based on Table 4 information, the MRA test obtained the results of the regression equation in this study, namely: Y = -36.148 + 1.310X1 + 1.562X2 - 1.326X3 + 0.475X4 + 1.481Z - 0.043X1Z - 0.044X2Z + 0.050X3Z - 0.002X4Z. With the regression equation above, it can be estimated that the magnitude of the implementation of close contact tracing of COVID-19 for communication, disposition, resources, policy structure, and policy context as moderator variables. The constant value is negative of -0.309, meaning that if communication, disposition, resource, bureaucratic structure, and policy context as moderator variables are equal to zero (0), the implementation of close contact tracing of COVID-19 will decrease. The R square value in the first regression (before the interaction of the moderator variable) was 0.518, or 51.8%, after there was a regression equation with the moderator variable, the R square value increased to 0.557, or 55.7%. So, it can be concluded that the existence of a policy context as a moderator variable will strengthen the influence of the variables of communication, disposition, resource, and bureaucratic structure on tracers in the implementation of close contact tracing of COVID-19 in Banjar Regency. The results of the ANOVA test in the SPSS program produce a significance level of 0.000 < 0.05, Then the regression model can be used to predict variable Y or know that the independent variables X1, X2, X3, X4, and Z jointly affect variable Y.

The effect of the independent variables on the dependent variable partially in a moderator variable based on test results on the communication variable and bureaucratic structure moderator variable is only a moderating

homogenizer as potential moderation. This means that the policy context variable didn't interact with the communication and bureaucratic structure variables and didn't have a significant relationship with the implementation of close contact tracing for COVID-19 as a variable. In the disposition variable, the effect of the moderating variable is a predictor of moderation, meaning that the policy context variable is an independent variable in the relationship model. Whereas in the resource variable, there is a significant effect from the moderator variable with a significant level of 0.051 (>0.05), and the significance of the interaction with the moderator variable (X1Z) of 0.036 (<0.05), so it can be concluded that the policy context variable on the resource variable is a pure moderator. This means that the policy context variable moderated the relationship between the resource variable and the implementation of close contact tracing of COVID-19, where the pure moderate variable interacted with the independent variable without becoming the independent variable.

DISCUSSION

Based on secondary data on the COVID-19 situation, it is known that close contact tracing of confirmed cases wasn't carried out. This needs to receive attention from the Health Department or the Regency COVID-19 in Banjar Task Force to prevent further transmission. Contact tracing is an important public health tool for limiting the spread of infectious diseases. Effective and efficient contact tracing involves the rapid identification of individuals with infections

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and their exposed contacts, and ensuring their isolation or quarantine, respectively. [3,4] Although the availability of vaccines and other treatments is adequate, contact tracing still must be done to identify exposed individuals at risk and direct them to health services.[16]

The test results showed an effect of factors: communication, dispositions, resource, and bureaucratic structure on tracers in the implementation of close contact tracing of COVID-19 in Banjar Regency. The magnitude of the influence of factors such as communication dispositions, resource, and bureaucratic structure simultaneously on the implementation of close contact tracing of COVID-19 in Banjar Regency was 51.8%; the rest was influenced by other factors not examined in this study (48.2%). A different study also explained that the four factors interacted together to influence policy implementation. [9,17,18] Policy implementation can do well if communication is carried out systematically and massively, resources are adequate, sufficient, and of good quality, a disposition is appropriate, and the bureaucratic structure is distinct. However, several other studies also stated that, apart from those four factors, there are other influencing factors in the implementation of a policy. [2,10,11,19]

Other factors that may influence this study are the power, interests, and strategies of the actors involved, which will be further analyzed as moderator variables in this study. Another study concludes that efforts to realize policy implementation depend on other factors, including the interests of the actors involved, their power, and the suitability of the running system.[12,14,20–22] Another factor that may also influence this is community participation.[11,23,24] If the policy has been implemented properly by officers and has been supported by actors who have power and interests, the results can't be maximized, if it is not supported by the community as a policy recipient. Several studies also stated that the existence of stigma, rejection, and less community cooperation in close contact can affect the results of close contact tracing.[25] However, this study didn't collect data on the community, which might be a recommendation for further study.

Based on the results of the study, there was an increase in effect. It is based on the results of the interaction test of four factors, namely communication, dispositions, resource, and bureaucratic structure, with the policy context as the moderator variable. The policy context in terms of power and the interests of the actors involved manages to moderate the resource factor as a pure moderator, which means that with the policy context variable, the influence of resource factors will increase on the tracer in the implementation of close contact tracing of COVID-19 in Banjar Regency.

Resources are one of the variables required for the successful implementation of a program or policy. It is useful to support the implementation of a policy. Without sufficient human and financial resources, the implementation of a policy will be disrupted. Although various policies have been issued regarding the implementation of activities, it is the strategies and actors that determine the success or failure of the issued policies, with the authority to make internal policies, agencies, an otherwise flexible budget, adequate infrastructure, and sufficient and qualified human resources that follow the organizational structure formed. [12,14]

Lack of commitment and support from stakeholders will lead to a lack of regulation of resource allocation, be it employee, funding, or facility, requiring the participation of policy stakeholders in efforts to formulate policies, processes, and even the results that are achieved.[11] So, based on the results of this study, an implementation that is well supported by the power and interests of the actors involved; by supporting the availability of resources, both human and financial; and the involvement of these actors in the implementation process, will run optimally. In the implementation of contacting, tracing involves the important roles of individuals, communities, and resources, including implementers and supporting policy actors, so that the health system and public health can be maintained.[16]

The study was conducted involving tracers who were only one of the implementing actors in the implementation of close contact tracing of COVID-19. This was without collecting data on other implementing actors and policy-making actors and the public as policy recipients, so the data obtained a view of the tracer and the presence of constraints in data collection which was carried out during the rainy season so that several study locations couldn't be reached, by public transportation due to natural conditions and inadequate road infrastructure causing interviews with several respondents to be conducted using the telephone which was felt to be ineffective because respondents sometimes are less focused in conducting interviews compared to face-to-face.

CONCLUSIONS

Simultaneously, the factors of communication, disposition, resources, and bureaucratic structure affect tracers in the implementation of close contact tracing of COVID-19 in Banjar Regency. Partially, some factors do not have an effect, namely the resource factor. Based on the results of MRA testing, the influence of resource factors increases with the existence of policy context variables, namely the power and interests of the actors involved and moderator variables as pure moderators.

Although Banjar district has implemented a vaccination program, contact tracing is still needed to direct them to health services to prevent and control COVID-19. Based on the study results, it is necessary to optimize the implementation of COVID-19 close contact tracing in the Banjar Regency. The actors who have power and interests should better support the availability of resources, both in quality and quantity, without neglecting other factors, namely communication, disposition, and bureaucratic structure, and continue to increase promotional efforts of health services to prevent stigma, rejection, and a lack of cooperation in identifying close contacts with COVID-19.

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GENDER DIFFERENTIAL IN SYMPTOMS, MORBIDITY, AND CASE FATALITY RATE IN THE COVID-19 PANDEMIC IN INDIA.

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ABSTRACT

BACKGROUND:

The COVID-19 epidemic has taken a considerable toll worldwide and has harmed both male and female health. Statistics revealed that fewer females were directly affected than males; however, the latter may be more affected by the consequences. Some studies at the global level have suggested gender as the key determining factor in COVID-19, but there is a lack of such studies in developing countries like India. In light of the situation, this study has analyzed the gender-wise pattern of symptoms, morbidity, multimorbidity, and mortality due to COVID-19 in Karnataka, India.

METHODS:

We used patient-level raw data from COVID19-India application programming interface (API) from 09th March to 05th September 2020. We have used descriptive statistics such as frequency, percentage distribution, and latent class analysis (LCA) to carry out this analysis.

FINDINGS:

The study comprised 78,983 COVID-19 patients who were 63.6% males and 36.4% females. Out of the total patients, 10.1% were reported as deceased, of which 68.4% were males and 31.6% were females. We found that all three symptoms (cough, breathlessness, and fever) were higher among males than females in the case of disease symptoms. Males had a higher risk of severe infection and mortality in general. In comparison, females suffered from comorbidities like diabetes and hypertension were at higher risk of mortality due to COVID-19 than their male counterparts. The latent class analysis also revealed that females had a more significant proportion of two or more symptoms, whereas males had more than two comorbidities.

INTERPRETATION:

Given the differences in lethality between the two genders, we believe that our study has found the root causes of the gender differentials in the COVID-19 pandemic. Furthermore, our research mapped gender differences in various aspects of COVID-19, which will help policymakers find suitable interventions to reduce the burden.

KEYWORDS

COVID-19, pandemic, gender, patients, morbidity, mortality.

INTRODUCTION

The COVID-19 pandemic has resulted in a dramatic loss of human life and caused an incomparable threat to public health [1,2]. Its economic and social uncertainties are catastrophic; on the other hand, it has triggered a focused area of scientific research globally [3].

Many developing countries already coping with humanitarian disasters have become vulnerable to the consequences of COVID-19 [4]. India, a developing country already dealing with many public health challenges, is a member of this group [5–7], recorded as having the second highest COVID-19 cases following the USA [8]. The COVID-19 pandemic has adversely affected the health of both genders. However, statistics reveal that fewer females are affected directly than males, though the former might be more affected by its consequences [9,10]. Thus, it is essential to analyze the impact of both diseases and their consequences on both genders to help policymakers adopt appropriate measures in the ongoing fight against the problem. But a limited number of studies on the gender differentials in COVID-19 may restrict the development of a proper policy response [11,12].

Studies at the global level suggest gender as the key determining factor of the severity of the symptoms, multimorbidity and mortality among COVID-19 patients [13–15]. To date, no such have included the above-mentioned factors in the Indian context [16–20]. Considering the need for such reviews, the present study has analyzed the gender differentials for the COVID-19 pandemic in the Karnataka state of India.

In the case of COVID-19 in Karnataka, the state confronted the pandemic with a lot of preparation. It was the first state to raise the Epidemic Diseases Act's provisions 1897 [21]. Nevertheless, the Karnataka government responded to COVID-19 well before the virus arrived on its land [22,23]. The first confirmed COVID-19 patient in Karnataka appeared 40 days after the first case in India [24,25]. However, the Karnataka government had already put a comprehensive response system in place well before the WHO declared it a public health emergency of international concern. However, it could not wholly succeed compared to other states in containing the virus [26,27]. Despite sincere efforts and practising the 5T (Tracing, Tracking, Treatment, Technology and Testing) government policy, Karnataka stood at the second highest

position with 8,41,889 confirmed and 11,347 deceased cases. With almost equal population distribution of gender across the state, it has been reported that the proportion of males out of total cases was significantly higher than the females [25,28]. By keeping in view an equal population proportion to an unequal burden, this paper deals with the gender differentials in the COVID-19 prevalence rate (PR), case fatality rate (CFR), the pattern of symptoms and multimorbidity, along with the latent class analysis of the symptoms and multimorbidity in the state.

METHODS AND DATA SOURCE

METHODOLOGY

This study used publicly available patient-level raw data from the COVID-19 application programming interface (API) from 09th March 2020 to 05th September 2020 and segregated it for gender and age for the analysis [29]. We have used categorical and nominal coding to transform raw data and applied quantitative methods for the study [30]. The Agency's data provided state bulletins and official handles (such as the Government of India: Press Information Bureau (PIB) and Ministry of Health and Family Welfare (MoHFW)) to update COVID-19 cases and provided time series data for the daily and cumulative numbers at the district and state levels. The government of India was collecting data related to COVID-19 with the help of authorized collection centre persons spread throughout the country [31]. Thus, the possibilities of data skewness are no longer applicable. We extracted information at the unit level for patients whose gender and age were available. Hence, we used a complete case analysis and discarded the cases whose information was missing.

DATA ANALYSIS AND STATISTICAL TOOLS

We used descriptive statistics such as frequency and percentage distribution to represent the gender-wise age distribution of total and deceased cases. Here gender implies males and females, which were distributed in five age categories: 0-14, 15-25, 26-40, 41-60, 61 and above years. We examined the average age at diagnosis and death using mean and standard deviation. For deceased cases, the descriptive statistics have been extended for influenza type (influenza-like illness (ILI), severe acute respiratory infections (SARI), symptoms (fever, breathlessness, and cough), multimorbidity (diabetes hypertension and others) and place of death (designated hospital, private hospital, and residence). Gender-wise

district-level analysis of prevalence rate (PR) and case fatality rate (CFR) for the state has been calculated and plotted using ERIS ArcGIS Enterprise 10.8 version [32]. To calculate the PR, we used 2020-year data from the Directorate of Economics and Statistics official website, which the Government of Karnataka maintains [33]. We used data from the Karnataka COVID-19 Dashboard webpage to compute CFR [25]. The Weka 3.8.4 version has been used to calculate the gender-specific pattern of symptoms and multimorbidity for deceased cases (34). Latent class analysis (LCA) has been performed on the RStudio 4.0.3 version to separate classes for deceased cases based on their symptoms and multimorbidity pattern [35]. LCA detects the intensity of symptoms and comorbidity in deceased patients by revealing hidden groups in the data. The novelty behind segregating data for deceased patients into different classes is that we can effactually predict their symptoms and morbidity by just knowing the number of symptoms and morbidity they suffer.

RESULTS

This section explains the analysis in this order: 1) gender-wise demographic and clinical profile of COVID-19 patients in the study area, 2) gender-wise district-level COVID-19 PR and CFR, 3) gender-wise pattern of symptoms and multimorbidity, and 4) gender-wise LCA of symptoms and multimorbidity of the deceased cases.

DEMOGRAPHIC AND CLINICAL PROFILE OF COVID-19 PATIENTS IN THE STUDY SAMPLE

Table 1 shows the results for 78,983 COVID-19 patients, consisting of 50,255 (63.6%) males and 28,728 (36.4%) females, have been included in this study. In each age

category, the proportion of males was higher than that of females. Out of the total male population, a higher proportion of COVID-19 patients was in the 41-60 age category. The higher proportion of COVID-19 patients in the female population was in the 26-40 age category.

Out of the total patients, 7,989 (10.1%) were deceased due to COVID-19, of which 5,463 (68.4%) were males and 2,526 (31.6%) were females. With the increase in age, the proportion of deceased cases increased, higher for males than females in all age categories. The average age at death was higher than the average age at diagnosis, except for females in the 0-14 years category. Further, concerning gender, the average age at diagnosis and death was found to be higher for males than females in the study. The influenza type was also given in the dataset for deceased cases, based on World Health Organization (WHO) definition. As of January 2014, WHO global guidelines for influenza surveillance described the meaning of the surveillance case for ILI: a person with acute respiratory infection with onset within the last ten days and having a high fever (≥ 100.4°F) with a cough. Simultaneously, SARI is defined as a combination of ILI requiring hospitalization [46]. The proportion of SARI was higher than ILI among both males and females. More females suffered from SARI than males, whereas more males suffered from ILI compared to females.

There are three symptoms of COVID-19 given in the dataset: fever, breathlessness, and cough. The proportion of breathlessness was higher than fever and cough for both males and females. The male ratio for all three symptoms was higher than females in all age groups.

TABLE 1 DEMOGRAPHIC AND CLINICAL PROFILE OF COVID-19 PATIENTS IN THE STUDY SAMPLE

Categories	Age	0-14	15-25	26-40	41-60	61 above	Total
Males	F (%)	2540 (5.1)	6234 (12.4)	16766 (33.4)	16898 (33.6)	7817 (15.6)	50255 (63.6)
Females	F (%)	2251 (7.8)	4790 (16.7)	9209 (32.1)	8434 (29.4)	4044 (14.1)	28728 (36.4)
Total	F (%)	4791 (6.1)	11024 (14.0)	25975 (32.9)	25332 (31.1)	11861 (15.0)	78983 (100)
Average age at diagnosis							
Males	μ (σ)	8.1 (4.1)	21.5 (2.9)	33.0 (4.3)	50.2 (5.7)	69.7 (7.7)	41.8 (17.5)
Females	μ (σ)	7.9 (4.0)	21.4 (2.9)	32.6 (4.4)	50.7 (5.8)	70.0 (7.2)	39.4 (18.5)
Total	μ (σ)	8.0 (4.1)	21.5 (2.9)	32.9 (4.4)	50.3 (5.7)	69.8 (7)	40.9 (17.9)

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Deceased cases							
Males	f (%) *	10 (0.4)	46 (0.7)	425 (2.5)	2138 (12.7)	2844 (36.4)	5463 (10.9)
Females	f (%) *	9 (0.4)	32 (0.7)	179 (1.9)	1050 (12.4)	1256 (31.1)	2526 (8.8)
Total	f (%) *	19 (0.4)	78 (0.7)	604 (2.3)	3188 (12.6)	4100 (34.6)	7989 (10.1)
Average age at death							
Males	μ (σ)	10.8 (5.3)	22.3 (2.3)	35.5 (3.9)	52.9 (5.5)	71.2 (7.4)	60.8 (13.7)
Females	μ (σ)	7.1 (4.7)	22.0 (2.6)	35.3 (4.5)	53.1 (5.5)	71.5 (7.4)	60.4 (14.1)
Total	μ (σ)	8.9 (5.3)	22.2 (2.5)	35.4 (4.1)	53.0 (5.5)	71.3 (7.4)	60.6 (13.9)
**Influenza type of deceased cases ** **							
Males	ILI	3 (30.0)	8 (17.4)	72 (16.9)	388 (18.1)	565 (19.9)	1036 (19.0)
	SARI	5 (50.0)	26 (56.5)	265 (62.4)	1385 (64.8)	1826 (64.2)	3507 (64.2)
	Data N/A	2 (20.0)	12 (26.1)	86 (20.2)	351 (16.4)	436 (15.3)	887 (16.2)
Females	ILI	3 (33.3)	3 (9.4)	36 (20.1)	187 (17.8)	235 (18.7)	464 (18.4)
	SARI	3 (33.3)	21 (65.6)	107 (59.8)	701 (66.8)	808 (64.3)	1640 (64.9)
	Data N/A	3 (33.3)	8 (25.0)	35 (19.6)	155 (14.8)	206 (16.4)	407 (16.1)
Total	ILI	6 (31.6)	11 (14.1)	108 (17.9)	575 (18.0)	800 (19.5)	1500 (18.8)
	SARI	8 (42.1)	47 (60.3)	372 (61.6)	2086 (65.4)	2634 (64.2)	5147 (64.4)
	Data N/A	5 (26.3)	20 (25.6)	121 (20.0)	506 (15.9)	642 (15.7)	1294 (16.2)
**Symptoms among deceased cases ** **							
Males	Fever	7 (70.0)	14 (30.4)	179 (42.1)	940 (44.0)	1282 (45.1)	2422 (44.3)
	Breathlessness	5 (50.0)	29 (63.0)	281 (66.1)	1526 (71.4)	2034 (71.5)	3875 (70.9)
	Cough	4 (40.0)	9 (19.6)	150 (35.3)	740 (34.6)	993 (34.9)	1896 (34.7)
Females	Fever	6 (66.7)	9 (28.1)	67 (37.4)	452 (43.0)	568 (45.2)	1102 (43.6)
	Breathlessness	4 (44.4)	21 (65.6)	109 (60.9)	742 (70.7)	886 (70.5)	1762 (69.8)
	Cough	2 (22.2)	2 (6.3)	47 (26.3)	354 (33.7)	404 (32.2)	809 (32.0)
Total	Fever	13 (68.4)	23 (29.5)	246 (40.7)	1392 (43.7)	1850 (45.1)	3524 (44.1)
	Breathlessness	9 (47.4)	50 (64.1)	390 (64.6)	2268 (71.1)	2920 (71.2)	5637 (70.6)
	Cough	6 (31.6)	11 (14.1)	197 (32.6)	1094 (34.3)	1397 (34.1)	2705 (33.9)
**Multimorbidity among deceased cases ** **							
Males	Diabetes	1 (10.0)	9 (19.6)	91 (21.4)	993 (46.4)	1412 (49.6)	2506 (45.9)
	Hypertension	2 (20.0)	8 (17.4)	83 (19.5)	849 (39.7)	1415 (49.8)	2357 (43.1)
	Others ***	1 (10.0)	15 (32.6)	105 (24.7)	518 (24.2)	848 (29.8)	1487 (27.2)
Females	Diabetes	0 (0.0)	3 (9.4)	50 (27.9)	527 (50.2)	626 (49.8)	1206 (47.7)
	Hypertension	0 (0.0)	5 (15.6)	41 (22.9)	430 (41.0)	699 (55.7)	1175 (46.5)
	Others ***	0 (0.0)	9 (28.1)	33 (18.4)	223 (21.2)	291 (23.2)	556 (22.0)
Total	Diabetes	1 (5.3)	12 (15.4)	141 (23.3)	1520 (47.7)	2038 (49.7)	3712 (46.5)
	Hypertension	2 (10.5)	13 (16.7)	124 (20.5)	1279 (40.1)	2114 (51.6)	3532 (44.2)
	Others***	1 (5.3)	24 (30.8)	138 (22.8)	741 (23.2)	1139 (27.8)	2043 (25.6)
**Place of death ** **							
Males	Designated hospital	5 (50.0)	19 (41.3)	144 (33.9)	844 (39.5)	1091 (38.4)	2103 (38.5)

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	Private hospital	1 (10.0)	11 (23.9)	116 (27.3)	488 (22.8)	819 (28.8)	1435 (26.3)
	Residence	0 (0.0)	2 (4.3)	43 (10.1)	188 (8.8)	188 (6.6)	421 (7.7)
	Data N/A	4 (40.0)	14 (30.4)	122 (28.7)	618 (28.9)	746 (26.2)	1504 (27.5)
Females	Designated hospital	3 (33.3)	7 (21.9)	80 (44.7)	416 (39.6)	518 (41.2)	1024 (40.5)
	Private hospital	2 (22.2)	9 (28.1)	31 (17.3)	241 (23.0)	316 (25.2)	599 (23.7)
	Residence	3 (33.3)	6 (18.8)	8 (4.5)	85 (8.1)	95 (7.6)	197 (7.8)
	Data N/A	1 (11.1)	10 (31.3)	60 (33.5)	308 (29.3)	327 (26.0)	706 (27.9)
Total	Designated hospital	8 (42.1)	26 (33.3)	224 (37.1)	1260 (39.5)	1609 (39.2)	3127 (39.1)
	Private hospital	3 (15.8)	20 (25.6)	147 (24.3)	729 (22.9)	1135 (27.7)	2034 (25.5)
	Residence	3 (15.8)	8 (10.3)	51 (8.4)	273 (8.6)	283 (6.9)	618 (7.7)
	Data N/A	5 (26.3)	24 (30.8)	182 (30.1)	926 (29.0)	1073 (26.2)	2210 (27.7)

F= frequency of all cases, % =number of patients in each age group as a fraction of the number with respective gender

µ= mean age, σ= standard deviation

f= frequency of deceased cases in each age group with respective gender, * = Number of deceased cases in each age group as a fraction of the number of total cases in each age group with respective gender, ILI =influenza-like illness, SARI= severe acute respiratory infections, Data N/A =data not available, ** number of deceased cases in a particular category in each age group as a fraction of the number of total deceased cases in each age group with respective gender.

*** others (chronic kidney disease, chronic obstructive pulmonary disease, chronic liver disease, ischemic heart disease, stroke, rheumatic heart disease, myocardial infarction, coronary artery disease, anemia, adrenoleukodystrophy, acute myeloid leukemia, acute respiratory distress syndrome, acute renal failure, asthma, bilateral patchy pneumonitis, benign prostatic hyperplasia, bronchopneumonia, carcinoma cancer, colon cancer, cardiomyopathy, renal disease, chronic respiratory disease, dementia, demyelinating, headache, dermatitis herpetiformis, diarrhea, anorexia, deep vein thrombosis, tuberculosis, filariasis, giddiness, weakness, fatigue, rashes, hepatitis b surface antigen, hypothyroidism, inflammatory bowel disease, interstitial lung disease, encephalitis, multiple organ dysfunction syndrome, obesity, absolute neutrophil count, pneumonia, percutaneous transhepatic cholangiography, restlessness, renal tubular acidosis, sensorium, sepsis, septic shock, chills, tiredness, thyroid, vomiting, wheezing, convulsions)

The study categorizes multimorbidity as diabetes, hypertension, and others. The other category includes almost all other ailments except the above mentioned two. Overall, females' diabetes (47.7) and hypertension (46.5) proportion were higher than males' diabetes (45.9) and hypertension (43.1). Females have diabetes in the age group 41-60, and 61 and above, whereas males affected with diabetes were more in the age groups 0-14, 15-25 and 26-40. The pattern was the same for hypertension as well. In the case of other diseases, males were more affected than females.

The proportion of males (26.3) admitted to private hospitals was more significant than females (23.7), whereas the females' (40.5) proportion was higher than males' (38.5) in the case of designated hospital admission. Overall, the proportion of patients admitted to designated hospitals was higher (39.1) than private (25.5) hospitals. For the age groups 26-40 and 41-60, the females' proportion of death at residence was higher than that of males, and a reverse pattern was found for other age groups.

GENDER WISE DISTRICT LEVEL COVID-19 PREVALENCE RATE AND CASE FATALITY RATE

The gender-wise prevalence rate has been calculated per 10,000 population for each district of Karnataka. Figures 1 and 2 results were plotted on a district map of Karnataka using ERIS ArcGIS 10.8 version. The prevalence rates for both males and females were 14.0 and 8.2, respectively. The prevalence rate was higher for the Bengaluru Urban district for both males (33.1) and females (21.4), whereas the same was lower for the Chitradurga district for both males (2.4) and females (1.0). The overall prevalence rate for each district was higher for males as compared to females. Bengaluru Urban was the worst-hit district, followed by Udupi (19.4), Dakshina Kannada (18.5) and Dharwad (13.3). On the other hand, the least hit districts were Chitradurga (1.7), Belagavi (Belgaum) (2.5), Tumakuru (Tumkur) (3.5) and Haveri (4.0). The overall case fatality rate of males and females was 11.1% and 8.86%, respectively. The CFR was highest in Chikkamagaluru (Chikmagalur) district for both males (54.9) and females (37.0). In contrast, it was lowest in the Yadgir district for both males (3.6) and females (1.9). The female CFR in the case of Bengaluru rural

(8.0), Mandya (13.0), Chitradurga (16.1), Ballari (Bellary) (11.6) and Tumakuru (Tumkur) (24.0) was higher than males.

FIGURE 1 DISTRICT WISE PREVALENCE RATE AS PER 10,000 POPULATION (MALES, FEMALES, AND TOTAL CASES)
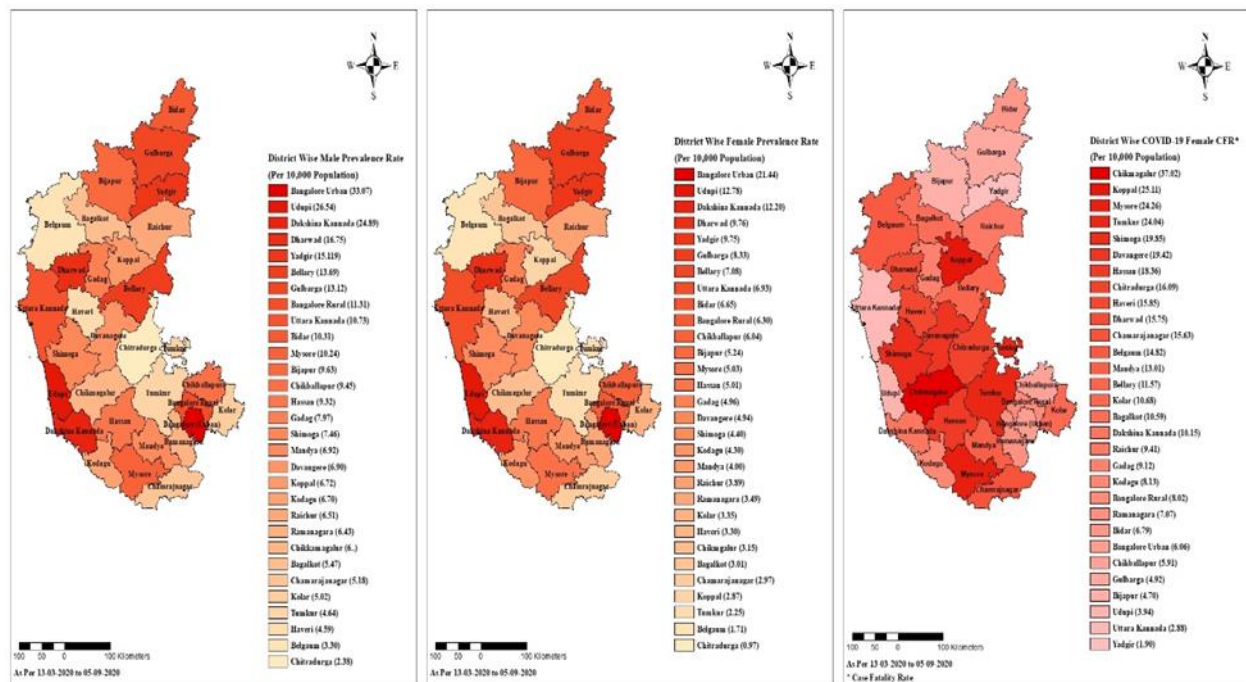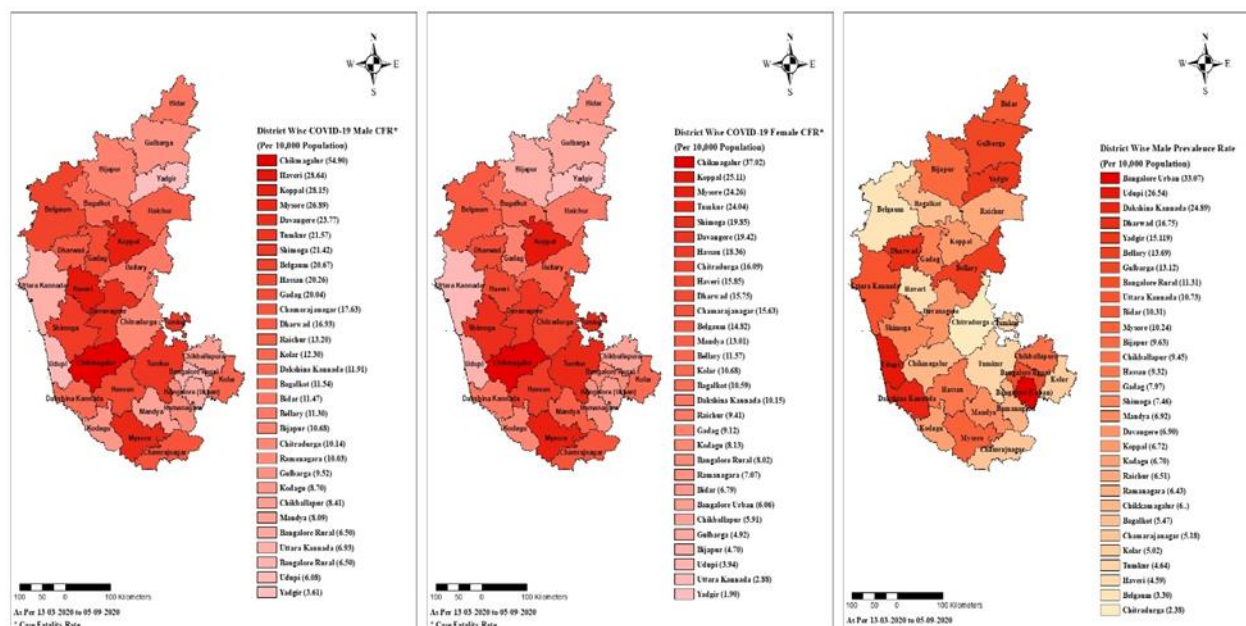

FIGURE 2 DISTRICT WISE CASE FATALITY RATE (MALES, FEMALES, AND TOTAL CASES)

GENDER WISE PATTERN OF SYMPTOMS (FEVER, BREATHLESSNESS, AND COUGH)

Only three symptoms, i.e., fever, breathlessness, and cough, were given in the dataset. The results in Table 2 show the eight latent variables that were not directly observed but inferred from the three observed symptoms. From these latent variables, we have calculated the pattern of symptoms for COVID-19 deceased cases. As per Figure 3 findings, the proportion of only breathlessness (no fever and cough) was more significant for both males and females, meaning that the severity of breathlessness was greater in deceased cases. 33.3% of males and 32.8% of females reported breathlessness that died due to direct and indirect implications of COVID-19. More females (13.7) were asymptomatic compared to the males (10.7) counterparts. Females (14.0) with breathlessness and

cough but having no fever were higher in proportion than the males (9.3) in the same latent variable.

TABLE 2 LATENT VARIABLES FOR A DIFFERENT PATTERN OF SYMPTOMS

The pattern of symptoms (latent variable)	Patient suffering from
121	Fever and cough, no breathlessness
222	Asymptomatic
112	Fever and breathlessness, no cough
212	Only breathlessness, no fever and cough
211	Breathlessness and cough, no fever
111	All three symptoms present
122	Only fever, no breathlessness and cough
221	Only cough, no fever and breathlessness

FIGURE 3 GENDER WISE PROPORTION OF DECEASED CASES IN LATENT VARIABLES FOR EACH PATTERN OF SYMPTOMS
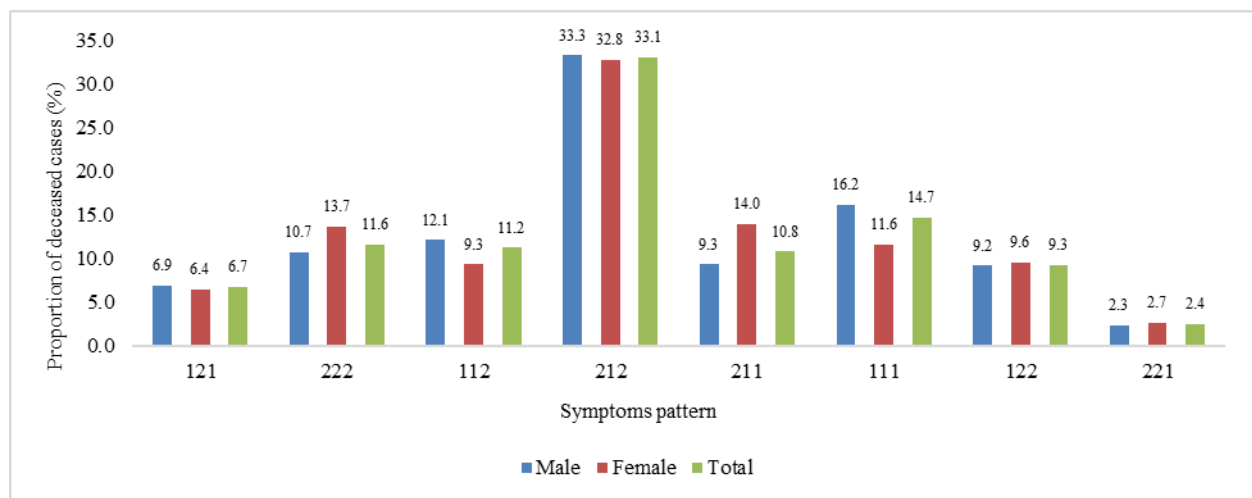
1 Yes, 2 No, Three-digit pattern representing three symptoms: fever comes at the first position, breathlessness comes at the second position, an d cough comes at the third position.

GENDER WISE PATTERN OF MULTIMORBIDITY (DIABETES, HYPERTENSION, AND OTHERS)

In line with the symptoms pattern, Figure 4 has also analyzed the multimorbidity pattern of COVID-19 deceased patients. From three observed variables, diabetes, hypertension, and others, we constructed eight latent variables for the multimorbidity pattern analysis (see Table 3). Total COVID-19 patients that died with no morbidity were 27.3%, in which the male (29.5) proportion was higher than the female (22.4)

ratio. In the case of latent variable 112 (patient suffering from diabetes and hypertension with no other morbidity), the proportion of females (29.1) was more significant than that of males (19.0). The same pattern was observed for the latent variable 211 (patient suffering from hypertension and others with no diabetes), 212 (patient suffering from hypertension only with no diabetes and others disease), and 122 (patient suffering from diabetes only with no hypertension and others disease).

TABLE 3 LATENT VARIABLE FOR DIFFERENT MULTIMORBIDITY PATTERN

Multimorbidity Pattern (latent variable)	Patient suffering from
221	Only others, no diabetes and hypertension
211	Hypertension and others, no diabetes
111	All morbidity present
121	Diabetes and others, no hypertension
112	Diabetes and hypertension, no others
222	No morbidity

212	Only hypertension, no diabetes and others
122	Only diabetes, no hypertension and others

FIGURE 4 GENDER WISE PROPORTION OF DECEASED CASES IN LATENT VARIABLES FOR EACH MULTIMORBIDITY PATTERN
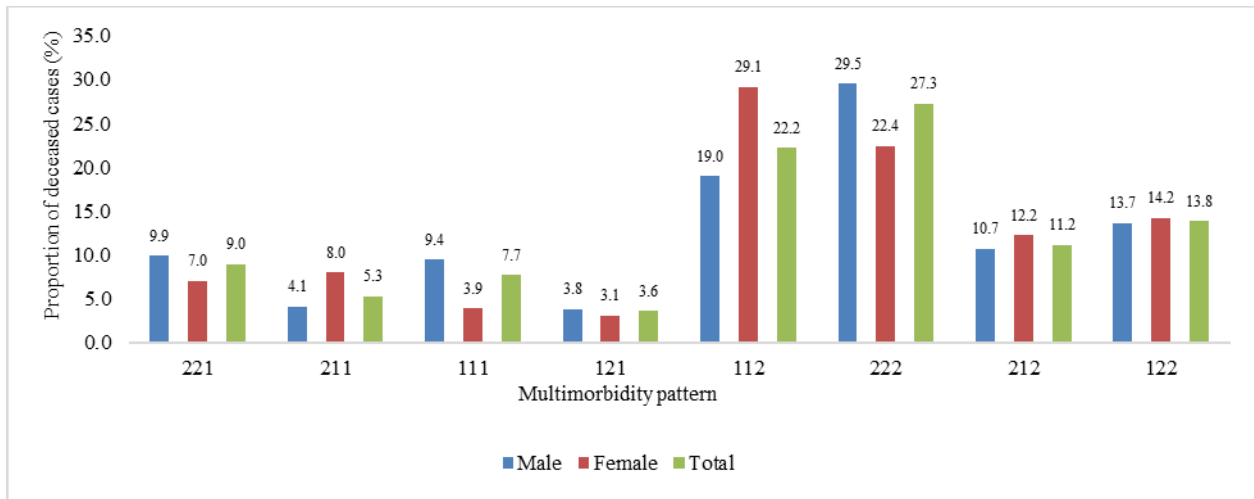
1 Yes, 2 No, Three-digit pattern representing three morbidities: diabetes comes at the first position, hypertension comes at the second position, and others come at the third position.

GENDER WISE LATENT CLASS ANALYSIS OF SYMPTOMS OF COVID-19 DECEASED CASES

We performed LCA to split COVID-19 deceased cases into subgroups based on an unobservable construct. After completing LCA for symptoms, we got the best-fit model for two classes. The two latent classes were assumed to be mutually exclusive and exhaustive. Thus, each patient belonged to one and only one latent class. Patients with two or fewer symptoms were classified as Class 1, whereas those with three were in Class 2. The higher proportion in Class 2 demonstrates that patients suffering from three symptoms were more likely to succumb. Results in Table 4 show that if a male patient belonged to Class 1, he had fewer chances of having a fever, a 76.59% chance of having breathlessness, and a 20.98% chance of coughing. Conversely, if a male patient belonged to Class 2, he had a 100% chance of having a fever, a 63.83% chance of having breathlessness, and a 51.96% chance of coughing. The pattern was the same for female COVID-19 patients.

TABLE 4 GENDER-WISE PROBABILITY OF HAVING SYMPTOMS FOR EACH CLASS OF DECEASED CASES

Symptom	Males		Females		Total	
	Class 1 (44.34)	Class 2 (55.66)	Class 1 (43.63)	Class 2 (56.37)	Class 1 (44.11)	Class 2 (55.89)
Fever	0	1	0.0000	0.9999	0	1
Breathlessness	0.7659	0.6383	0.7472	0.6334	0.7599	0.6368
Cough	0.2098	0.5196	0.2121	0.4601	0.2105	0.5010

Value in parenthesis is the population share of deceased cases in each class

FIGURE 5 POPULATION SHARE OF EACH CLASS OF DECEASED CASES
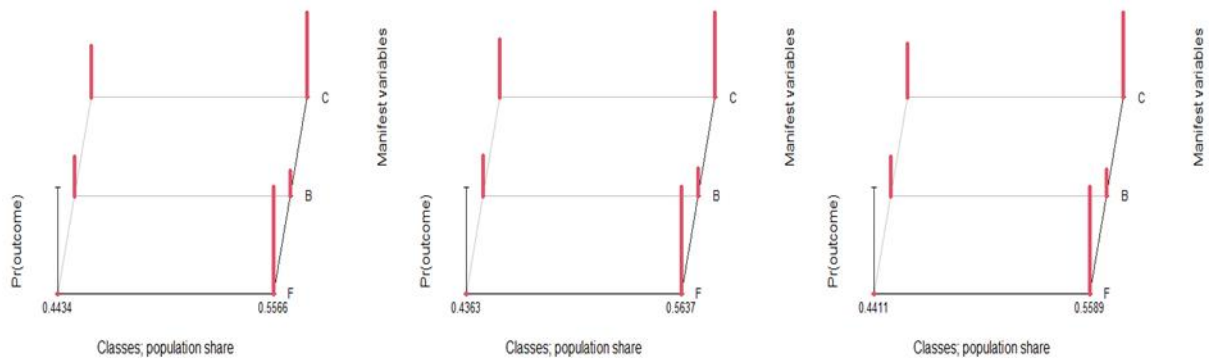
GENDER WISE LATENT CLASS ANALYSIS OF MULTIMORBIDITY PATTERN OF COVID-19 DECEASED CASES

Same as above, the results in Table 5 extended the analysis where LCA was performed to classify deceased COVID-19 cases into latent classes based on their multimorbidity pattern. Patients with two or fewer morbidities were classified as Class 1, whereas those with three were in Class 2. If a male patient belonged to Class 1, he had a 30.71% chance of having diabetes, 19.89% of hypertension, and 24.08% of other diseases. On the other side, if a male patient belonged to Class 2, he had an 82.83% chance of having diabetes, 99.91% chance of hypertension, and 34.89% of other diseases. Female COVID-19 patients in the study region showed the same trend.

TABLE 5 GENDER-WISE PROBABILITY OF HAVING MULTIMORBIDITY FOR EACH CLASS OF DECEASED CASES

Multimorbidity	Males		Females		Total	
	Class1 (29.09)	Class2 (70.91)	Class1 (37.48)	Class2 (62.52)	Class1 (30.97)	Class2 (69.03)
Diabetes	0.3071	0.8283	0.3240	0.7334	0.3123	0.8023
Hypertension	0.1989	0.9991	0.1450	0.9994	0.1905	0.9999
Others	0.2408	0.3489	0.1895	0.2712	0.2252	0.3233

Values in parenthesis are the population share of deceased cases in each class

FIGURE 6 POPULATION SHARE OF EACH CLASS OF DECEASED CASES
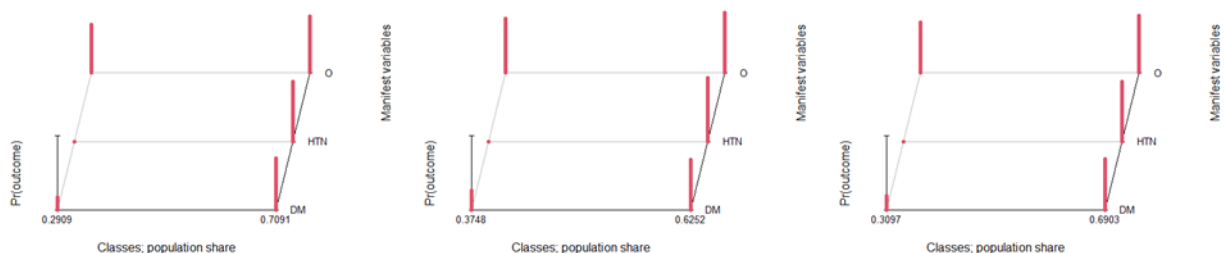
DISCUSSION

The study indicates the presence of gender differences in disease prevalence and CFR in COVID-19 in Karnataka. Out of the total number of COVID-19 patients, the male population proportion was higher than females, and out of total deceased cases, the proportion of males was higher than females. The higher proportion of COVID-19 patients and the higher fatality among males can be attributed to the higher co-persistence of all three disease symptoms, i.e., fever, breathlessness, cough, and high ILI cases in males.

Gender Differential In Symptoms, Morbidity, And Case Fatality Rate In The COVID-19 Pandemic In India.

Asia Pacific Journal of Health Management 2023; 18(3):i1227. doi: 10.24083/apjhm.v18i3.1227

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Furthermore, the overall prevalence rate in each district in Karnataka was also higher for males than females. The higher antibody production and the likelihood of low immune dysregulation in females may account for the differences between males and females. As neutralizing antibodies like Immunoglobulin G (IgG) prevent the disease from worsening, it is higher in females (36). The respiratory tract differences among males and females in terms of the larger size of males' lungs further augment the ground on which the gender difference in COVID-19 can be explained [37]. Also, lifestyle is another major cause of gender-based disparities, as COVID-19 was more severe among smokers than non-smokers [38]. Since males are more likely to smoke in India than females [39], smoking can potentially augment this disparity. In India, as compared to females, more males go out to earn the family's livelihood [40]. This exposure could be another potential cause of the disease's high prevalence among males in the state.

The results also showed that the number of deceased cases and age were directly proportional. The decrease in sex hormones with an increase in age seems to be an essential factor responsible for the increased proportion of deceased cases among older people, as these hormones affect immune responses [41]. Due to the age-dependent decrease of sex hormones, these hormones can be considered excellent therapeutic options, especially estrogen therapy [42]. The estrogen therapy further fuels the revealed gender difference in deceased cases among the elderly population, leading to a better immune system among females against COVID-19, as evident from other similar studies [43,44].

However, District-wise, CFR analysis showed a non-uniform pattern for males and females. CFR for females in districts like Bengaluru, Mandya, Chitradurga, Ballari and Tumakuru was higher than for males. The observed higher CFR among females could be attributed to numerous overlapping reasons like disproportionate work in the informal or grey economy, inadequate access to social securities, lower earnings, lower savings, and a higher burden of unpaid care & domestic work [45].

Besides this, our gender-wise analysis of multimorbidity also reflected that the proportion of females for latent variables 112, 211, 212, and 122 was significantly higher than males and contributed to the COVID-19 fatalities. This higher proportion among females can be due to several biological, psychological, and social factors like poor nutrition, poor respiratory health because of indoor air pollution, mainly due to cooking with solid fuels and higher post-traumatic stress syndrome (PTSS) [46]. Worrying aggressively about other family members' health and more significant concern about managing households under the loss of income due to a workplace closure than males could also have contributed to the same [36,46].

Gender-wise analysis of the pattern of symptoms showed a gender-neutral way for latent variable 212 (only breathlessness, no fever and cough) that highlights the severity of breathlessness in deceased cases among both genders. Although, for the latent variable 222 (Asymptomatic), the females' proportion was higher than the male counterparts. The latent class analysis also revealed that females had a more significant proportion of two or more symptoms, whereas males had more than two comorbidities.

IMPLICATIONS

Gender integration in health research has long been emphasized, yet it remains insufficient, especially in COVID-19 research [47]. Clinical trials, social and behavioural research, health service delivery innovations, and gender mainstreaming in health systems and public governance are all part of the emerging gender and COVID-19 research agenda [48–50]. Thus, in the same direction, this research offered a quantitative approach that has amplified the perspectives of India's gender-related research in the case of COVID-19. Our study has been conducted to understand the potential differences in prevalence rates, CFR, symptom and morbidity patterns, and related outcomes among males and females. In our study, males were at increased risk for infectivity; therefore, intensive care unit admission was recommended for male patients with more morbidities.

Furthermore, we advocated better precautions for females with more symptoms since their chances of succumbing were high in our study. In addition, patients with breathlessness among both genders should have received special treatment, as our research highlighted that the severity of breathlessness was a significant cause of mortality. Furthermore, to limit the possibility of getting COVID-19 and developing accompanying symptoms, asymptomatic patients, particularly females, must strictly adhere to preventative measures such as wearing masks, practising hand hygiene, and keeping physical distance. In this direction, ongoing research is required to provide

insights into these complexities and inform public health strategies to understand such gender disparities. As a result, we suggest big data agencies ensure gender data, which should be available, analyzed, and actionable on a larger scale.

CONCLUSION

Significant gender-related differences were present in the occurrence of COVID-19 in the Karnataka state considered in this study. Besides a wide range of factors that may influence the outcome, gender should be one criterion for selecting the appropriate measures. Indeed, given the differences in lethality between the two genders, we believe that studying gender differences will help find suitable interventions for all patients and help policymakers frame better policies to reduce the spread of COVID-19. Only extensive studies considering all factors concerning gender differences may explain why males tend to have a higher risk of severe infection and mortality in general and why females suffering from comorbidities like diabetes and hypertension were at higher risk of mortality due to COVID-19 than their male counterparts. Therefore, it is recommended that for all COVID-19 patients, gender-disaggregated data with some critical socioeconomic determinants must be recorded during diagnosis and treatment and made available to the researchers for analysis. It will enhance the research scope to determine the root causes of the gender differentials in the COVID-19 pandemic in the country.

LIMITATIONS

The study analysis could not be extended to all Indian states due to the unavailability of gender-wise information on the given source. Additionally, in the case of symptoms, the study is limited to three symptoms: fever, breathlessness, and cough, and could not consider some other COVID-19 symptoms, such as tiredness, headache, diarrhoea, loss of taste and smell, etc. because of the unavailability of data. The study is also time-bound and analyzed the cases between 09th March 2020 to 05th September 2020.

AUTHORS' CONTRIBUTORS

SR contributed to the data curation, analysis, and writing. AK added literature search, data interpretation and writing. RT conceptualized and visualized the study design and contributed to the analysis. All authors contributed equally to the final manuscript review, provided edits, and approved it.

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PANDEMIC PREPAREDNESS IN THE AGED CARE SECTOR: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

Infectious disease outbreaks in aged care services present challenges for consumers and staff. The vulnerability of users of aged care services and a lack of preparedness on the part of aged care services to manage the risk associated with viral disease transmission was particularly evident during the COVID-19 pandemic.

We used the PRISMA Method to review the available literature systematically. This qualitative review of the literature on pandemic preparedness assessed eight high-quality research papers and identified themes that emerged to support aged care services in preparing for future pandemics. These articles provided insight into what aged care services require to increase their capacity to respond to communicable disease outbreaks.

Four themes emerged from the literature reviewed: Staff Training and Development, Safety Culture, Creating a Safe Environment by planning for contingencies and Risk and Resource Management (including resourcing for Personal Protective Equipment (PPE), Leader Presence and Time Responses and Clear, Consistent Messaging) were the dominant themes in the literature. The researchers found that using guidelines and checklists is helpful but only if they are clear, not complex and do not take too long to read. Risk strategies in future must also focus on the resources required to protect staff, families, and consumers.

This paper also provides recommendations that will allow aged care services to respond to future communicable disease outbreaks more effectively. Such measures include the need for a planning methodology that incorporates ready access to PPE, the use of meaningful communication, increased hazard and risk awareness and the need to create a safety culture within the service based on sound values, attitudes and behaviours of leaders and staff.

KEYWORDS

Pandemic, preparedness, aged care, strategic management, infection management.

INTRODUCTION

This literature review aims to identify the priorities and necessities of preparation of aged care staff and the care environment for another pandemic or for outbreaks of communicable diseases, including those with the potential to reach pandemic proportions. Understanding factors that influence aged care services in preparing and managing outbreaks is essential to the quality and safety of the aged care residents, their families, and staff. This understanding of the evidence available will assist with

others to develop a preparedness tool that aged care providers can use to create conditions that will ensure that their facilities, staff, residents, and families are well prepared to minimise the effect of communicable outbreaks.

BACKGROUND

Paralleling global trends, Australia's population is rapidly ageing, resulting in burgeoning demand for aged care services. There is an increasing requirement for aged care staff at all levels in a sector that continues to experience workforce shortages [1]. These workforce shortages, attributed to increased life expectancies, decreased fertility rates, the nature of the work, the aged care sector policy and the regulatory environment, continue to cause challenges for aged care service provision [2].

The World Health Organisation reports that as of 1 April 2022, 486.762 million confirmed COVID-19 cases were reported, with 6.143 million attributed deaths and more than 11 million vaccine doses administered [3]. In Australia, the Federal Department of Health reports 4,443,475 cases and 6,367 deaths since the first case was registered on 25 January 2020 [4]. The case numbers and resultant deaths are significantly lower than in other countries worldwide. As of 2 April 2022, 22,168 cases and 1,938 deaths [4] have been recorded by the Australian Commonwealth Department of Health.

The Royal Commission into Aged Care Quality and Safety was operating when the COVID-19 pandemic was announced and issued a special report on 30 September with Aged Care and COVID-19 [5] as a topic. The Royal Commission conducted a hearing from 10-13 August 2020 [6], concluding that COVID-19 was the greatest challenge that Australia's aged care sector has faced, with those suffering the most being the residents, families, and aged care staff. Six recommendations from the hearing relating to four areas for immediate action. The four priorities cited in the Commission's report relate to staffing levels, Medicare rebates for Allied Health and mental health, publication of a national aged plan for COVID-19, and deployment of accredited infection prevention and control experts into residential aged care. The Australian Government was to implement to better prepare the sector for future outbreaks. Apart from some valiant efforts by aged care providers and aged care advocacy groups,

there is little evidence available to demonstrate the implementation of any of these recommendations six months after the release of this report to the Governor-General of Australia.

The operational level of aged care services, both residential and community-based, would benefit greatly from an evidence-based tool to measure the pandemic preparedness of each aged care service that allows measurement within the context in which the aged care service operates. It is asserted that if pandemic preparedness were measured as part of the risk management plan for an aged care service, impliedly, that would also hold for outbreak preparedness in other communicable diseases regularly experienced in aged care. For example, a study reported in 2010 demonstrated that 37 communicable diseases were reported in the aged care sector, the most common being influenza and Norovirus [7].

The authors do not question the emergence of a national plan for pandemic preparedness as necessary. However, a practical tool to measure pandemic preparedness in aged care that would fit within the national plan would provide aged care consumers and their families, aged care providers, and aged care workers with the confidence of the readiness of each service to cope with outbreaks even at the level of a pandemic. Families and significant others related to the consumers of aged care services would also benefit from the knowledge that quality and safety strategies that included measuring preparedness were regularly assessed in the care services [8].

The authors aimed to examine high-quality evidence that would inform the development of a tool for measuring outbreak and pandemic preparedness and conducted a systematic review of the literature using the PRISMA method [15] to inform the development of an evidence-based tool.

LITERATURE REVIEW

Infectious disease outbreaks in residential aged care services present significant challenges for residents and staff. There is a substantial risk of developing further morbidity secondary to the incidence of pre-existing comorbidities [6, 8]. Outbreaks can further compromise health status and increase disabilities and deaths [8, 9].

The COVID-19 global pandemic has reinforced the necessity of preparedness for viral communicable disease transmission in aged care services because of the vulnerability of those who access such services. COVID-19 disproportionately impacted vulnerable populations, especially residents in residential aged care facilities [10]. There is considerable evidence in the literature that residential aged care facilities and other aged care services have an increased risk of outbreaks of communicable diseases. Moreover, the severity of the outbreaks intensifies because of the compromised health status of those for whom care is provided [10-13].

Most risk management programs for services that provide care for vulnerable communities contain risk and consequence matrices that place the risk as either high or very high and the consequences as severe to catastrophic. A recent systematic review of the literature found 37 reported outbreaks in long-term care facilities such as residential aged care services. The most reported single pathogen was the influenza virus, followed by group A streptococcus (GAS) [8]. A systematic literature review by Lee and colleagues reported that approximately half of the included studies found that person-to-person was the most common transmission mode. This mode of transmission and suboptimal infection control practices, including inadequate decontamination and poor hand hygiene, propagated transmission in most cases. Therefore, best practices for infection prevention and control (IPC) are necessary to reduce transmission and prevent outbreaks [8].

Aged care is also community-based and provided in the care recipient's home. The evidence relating to infection prevention and management of in-home care situations is limited, with high reliance on hospitals and long-term care facilities experience translated to the home care environment. A recent study assessed the prevalence and characteristics of COVID-19 in older people after a lockdown period to quell the transmission [14]. This study sampled 1505 participants whose mean age was 68 years, with 885 (59%) women, 32 (2%) racial/ethnic minorities, and 906 (60%) with high-risk conditions for influenza e did not identify any COVID-19 infection in the study cohort [14].

The researchers considered that participants' behaviours in adhering to recommended public health measures (RPHM) and their living environment might considerably mitigate the risk of COVID-19 [14].

Other evidence related to preparation for pandemics and epidemics of communicable diseases in community-based care settings for seniors is scant. While considerable grey literature provides sound guidance, empirical evidence of the appropriateness and effectiveness of the advice offered in grey literature is sparse. The lack of an evidence base provides a sound rationale for this systematic review of the literature relating to pandemic preparedness in aged care services in all its forms to determine the research gap.

METHOD

This qualitative review of the literature used the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement [15]. The Griffith University Library electronic catalogue was used and search results from databases used by the catalogue are reported in Table 1. Appendix 1 reports the names of all databases searched by the Griffith University Library Catalogue. The authors used the updated PRISMA 2020 Explanation and Elaboration guidance to guide the systematic literature process [16].

INCLUSION AND EXCLUSION CRITERIA
Only English language articles published between January 2019 and March 2021 were included for review. The refined search included only academic, peer-reviewed materials with the full online text. There was no grey literature included. Articles were included if they were empirical studies relevant to pandemic preparedness in the aged care sector. Search strings were created using keyword searches derived from the research question and Boolean operators.

ARTICLE QUALITY ASSESSMENT
Quality assessment of research reports and other evidence-based articles was conducted using the Mixed Methods Appraisal Tool (MMAT), 2018 version [17]. The assessment tool is reproduced in Figure 1.

FIGURE 1-MIXED METHODS APPRAISAL TOOL (MMAT) VERSION 2018 [17]

Category of study designs	Methodological quality criteria	Responses			
		Yes	No	Can't tell	Comments
Screening questions (for all types)	S1. Are there clear research questions?				
	S2. Do the collected data allow to address the research questions?				
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.				
1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?				
	1.2. Are the qualitative data collection methods adequate to address the research question?				
	1.3. Are the findings adequately derived from the data?				
	1.4. Is the interpretation of results sufficiently substantiated by data?				
	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?				
2. Quantitative randomized controlled trials	2.1. Is randomization appropriately performed?				
	2.2. Are the groups comparable at baseline?				
	2.3. Are there complete outcome data?				
	2.4. Are outcome assessors blinded to the intervention provided?				
	2.5 Did the participants adhere to the assigned intervention?				
3. Quantitative non-randomized	3.1. Are the participants representative of the target population?				
	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?				
	3.3. Are there complete outcome data?				
	3.4. Are the confounders accounted for in the design and analysis?				
	3.5. During the study period, is the intervention administered (or exposure occurred) as intended?				
4. Quantitative descriptive	4.1. Is the sampling strategy relevant to address the research question?				
	4.2. Is the sample representative of the target population?				
	4.3. Are the measurements appropriate?				
	4.4. Is the risk of nonresponse bias low?				
	4.5. Is the statistical analysis appropriate to answer the research question?				
5. Mixed methods	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?				
	5.2. Are the different components of the study effectively integrated to answer the research question?				
	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?				
	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?				
	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?				

RESULTS

SEARCH STRINGS

The keyword following keyword combinations was used as search strings and delivered the following results:

TABLE 1- SEARCH STRINGS WITH NUMBER OF RECORDS RETURNED

No.	Search String	Records Returned
11	(infection control) OR (infection management) AND (aged care)	97,691
22	(infection control) OR (infection management) AND (aged care) AND COVID-19	18,914
33	(infection control) OR (infection management) AND (residential aged care) AND Australia	1,230
44	(infection control) OR (infection management) AND (community aged care) AND Australia	7,919
55	(infection control) OR (infection management) AND (home aged care) AND Australia	5,547
66	(infection prevention) AND (aged care)	51,165
77	(infection prevention) AND (aged care) AND COVID-19	11,573
88	(infection prevention) AND (aged care) AND (checklist)	3,387
99	(infection prevention) AND (aged care) AND (checklist) AND (Australia)	849
110	(infection management) AND (aged care) AND (checklist) AND (Australia)	1,179

111	(pandemic preparedness) AND (aged care) AND (checklist)	211
112	(infection management) AND (aged care) AND (checklist) AND (preparedness) AND (Australia)	74
113	(infection management) AND (aged care) AND (checklist) AND (preparedness)	280
	Total	200,019

Databases Searched – See Appendix 1.

QUALITY ASSESSMENT

The authors used a dual independent review of search results; each search result was reviewed by at least two of the authors independently, and a consensus was reached on inclusion or exclusion. The process was repeated when the research team examined the results of the dual independent review. Quality assessment was blind, with quality assessments reviewed by at least two authors before achieving a consensus on the inclusion or exclusion of all articles.

FIGURE 2- PRISMA FLOW DIAGRAM [18]
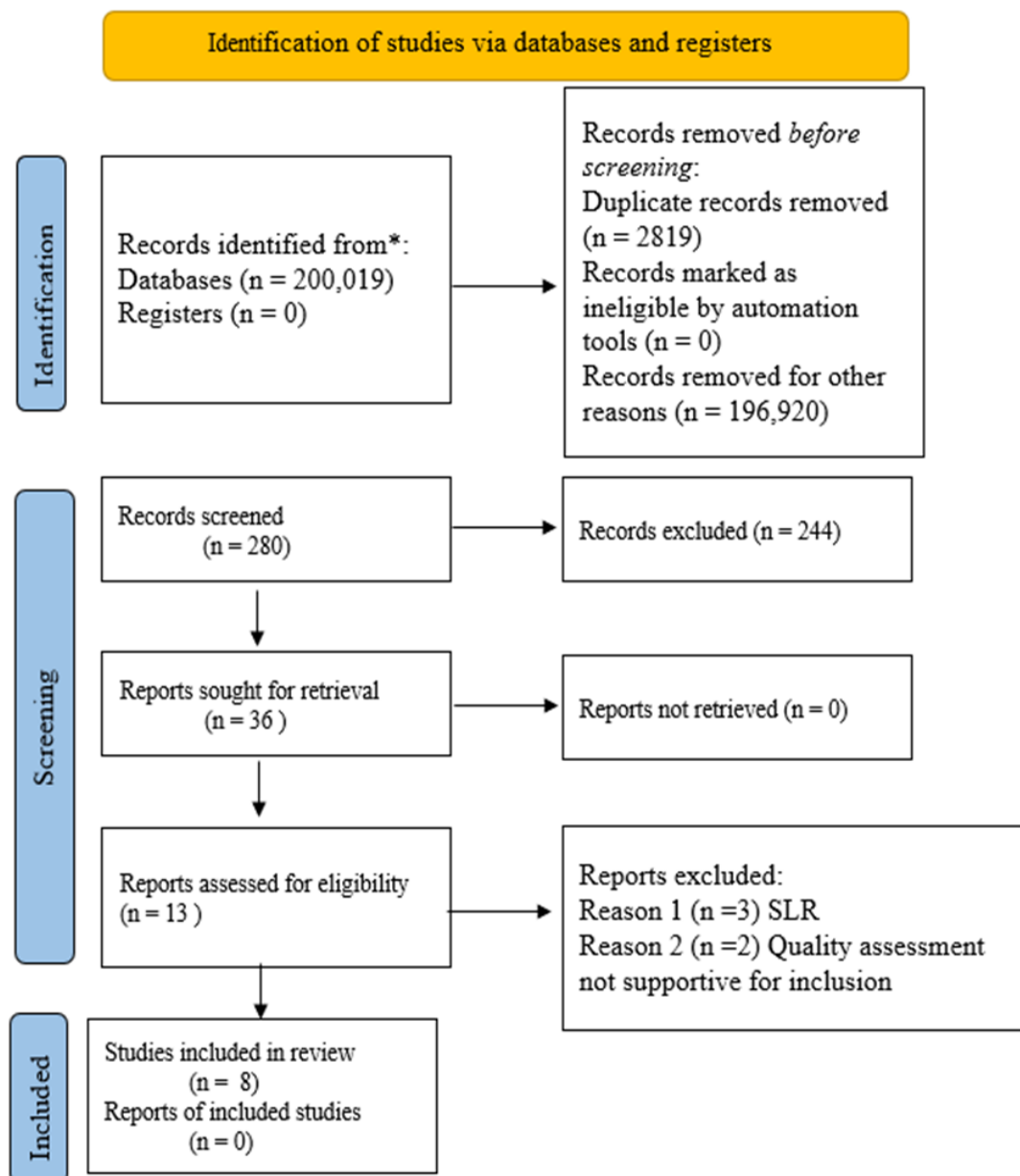
TABLE 2- STUDIES INCLUDED IN THIS SLR

Author/ Title	Synopsis of Findings/Conclusions	Identified Theme(s)
Huhtinen et al. (2019) [19] Understanding barriers to effective management of influenza outbreaks by residential aged care facilities.	This study identified the barriers to implementing the Australian national guidelines on influenza outbreak management with Sydney Local Health District (SLHD) residential aged care services (RACF) staff. The three most common barriers identified are scepticism toward staff influenza vaccination); the effort required to read the national guidelines, and the lack of infrastructure to physically separate residents during an outbreak. Conclusions were that there is a need to implement and evaluate programmes that address misconceptions about influenza vaccination amongst RACF staff and that all RACF staff receive targeted education on the role of infection control in influenza outbreak management	Staff training and development Safety culture Creating a safe care environment
Shi et al. (2021) [20] Perceptions and experiences of risk management by managers of residential aged care facilities: a qualitative study from Hunan Province, China.	Risk management is of utmost importance in reducing risks and improving the quality of care for older adults in long-term care. Although previous studies have made great efforts to explore risk management methods and technologies in RACFs, little is known about how managers identify and respond to risks in practice. Thematic analysis of semi-structured interviews revealed a central theme of managers' responsibility for facilitating an error-free culture with sub-themes of creating an age-friendly physical environment, paying close attention to frail older adults, improving the competence of nursing staff, and building effective management programs.	Contingency planning and/or Risk Management Staff training and development Creating a safe care environment
Brito Fernandes, et al. (2021) [21] COVID-19 Preparedness and Perceived Safety in Nursing Homes in Southern Portugal: A Cross-Sectional Survey-Based Study in the Initial Phases of the Pandemic.	In nursing homes in Portugal, preparedness for a public health emergency has been poor, affecting the safety culture. The mixed-methods study assessed nursing homes' COVID-19 preparedness, including staff's work experiences during the pandemic. The researchers found that 25% of nursing homes did not have an adequate decision-making structure to respond to the pandemic. There was a need for increasing outbreak capacity and training and for pandemic contingency plans. Teamwork facilitation was also necessary as an area of strength for safety culture, compliance with procedures, and a no-blame response to mistakes.	Contingency planning and/or Risk Management Staff training and development Safety Culture Creating a safe care environment

Author/ Title	Synopsis of Findings/Conclusions	Identified Theme(s)
Ochi et.al (2021)[22] Prevention and control of COVID-19 in imperfect condition: Practical guidelines for nursing homes by Japan environment and health safety organisation (JEHSO).	Control measures for nursing homes often ignore the fact that residential aged care facilities are often under-resourced. A Guidelines list was developed and peer-reviewed by eight experts who considered their significance, scientific validity, and feasibility. The study revealed that factors related to the nursing home environment, the nature of SARS-CoV-2 transmission, and patient characteristics were causes of difficulties in infection control. To develop realistic prevention measures in an under-resourced condition, and while there are no perfect control measures that can achieve zero risk, the present risk can be managed. There were 75 guidelines developed based on the concept of deep defence, and practical checklists with 75 items were established. The study supported the evaluation of nursing homes by independent organisations using the checklists would achieve sustainable infection control.	Contingency planning and/or Risk Management Staff training and development Safety culture Creating a safe care environment
Marta Mas et al. (2020) [23] COVID-19 outbreak in long-term care facilities from Spain. Many lessons to learn	This study analysed mortality, costs, residents, and personnel characteristics, in six long-term care facilities (LTCF) during the outbreak of COVID-19 in a Spanish population of 198 residents. Measurements were recorded for baseline demographic, clinical, functional, cognitive, and nutritional variables. 1-month and 3-month mortality were determined, and excess mortality was calculated. The costs associated with the pandemic were analysed. The study found that the pooled mortality rate for the first month and first three months of the outbreak were 15.3% and 28.0%, respectively, with a pooled excess mortality of 564% and 315%. In facility A, the percentage of probable COVID-19-infected residents was 33.6%. Infected patients were older, frail, and in a worse functional situation than those without COVID-19. The most common symptoms were fever, cough and dyspnoea. 25 residents were transferred to the emergency department, 21 were hospitalised, and 54 were moved to the facility's medical unit. Mortality	Contingency planning and/or Risk Management Staff training and development Creating a safe care environment

Author/ Title	Synopsis of Findings/Conclusions	Identified Theme(s)
	was higher among older male residents, with worse functionality and higher comorbidity. During the first month of the outbreak, 65 (24.6%) workers left, mainly with COVID-19 symptoms, and 69 new workers contracted COVID-19. The mean number of days of leave was 19.2. Costs associated with CovidOVID-19 in facility A were estimated at € 276,281/month, mostly caused by resident hospitalisations, furlough of workers, staff replacement, and interventions of healthcare professionals. The study concluded that the COVID-19 pandemic posed residents with a higher mortality risk, mainly those older, frail and with worse functional status. Personal and economic costs were high.	
Sarabia-Cobo et al. (2021)[24] Experiences of geriatric nurses in nursing home settings across four countries in the face of the COVID-19 pandemic	This qualitative study collected interview data from 24 semi-structured interviews. The transcripts were thematically analysed to explore the emotional impact and experiences of geriatric nurses working in nursing homes and caring for patients with COVID-19. The study sampled geriatric nurses from Spain, Italy, Peru, and Mexico in 2020. Three main themes emerged from the thematic analysis: fear of the pandemic, the sense of duty and professional commitment, and the nursing staff feeling exhausted and overwhelmed. The study recommends considering the most appropriate model of care for nursing homes in a pandemic situation.	Contingency planning and/or Risk Management Creating a safe care environment
Lyng et al (2021) [25] Healthcare leaders use innovative solutions to ensure resilience in healthcare during the COVID-19 pandemic: a qualitative study in Norwegian nursing homes and home care services.	This qualitative research was conducted in a large city municipality in Norway. Phase 1 of the study collected semi-structured interviews of nurses at various organisational levels who worked at 13 nursing homes and home care services. In the second phase, an online survey was distributed at 16 nursing homes and home care services to expand our understanding of the phenomenon from other leaders within the case municipality. Twenty-two leaders participated in the study, demonstrating how nursing homes and home care leaders used innovative solutions to maintain appropriate care for infected and non-infected patients. Innovations were categorised as technology for communication and remote care, practice innovations, service innovations, and physical innovations.	Contingency planning and/or Risk Management Staff training and development Creating a safe care environment

Author/ Title	Synopsis of Findings/Conclusions	Identified Theme(s)
	This study offers a new understanding of crisis-driven innovation's influence on healthcare resilience during the COVID-19 pandemic. Nursing home and home care leaders implemented several innovative solutions to ensure resilient performance during the pandemic's first 6-9 months. In terms of resilience, different innovative solutions can be divided based on their influence into situational, structural, and systemic resilience. The paper outlines a framework for bridging innovative solutions and their impact on healthcare resilience.	
Usher et al. (2021)[26] Preparedness for viral respiratory infection pandemic in residential aged care facilities: A review of the literature to inform post-COVID-19 responses.	This study was conducted across Sydney Local Health District (SLHD) residential aged care staff and investigated potential/perceived barriers to implementing the national guidelines for managing influenza outbreaks. Barriers identified include: Scepticism of staff towards vaccination Lack of infrastructure in many facilities to achieve the required isolation of individual residents during an outbreak. The size of the document and the effort required to read, understand, and implement it The researchers concluded that: There is a need for more work required with RACFs on the development and implementation (and evaluation) of programs that will support RACF staff to implement the requirements of the guidelines. Education programs are required to manage the misconceptions about influenza vaccination. Infection control (targeted) training also required in the management of outbreaks	Contingency planning and/or Risk Management Staff training and development Creating a safe care environment

DISCUSSION

This review of the existing peer-reviewed literature provides insight into the capacity of aged care services to respond to outbreaks of communicable diseases, including those with the potential to reach pandemic proportions. Four themes emerged from the thematic analysis of the literature: Staff training and development, Safety culture, Creating a safe care environment by planning for contingencies, and Risk and resource management.

STAFF TRAINING AND DEVELOPMENT

All the articles in the review identified the importance of targeted staff training and education programs to improve pandemic preparedness. Close communication with the staff was essential to preventing social confusion as it minimised the spread of non-scientific conversations and myths [22]. The flow of information from authorities to front-line staff was identified as essential for disseminating new information and guidelines [25]. However, despite several studies using various communication and social media

platforms, there was a notable lack of knowledge regarding infection control procedures, which necessitated additional staff training [27]. Staff education and training were not seen as a barrier to preparedness when available resources and there was access to outbreak management and training programs. Non-compliance was associated with a lack of education. Some educational programs are not providing a translation between education and practice [19].

To improve outbreak preparedness, aged care facilities need to provide education and training programs that promote a clear understanding of the core principles of essential skills such as infection control. Improving the competence of professional staff was seen as a priority for managing well in times of an outbreak [20]. Other skills essential to providing competent and safe care during outbreaks included communication, technical information about the outbreak, and decision-making. Additionally, improving these skills was found to reduce the occurrence of adverse events during crisis management and emergency responses [20]. Education and training programs were often developed after an outbreak rather than facilities already having these programs in place [24].

SAFETY CULTURE

Facilities with a strong safety culture were identified as having aligned individual and group values, attitudes, and behaviours to shape safety management [28]. When a high level of importance is placed on the values, attitudes and behaviours within the organisation, a strong safety culture emanates. This strong safety culture will likely influence positive staff satisfaction, turnaround and well-being [21]. However, developing and influencing the organisation's culture requires strong leadership where there is a commitment and practice directly related to safety performance. This means that attitudes and behaviours not in line with safety and performance are not tolerated in the organisation [28].

Guidelines and checklists were used in some studies associated with preparing for outbreaks [22, 25]. The benefit of the use of checklists was the ability to ensure that healthcare professionals received the correct information. However, checklists that are too complex and take too long to read were less likely to be fully implemented by staff [19]. This highlights the need to have guidelines and checklists that are succinct and made available through regular training and education platforms.

Staff compliance and scepticism was a significant issue concerning infection control prevention (IPC) and compliance with vaccination [19]. The minimisation of scepticism occurred by including vaccination strategies in education programs, and this addressed some of the myths associated with outbreaks [19]. Changing staff attitudes towards health practices during the pandemic was often facilitated by the presence and visibility of senior managers and leaders at the front line. Additionally, the use of procedure and equipment control personnel whose role was to observe that staff were donning and doffing protective equipment appropriately [25].

CREATING A SAFE CARE ENVIRONMENT BY PLANNING FOR CONTINGENCIES.

Creating a safe care environment was often linked to resource availability. A lack of human resources often resulted in managers quickly addressing disruptive events by recruiting staff with limited healthcare experience [25]. Some innovative solutions to seeking staffing resources involve using social media platforms such as Facebook and Instagram to contact potential staff. However, this was not a permanent practice for recruiting staff but a temporary solution to fix an immediate crisis. Using social media platforms was efficient, effective, and timely and could be initiated rapidly during an emergency [25]

Some of the vulnerabilities in the preparedness of aged care facilities were because of various long-lasting structural barriers such as overcrowding and staff shortages [21]. Staff shortages were a significant cause of an unsafe care environment as they often resulted in care that was either missed or rushed [20].

The staff-to-patient ratio was considered an effective way to avoid poor quality care. However, this was not always recognised by management [20]. Increasing the staff-to-patient ratio during a pandemic would allow for the extra time required to implement enhanced infection control strategies [20]. For example, adding staff to ensure that PPE was donned and doffed appropriately minimises the risk of further spread during an outbreak. Additionally, planning alternative workflows can assist with reducing the pressure placed on existing staff. For example, nursing residents in a negative pressure room in full PPE meant staff had to rely on alternative communication tools when working in isolation [29]. However, many aged care facilities with a poor safety culture did not have adequate structure for planning and decision-making in response to an outbreak [28]. They did not have a contingency plan that included

designated staff operationalising it. This added further pressure on existing staff. Teamwork was an area of strength for a safe care environment [21].

The additional pressure placed on healthcare professionals resulted in staff feeling emotional exhaustion with elevated stress, anxiety, and depression levels. Feeling overwhelmed was often a result of other pressures brought about by facilities that were not well prepared for managing an outbreak. Contingency planning, including outbreak capacity assessment and training, was often overlooked and resulted in a poor safety culture [21].

Contingency planning was identified as a major component of preparedness. Many studies found that aged care facilities overlooked the importance of thorough planning for outbreaks. An example of this is reported from a nursing home in Portugal with little contingency planning experienced an event that resulted in 18 deaths, largely due to the absence of adequate contingency planning [28]. Interestingly despite these major events that resulted from a poor safety culture and poor contingency planning, there was little improvement over time [21].

RISK AND RESOURCE MANAGEMENT

Resourcing Personal Protective Equipment (PPE)

PPE is an important and significant strategy for preventing the spread of infection to and from healthcare workers, and critical shortages of this essential equipment were experienced in the early stages of the COVID-19 pandemic [30]. There was an unprecedented demand for gloves, face masks, air-purifying respirators, face shields and goggles, and over gowns coupled with a dysfunctional costing model in American hospital operating systems [31]. This magnified the problem and caused a buying panic, depleting available domestic PPE inventories. Australia also seems to have experienced a similar phenomenon, although this requires further investigation. This urgent risk and resource management issue requires careful thought and planning to prevent what Lyng and colleagues called crisis-driven innovation to maintain appropriate care for infected and non-infected care recipients and staff in future pandemic planning [25].

Leader presence and time responses

A crisis is the true test of leadership, and globally, health leaders were forced to adapt to rapidly changing circumstances to support their teams to navigate through disruption successfully. Different national responses were mandated [32], all of which have learnings that will prove valuable in preparing for another pandemic. One of the most important functions of a leader is to facilitate and nurture the development of trust in the followership [33]. Leader affective presence and positive interpersonal behaviour in the workplace during crises are essential [34].

Clear and consistent messaging

One key lesson emerging from the COVID-19 pandemic is the importance of consistency in communications, specifically in crisis communications [35, 36]. The literature contains numerous complaints about messages and advice from different authorities and jurisdictions emerging from various jurisdictions globally [36-38]. For the same reasons, consistency is also important to how organisations manage their COVID-19 communications. Internal staff communication must be consistent with externally facing messages, including organisational social media pages. Positive, accurate and clear messages consistent with the known science must be consistently communicated because it relates to reputation and perception of trust in the organisation. The evidence is clear that consistency of message is a key part of best practice crisis communication. To integrate its communication, an organisation needs to embrace diversity and variety and balance the wisdom of its many voices with the effort to secure clarity and consistency in its overall expression [39].

CONCLUSION

This literature review has identified some of the priorities and necessities required for preparing aged care staff and the care environment for the pandemic or other outbreaks of communicable diseases. This systematic literature review highlighted the need for a strong safety culture where the organisation's values are lived within the leaders' and staff's attitudes and behaviours.

Building a strong safety culture includes having access to regular training and education for staff to ensure preparedness for communicable outbreaks and the quality and safety of aged care residents, their families, and staff. Creating a safe care environment prepared for outbreaks requires overcoming long-lasting structural barriers, such as staff shortages and poor staff ratios. Being prepared means having contingencies in place, plans ready and staff trained, but it also means paying attention to and minimising structural barriers.

When considering preparedness, guidelines and checklists are useful if they are clear, not too complex or take too long to read. However, for guidelines and checklists to be effective, they must be succinct and made available through regular staff education and training platforms. Additionally, developing a preparedness tool to assist aged care providers in creating conditions that will ensure their facilities are well-prepared must also consider risk management strategies. The risk strategies must focus on the resources essential to protect staff, families and residents, such as adequate PPE. This also includes timely leadership responses and clear messaging to limit confusion and scepticism from staff and minimise the effect of communicable outbreaks.

RECOMMENDATIONS

CREATE A SAFETY CULTURE

Aged care facilities need to focus on safety and ingrain this into the values, attitudes and behaviours of leaders and staff. This can be communicated through clear and consistent messaging via policies, guidelines, safety posters, toolkits, safety huddles, and 'walk arounds' by management regularly reinforcing the safety culture.

RESOURCES

Human and material resources are important in creating a safety culture to ensure the safety and well-being of aged consumers and staff. Organisational succession management of key infection prevention and control (IPC) staff is vital to ensure guideline implementation, compliance monitoring of outbreak trigger points and awareness of escalation pathways. Additionally, equitable access to PPE reserved stockpiles for aged care services is essential.

PLANNING FOR CONTINGENCIES

Infectious outbreaks are inevitable, so it is important to plan for them, including ensuring that resources are effectively and efficiently managed to reduce the risk to staff and residents. Resources are an important part of ensuring safety and avoiding injuries and fatalities. PPE is essential, and facilities should have access to adequate supplies when needed. Increasing hazard and risk awareness of staff and management will encourage preventative behaviours. Meaningful communication is key to raising risk awareness as it enables the necessary actions to ensure that various structural barriers, such as overcrowding and staff shortages, are overcome efficiently and effectively so they do not become long-lasting.

FOSTER MORE RESEARCH

This literature review revealed a significant gap in high-quality research into pandemic preparedness and responses in the aged care sector. It is imperative to bridge this gap by fostering more research to solve the many wicked problems in infection control and management in the aged care sector.

LIMITATIONS

There may be a risk of bias common to some of the included studies, such as a lack of blinding for subjective outcomes or unavailability of data. Moreover, some of the included studies may have inconsistencies of effect or association, as demonstrated by high clinical, methodological or statistical heterogeneity. This means that reported interventions may not work the same way every time the intervention is implemented. Some of the included studies had a relatively small sample size or lack of diversity in the sample. While it was not obvious to the authors when reviewing the included studies, there is a risk of publication bias within the included studies.

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APPENDIX 1 – DATA BASES SEARCHED IN THE SYSTEMATIC LITERATURE REVIEW

1. Scopus,
2. Web of Science
3. Science Citation Index expanded
4. ProQuest Central
5. DOAJ Directory of Open Access Journals
6. PubMed; PubMed Central
7. IngentaConnect
8. Gale Academic OneFile
9. Social Sciences Citation Index
10. MEDLINE (Ovid); Medline
11. Springer online Journals Complete; Springer Journals Complete open access; Springer Nature OA/Free Journals; Springer LINK Archive
12. PLoS
13. Journals @Ovid Full text
14. BiomedCentral open
15. MDPI Open access
16. Wiley online library all journals
17. Wiley online Library Database Model 2022
18. Highwire press; BMJ Journals
19. BMJ Open Access Journals
20. Wiley Online Library All Backfiles
21. HighWire Press (Free Journals)
22. CINAHL Complete; Single Journals
23. Freely Accessible Science
24. Wiley Online Library Nursing Backfiles
25. Taylor & Francis Online; Springer Online Journals - CAUL 2019
26. ScienceDirect Journals
27. Gale General OneFile
28. DOVE Medical Press Journals [SAGE Journals Premier 2021
29. SAGE Journals Premier 2022
30. ScienceDirect Freedom Collection 2021
31. Taylor & Francis Online 2021
32. Nature Journals Online
33. SAGE Complete A-Z List
34. International Bibliography of the Social Sciences– Medicine
35. Taylor & Francis Open Access
36. Wiley-Blackwell Open Access Titles
37. Co-Action Open Access Journals
38. SAGE Open Access Journals; Australia/New Zealand Reference Centre
39. SAGE Deep Backfile 2009
40. Wiley Free Content
41. Elsevier Open Access Journals
42. Social Services Abstracts; Cambridge Journals: 2022 Full Collection
43. Oxford University Press Journals All Titles
44. Clinical Key Australia Flex.

BENEFITS AND CHALLENGES FOR YOUNG AUSTRALIANS WITH EPILEPSY TRANSITIONING INTO ADULT HEALTHCARE: A SCOPING REVIEW

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ABSTRACT

BACKGROUND

Transitioning from paediatric healthcare into an adult healthcare system is a high-risk time for people with complex epilepsy. This can be a period of significant upheaval as a young person moves away from familiar and safe paediatric environments into unfamiliar adult healthcare. This is compounded by normal adolescent development, the challenges of epilepsy and the lifestyle conditions it demands, including restrictions on driving and levels of independence. Such factors can contribute to suboptimal health engagement which result in increased seizure activity, hospital admissions and reduction in community participation [1-6]. Effective, well implemented transition programs are key to reducing risks, however little is known about which features of transition pathways define success or best practice.

A scoping review was used to examine a broad range of peer-reviewed literature published between 2017 and 2022. This review examined evidence-based literature relating to experiences of people with epilepsy as they transitioned between paediatric and adult healthcare environments. Specifically, exploring practices that offered benefits, recognising barriers, and identifying findings to inform future research and advance transition practices.

CONCLUSION

This review found that key to reducing transition-related health impacts for young people was patient-centred, engaging care that acknowledges their psychosocial and mental health needs specific to their level of development. Evidence suggests that engagement is built through multidisciplinary clinics that facilitate education and self-management. This review found that successful programs can deliver this by focusing on four key areas: relationships and continuity, capacity building, processes, and health services and systems. At a paediatric level this involves timely, age-appropriate preparation that builds skills and knowledge through tailored care-plans. At the transfer phase this means coordinated teams that work together across systems to ensure handover continuity, reduce stressors, and to aid navigation. At the adult level, care-teams that welcome young patients with protocols for continued capacity building are required.

KEYWORDS

adolescent, healthcare transition, epilepsy, paediatric to adult healthcare

INTRODUCTION

Transition to adult care from the paediatric health system is described as a high-risk time for patients with epilepsy who require ongoing specialised care and treatment [1-3]. For these adolescents and young adults (AYA) transition can be stressful as they leave familiar, facilitated, and safe paediatric centres for new adult orientated health environments [4]. While simultaneously, patient case management changes from being parent (or significant adult) led to being self-managed. This means patients must acquire the skills and abilities to manage their own care, sourcing and complying with medication, scheduling, navigating, and attending appointments, while also knowing how to react to changes in their condition [5]. In the paediatric system this health management is scaffolded by supportive adults, including parents and health practitioners. In an adult-orientated system there is a higher expectation that patients have the capacity and knowledge to do this unaided [4]. For AYA's deemed not to have this capacity, transition proceeds with their existing supports in place.

Transition is further complicated by normal developmental social and emotional changes experienced by all young people, including increases in general risk-taking behaviours and a desire for autonomy [6]. These emotional changes mean that some young people can struggle to make the lifestyle adjustments their condition requires. Collectively these factors contribute to suboptimal health engagement, resulting in decreases in adherence to medication, low appointment attendance and poor lifestyle behaviours [7, 8]. This leads to increased seizure activity, hospital admissions, injuries, risk of sudden unexplained death in Epilepsy (SUDEP) as well as disruptions to education, vocational and social participation [9]

BACKGROUND LITERATURE REVIEW

EPILEPSY

Epilepsy is a chronic neurological condition that is characterised by unpredictable and recurrent seizures. For some, childhood epilepsy is self-limiting, but others may require ongoing anti-seizure treatment and specialist care into adulthood [1, 10]. People with epilepsy experience differences in seizure severity, frequency, and type and as such require individualised ongoing treatment [10]. Australian healthcare expenditure for epilepsy in 2018-19 was calculated at $333 million, with people aged 15-19 years experiencing the highest burden of disease [11]. One in three people with an epilepsy diagnosis do not gain seizure control from anti-seizure medications (ASM) (1). In addition to this lack of seizure control, ASM treatments are complicated by negative side effects such as cognitive slowing, depressive symptoms, and behaviour disinhibition [1, 10].

TRANSITION PRACTICES

Healthcare transition involves the staged process of preparation and purposeful planned movement between healthcare systems. Differences between paediatric and adult healthcare models are marked and therefore require a strategic approach to maximise patient outcomes.

This paper defines people aged between 10-24 as adolescents and young adults (AYA's) (People aged between aged 10-14 are young adolescents, 15-19 are older adolescents and young adults are 20-24) [12, 13]. The goals for this process should be for uninterrupted, comprehensive, developmentally appropriate, psychologically sound, and coordinated healthcare [14]. Research is clear that discontinuity of adequate epilepsy healthcare poses risks for poor health related quality of life as well as lifestyle and occupational restrictions [10, 15, 16]. In other words, transition programs that do not meet a young person's needs increase the incidence of disengagement and increase risks of treatment failure which exacerbates the disease.

Published work acknowledges this complex time with consensus that little is known about which features of transitional care define success [17, 18]. Transitional pathways for chronic disease are an expanding area of practice, with much of the published literature recognising the need for established, widespread service models [16]. To date, much of the published work pertains to specific disease states, for example HIV or diabetes. As yet common protocols or programmes for epilepsy transition have not been established [18]. In addition to this, research indicates there is a need for a consensus driven approach as to how transition readiness is measured and how success is evaluated.

Existing transition research indicates higher age was associated with transition readiness. Positive correlations were also found with factors such as high levels of knowledge, cognitive ability, and psychosocial function [1, 2]. This is significant because it is recognised that AYA's with epilepsy can have deficits in all these areas, which further

complicates their transition [1, 2, 10, 17]. They found that successful transition was aided by care that managed seizures and actively acknowledged psychosocial and mental health needs. Collectively these studies concluded that further understanding and transition programs based on identified best practice models were still needed.

Additional studies converge to highlight the research gap for more knowledge around transitional needs and program design. Research states that AYA's need a process that recognises their individual needs delivered by upskilled clinicians to ensure a smooth transition and optimal care [18, 19]. Authors found that despite national recommendations transition discussions and processes were not routinely happening [1]. A significant finding was that adult health providers reported low-levels of confidence in dealing with complex forms of childhood-onset epilepsy. This finding was supported by Tirol and Kumar [20] whose qualitative study of resident doctors found most respondents rated their transition knowledge as very minimal. Respondents reported a lack of exposure to transition processes and the need for improved training.

These findings indicated there are common factors that provide benefits and challenges which this review study sought to further explore.

AIM

The aim of this project was to conduct a scoping review of published literature to examine what is known about current transition practises. Specifically, to understand what is beneficial and what are the ongoing challenges experienced by AYA's at this time. It is important to clarify and define these findings so they can then be generalised or transferred to further benefit Australian youth with epilepsy. This is crucial because transition programs that do not meet a young person's needs increase the incidence of disengagement leading to an increased risk of treatment failure and increased disease burdens.

METHOD

A scoping review was conducted using the Arksey and O'Malley [21] framework in conjunction with PRISMA ScR methodology [22]. These are both established conventions that provided stand-alone systematic methodology for mapping literature on a broad topic from a broad range of study types [21, 23]. The following sections describe the process used.

RESEARCH QUESTION IDENTIFICATION

Early investigations indicated that there were several potentially relevant studies, but each examined different elements of transition and were not overarching in their findings. For example, some studies assessed a singular trial transition program, or mental health experiences of patients. This paper therefore sought to review several studies for a holistic understanding of the issues and benefits effecting these young people by asking: "What are the benefits and challenges for paediatric patients with epilepsy as they transition into the adult healthcare system in Australia?"

STUDY IDENTIFICATION

Date Collection:

This study reviewed published literature using a search criterion based on key words from credible, peer-reviewed articles published in the last five years. This time frame was chosen because transitional care is an expanding area of research as increasing numbers of children with chronic health needs age out of paediatric systems [16, 18, 24]. At the same time, modern healthcare has increasingly separated children and adults' hospitals with purpose built paediatric hospitals. Transition processes, therefore, now effect a larger group of people across a wider chasm. Consequently, it was, important to explore contemporary literature to examine this emerging area of practice.

Data Bases:

This search used online data bases; WorldCat.org, ABI/INFORM Collection, Gale Academic OneFile, and ERIC. They were selected because they offer a wide range of peer reviewed articles that have been tested by experts and validated to ensure credibility.

Search Terms:

Transitional care for young adults with epilepsy in Australia and Transitional care for young adults with epilepsy. These terms target key words of transitional, young adults, epilepsy, and Australia. The search was then broadened by removing the word Australia to capture international articles that could offer commonalities and generalisable themes.

STUDY SELECTION

Inclusions

This review included all forms of empirical research concerning people with epilepsy aged 10-24 transitioning between paediatric and adult health systems. To ensure a

complete examination this project placed no limits on the study types included. Where possible, the project sought to examine literature describing the Australian healthcare system but as this information was limited, international studies were also reviewed for transferable findings. All forms of healthcare and allied healthcare services for people with epilepsy were included as were all forms of service delivery such as, face-to-face, telehealth, hospital, etc.

EXCLUSION CRITERIA

This study excluded articles not published in English due to time factors associated with translation. To further exclude unsuitable articles this study used the PRISMA ScR flow method for selection.

ARTICLE QUALITY ASSESSMENT

To ensure the quality of included articles a quality assessment was conducted using the Mixed Methods Appraisal Tool (MMAT), 2018 version 17 [25]. The assessment tool is reproduced below in Figure 1.

To achieve consensus for article quality, a dual review was undertaken. Studies considered for selection were reviewed independently by each author to determine appropriateness for inclusion or exclusion. This process examined and scored the search results against the MMAT to ensure unison for article quality and integrity.

FIGURE 1. QUALITY ASSESSMENT TOOL

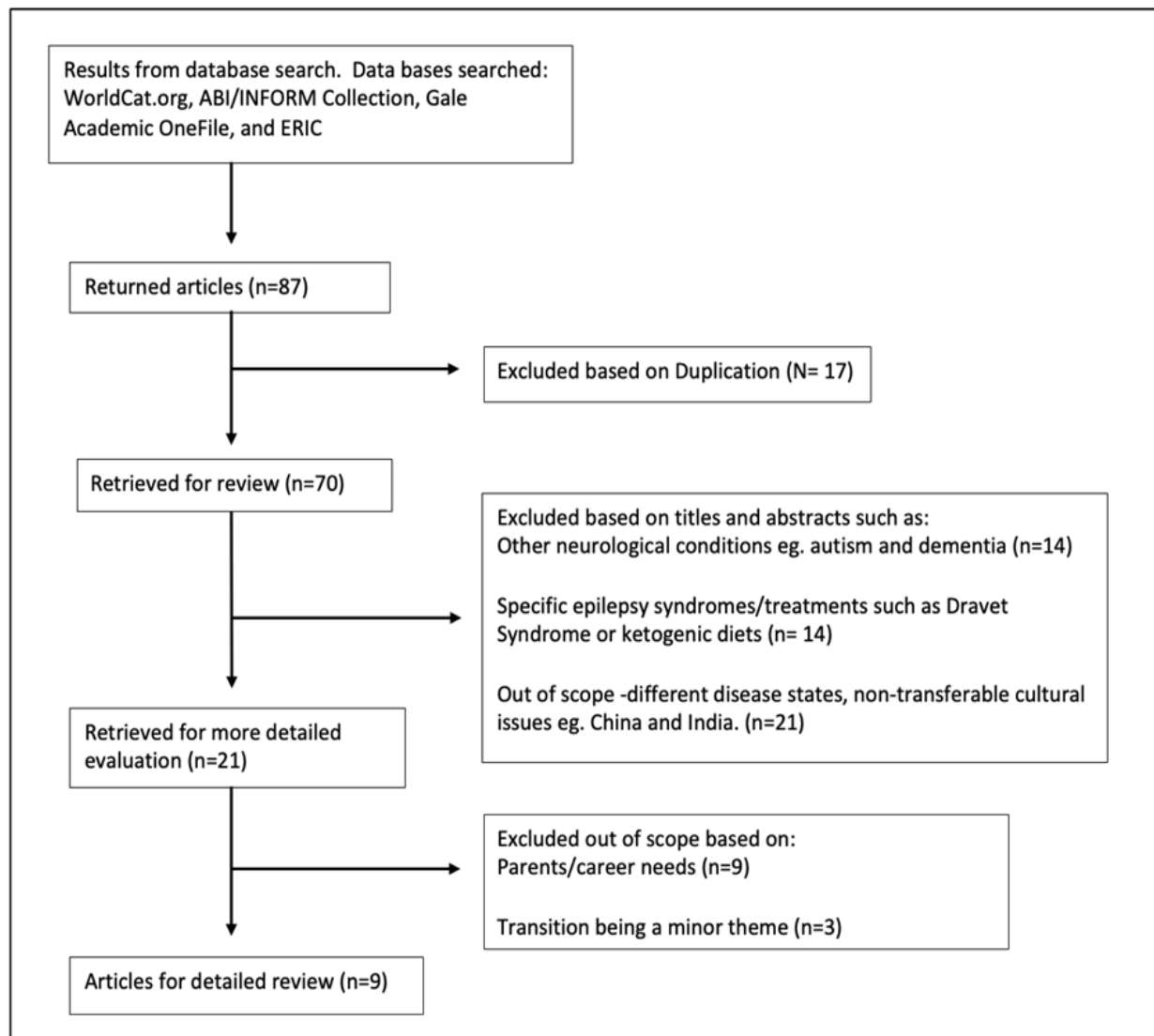| Category of study designs	Methodological quality criteria	Responses			
		Yes	No	Can't tell	Comments
Screening questions (for all types)	S1. Are there clear research questions?				
	S2. Do the collected data allow to address the research questions?				
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.				
1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?				
	1.2. Are the qualitative data collection methods adequate to address the research question?				
	1.3. Are the findings adequately derived from the data?				
	1.4. Is the interpretation of results sufficiently substantiated by data?				
	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?				
2. Quantitative randomized controlled trials	2.1. Is randomization appropriately performed?				
	2.2. Are the groups comparable at baseline?				
	2.3. Are there complete outcome data?				
	2.4. Are outcome assessors blinded to the intervention provided?				
	2.5 Did the participants adhere to the assigned intervention?				
3. Quantitative non-randomized	3.1. Are the participants representative of the target population?				
	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?				
	3.3. Are there complete outcome data?				
	3.4. Are the confounders accounted for in the design and analysis?				
	3.5. During the study period, is the intervention administered (or exposure occurred) as intended?				
4. Quantitative descriptive	4.1. Is the sampling strategy relevant to address the research question?				
	4.2. Is the sample representative of the target population?				
	4.3. Are the measurements appropriate?				
	4.4. Is the risk of nonresponse bias low?				
	4.5. Is the statistical analysis appropriate to answer the research question?				
5. Mixed methods	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?				
	5.2. Are the different components of the study effectively integrated to answer the research question?				
	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?				
	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?				
	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?				

Sourced: Methods Appraisal Tool (MMAT), 2018 version 17.

SEARCH RESULTS

The initial search term returned only 65 articles, after removing the term Australia this increased to 87 peer-reviewed articles. The small number of articles generated is indicative of the limited information available on this emerging topic. Duplicates were excluded as were a further 28 studies as they were out of scope for example, relating to other neurological conditions, or relating only to specific epilepsy conditions or treatments. 21 studies were removed as they were outside of scope discussing: different disease states, or non-transferable international issues. Abstracts of the remaining 21 were read and a further 12 were deemed out of scope, for example: focusing on parents/carer needs or discussing transition as a minor theme. This produced nine remaining articles suitable for inclusion, see Figure 2.

Benefits And Challenges for Young Australians with Epilepsy Transitioning Into Adult Healthcare: A scoping review **4**

Asia Pacific Journal of Health Management 2023; 18(3):i2473. doi: 10.24083/apjhm.v18i3.2473

FIGURE 2. ARTICLE SELECTION

Source: Adapted PRISMA flow diagram (2020) https://prisma-statement.org/PRISMAStatement/

CHARTING, SUMMARY AND REPORTING

The selected articles were read for in-depth analysis and interpretation. Data were extracted from each paper in accordance with key findings and comparable themes. This information was charted in a spreadsheet as seen in Table 1.

Continued analysis of themes allowed for categories to be charted as commonalties and overlapping findings were identified and summarised. These were identified and coded according to five categories focusing on factors that benefited transition. They were relationships and continuity, capacity building, process, health services and systems, mental health, and comorbidities, as seen in Table 1.

These categories were then further condensed into four key area that grouped common elements in accordance with factors that contributed to successful transition for AYA's as seen in Table 2. This process of data analysis and charting produced a descriptive account of transitional elements that contribute clarity to the research topic.

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TABLE 1. ARTICLES SELECTED

	Author/Year	Design	Title/Objective	Outcome/Findings	Benefits/Strengths	Challenges/Barriers
1	Smith et al., 2020 USA	Qualitative cross sectional	Modifiable factors related to transition readiness in adolescents and young adults with epilepsy	Need for epilepsy specific transfer readiness to identify targets for intervention. Age must be matched with factors such as knowledge, psychosocial/cognitive functioning Target modifiable social-ecological factors	Start transition conversations early Target modifiable factors Work with families Gradual process Individualised plans	Low cognitive function Insufficient knowledge Provider discomfort Family concerns
2	Reger et al., 2021 USA	Mixed methods	Development of the transition-age program (TAP): Review of a pilot psychosocial multidisciplinary transition program in a level 4 epilepsy centre.	Screen for readiness, and neurological comorbidities. Develop skills of selfcare and decision making. Build lifestyle factors for participation. Effective communication. Develop targeted individualised care plans before transition begins.	12-13 start discussions Initiate plan 14-15 years Individualised plan	Anticipatory anxiety Untreated neurological comorbidities
3	Stefanidou et al., 2020 USA	Literature Review	Mental health issues in transition-age adolescents and young adults with epilepsy.	Transition programs are promising methods for improving patient engagement and empowerment	Span 13 – 19yrs Educate, Build relationships Screen for mental health	Depression and anxiety Intellectual disability
4	Goselink et al., 2022 Sweden	Systematic review	Transition to adult care in epilepsy: A systematic review	Found gaps in knowledge for what constitutes efficacious transition. More study required to understand patient and family need of services Needs of AYA with ID vs needs of normal ID function without comorbidities. Start transition early 12-16 years, meet with adult team before transition	Planned transition enhances outcomes Multidiscipline teams Central coordinator Patient centered communication	Behavioural and cognitive problems effect transition more that epilepsy Anxiety and depression
5	Baca et al., 2018 USA	Longitudinal Qualitative study	The epilepsy transition care gap in young adults with childhood-onset epilepsy.	Only 15% of all cases had transition care discussion with provider before 18yrs. Higher rates for those with active epilepsy 31% compared to 4% for inactive. Participants would have expected earlier discussions. Epilepsy transition includes management of seizures, mental health and psychosocial needs. Presence of ID does not change the need for discussion, just the nature of discussion.	Early discussions Multipronged care Joint clinics Structured models	Low relationships Lack of definition Low knowledge
6	Le Marne 2018 Australia	Quantitative Likert-type scales Qualitative questions	Implementing a new adolescent epilepsy service: Improving patient experience and readiness for transition.	Age-appropriate education, self-management strategies and mental health support improve patient outcomes. 45 teens mean age 15.7yrs, 44 parents/care givers. Reduce attendance burden, create social opportunities	Upskilled staff Start transition early Include mental health	Attendance burden Lack of understanding Mental health stigma
7	Mc Govern et al., 2018 France	Qualitative OYOF-TES questionnaire and visual analogue scales	Making a 'Jump' from paediatric healthcare: A transitional program for young adults with chronic neurological disease.	Multidisciplinary and coordinated approach to transition leads to high satisfaction among patients and families. Coordinating nurse specialists were key to success. 111 patients, mean age of 19.7yrs 33% had epilepsy, 23% had etiology that didn't fit the main categories of neurological disease including: undiagnosed epilepsy, work ups in progress and functional symptoms. Study conducted in large hospital setting and may not transfer to smaller facilities, but guiding principles are still beneficial.	Multidiscipline teams Nurse coordinators Holistic Allied health team Tailored transition plans	Diverse neuro conditions How to quantify satisfaction and measurement Transition timing difficult for AYA
8	Burke et al. 2018 UK	Scoping review Includes papers from 2001 - 2016	The transition of adolescents with juvenile idiopathic arthritis or epilepsy from paediatric health-care services to adult health-care services: A scoping review of the literature and a synthesis of the evidence.	Found – lack of definition for a successful transition and lack of research evaluating effectiveness of interventions to support YP transitioning. Consensus on need and importance but no model. Study included Epilepsy and Juvenile Idiopathic Arthritis (JIA) epilepsy was a significant theme.	Strong relationships Continuity of health professionals Individualised approach Programme coordinator Education	Paucity of information Different protocols across hospitals Poor coordination between services
9	Tirol et al., 2020 USA	Qualitative	Resident training in transitioning youth with epilepsy into adult care	Educational interventions will improve transition process for patients.	Health professional Training and mentorship	Lack of/gaps in training and experience

TABLE 2. KEY CATEGORIES AND ELEMENTS OF SUCCESS

Theme	Elements of success
Relationships and Continuity	Patient centred care
	Include caregivers
	High quality relationships
	Confident practitioners
	Designated program coordinators
Capacity Building	Address comorbidities eg. cognitive deficits, mental health
	Provide epilepsy education and care
	Address psychosocial needs – school, vocation, housing, social
	Individual plans
	Create social opportunities
Process	Patient age and readiness
	Patient needs and goals
	Preparation and timing
	Multidisciplinary teams
	Joint transition plans
Health Services/systems	Upskilled clinicians
	Multidisciplinary teams
	Measurement scales/frameworks eg. readiness and outcomes
	Resourcing
	Utilise NGO's and support groups

RESULTS

RELATIONSHIPS AND CONTINUITY

An early theme to emerge in this review was the emphasis on high-quality relationships and continuity of care. Researchers consistently stated the importance of building relationships, working collaboratively, and understanding the viewpoints of patients and parents/care givers [1, 15, 17, 18]. It was stated specifically that nursing kindness and health professionals' interpersonal care were key predictors of patient satisfaction as were designated programme coordinators [18, 26]. These coordinators (often nurses) were credited with providing a consistent point of contact that facilitated and strengthened connections [15, 17, 18]. Authors' recommendations focused on building strong interpersonal relationships as a means of building trusting connections that foster AYA empowerment [3]. Multiple studies noted the importance of working collaboratively with AYA's families and care givers as key stakeholders in conjunction with the AYA patient, care provider and care system [1, 18]. This can be done by including families during the transition process to ensure their concerns are addressed and they are involved in capacity building education [15, 18]. Also noted was the importance of effective communication between treating practitioners, for example paediatric and adult teams [19].

CAPACITY BUILDING

Another strong theme in the analysis, was the need to recognise comorbidities commonly experienced by AHA's with epilepsy. This was included within the capacity building category to recognise that AYA's with epilepsy experience higher rates of intellectual disabilities, conduct disorders, and psychiatric comorbidities that amplify transition difficulties [2, 3, 17]. In particular, researchers noted that behavioural and cognitive problems affect AYA's transition more than epilepsy [17]. As such, this should take priority. Research states that programmes should screen for comorbidities and include treatment pathways as part of transition preparation. They state that capacity building was strengthened by developing self-esteem and including protectors against psychiatric conditions [15, 17, 19]. Further capacity is enhanced through education, self-management, and skill building by focusing on modifiable factors such as knowledge, psychosocial, and cognitive capacity [2, 3, 26]. Importantly, it is recommended that transition programs are adapted for AYA's with cognitive impairment whilst considering behavioural and emotional problems of all participants [1, 15, 17].

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Further analysis concluded that transition preparation should be a gradual process of age-appropriate, goal orientated education, and skill building [2, 18, 19]. Recommendations focused on building individualised and tailored plans that could respond holistically to AYA's psychosocial needs as part of their epilepsy healthcare. Participants were reported as requesting 'teen-friendly' clinics and opportunities for social and peer support from other teens [2]. Researchers concluded that transition is challenging but critical and education and self-management strategies can improve patient outcomes [2, 15, 19, 26].

PROCESS

Another consistent theme in the data chart was that of patient age and readiness. The research recognised that transition processes were dependant on the patient being prepared for transition according to their individual needs and goals. The findings stated that successful transition was enhanced by organised, multidisciplinary teams who worked together on joint plans. Studies concur that plans individually tailored and delivered by teams reduce anticipatory anxiety and enhance transition processes [19]. For example, these teams may consist of neurology specialists, epileptologists, clinical nurses, coordinating staff and include allied health such as sexual health nurses, occupational therapists, and social workers [2, 19].

Significantly, patient age was frequently discussed within the research. Authors noted that there was no fixed age for transition, rather, transition is a process that should span several years and is dependent on the individual [1, 3, 15]. Studies found that higher age was associated with readiness and that preparation discussions should begin between 10-13 years [3, 19]. Further research supported the introduction of transition discussions beginning at 12-13 years with initiation by 14-16 years. Studies concluded that benefits were gained by early planning followed by more targeted interventions just prior to actual transition at or around of 18 years [1, 3, 17, 19].

In an Australian setting, it is important to note that transfer taking place at 18 years coincides with the final year of school for most students. This may involve study commitments, exams, vocational preparation, tertiary study transition and end of school rites of passage. This is a complex and busy time that highlights timing and scheduling as a potential barrier for appointment attendance and engagement.

HEALTH SERVICES AND SYSTEMS

The management of health services and systems is another key element in the successful transition to adult care. Health system continuity issues were found to contribute to shortfalls in transition services [1, 26]. This presents as different treatment protocols, working methods, infrastructure, and priorities between service providers [2, 20, 26]. For example, it was noted that paediatric and adult health professionals may not know each other or understand each other's protocols and treatment models [18, 26]. These observations provide transferable cautions for health service providers and managers in Australia as a lack of coordination and appointment delays risk eroding patient engagement.

Further barriers to transition came from discordance between care models and low confidence levels of health providers [1]. Cautions for service providers came from findings that despite national recommendations, transition discussions and processes were not routinely happening. Some providers reported low-levels of confidence in dealing with complex forms of childhood-onset epilepsy [1]. This finding was supported in a qualitative study of resident doctors that found most respondents rated their transition knowledge as very minimal [20]. Respondents reported a lack of exposure to transition processes and the need for improved training. However, both studies were American and drew from small cohorts. Further evidence is needed to determine how prevalent these findings are and to what degree they apply to Australia.

Another theme identified as a barrier in AYA transition, was how transition readiness or success is measured and reported. Studies have noted that empirical data on transitional best practices is limited, and outcome measures are inconsistent, for example, how and when are transition outcomes measured [18, 26]. Transition is an ongoing process which means programmes may need longitudinal assessment to gauge their effectiveness [2].

Detailed analysis of the papers included in this study provided clear evidence of common themes that can be used to guide transition practice. A summary of these benefits and challenges can be seen in Table 3.

TABLE 3. KEY THEMES OF BENEFITS AND CHALLENGES.

Benefits – What works	Challenges – What hinders
High quality relationships	Comorbidities – mental health, cognitive deficits
Addressing psychosocial needs Capacity building through education	Psychosocial burdens
Individualised, tailored, and targeted programs	Parental/care giver transition anxiety
Multidisciplinary teams with designated coordinators	Practitioner inexperience or confidence gaps
Correct preparation and timing	Appointment burdens, time, access, expense
Continuity of care	Absence of measurement frameworks and empirical care models

FUTURE DIRECTIONS

This scoping review identified several elements that aide in answering the research question to understand the challenges and benefits for young Australians with epilepsy as they transition between healthcare systems. The results indicate the main categories to consider as health service managers are the timing and preparation of programs, which must be delivered by multidisciplinary joint teams with designated coordinators. Programs need to collaborate with patients and families to build individualised plans. In addition, these programs need to include strategies and adjustments to address the high prevalence of psychological, behavioural, and cognitive issues experienced by this cohort. While progress is being made in the transition area there is opportunity for further research as to how transition readiness is assessed and how successful transition is measured particularly in Australia. Investing in well-developed upstream transition programs will contribute to closing detrimental and expensive treatment gaps while improving long term health outcomes [10, 27, 28]

LIMITATIONS

A limitation for this study is the exclusion of disease states other than epilepsy. It is acknowledged that other disease areas could offer insight and value for improving transition processes but fall outside the scope of this review. A further limitation is that studies reviewed had a low prevalence of minority groups and transition data was drawn from metropolitan areas in well-resourced countries. As such the findings may not reflect the impacts for people living with different sociodemographic factors or in remote or regional areas. Further research is needed to understand the health and access disparities for people in these groups, particularly for First Nations Australians.

DECLARATION OF CONFLICTING INTERESTS
The Authors declare that there is no conflict of interest.

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REVIEW ARTICLE

THE ASSOCIATION BETWEEN WORK-LIFE BALANCE AND EMPLOYEE MENTAL HEALTH: A SYSTEMIC REVIEW

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ABSTRACT

The existence of an association between work-life balance and mental health in employees has not been found. The purpose of the systematic review is to assess the relationship between work-life balance and mental health among employees. This study used the SLR method; a literature search was conducted on the PubMed, Scopus, Google Scholar, and Crossref databases in early January 2023. The results showed n = 79 on Scopus, n = 2 on PubMed, n = 147 on Google Scholar, and n = 4000 on Crossref. After PRISMA analysis, n = 30 studies were included in the review. Number of reviews Positive correlation between work-life balance and positive mental health (n = 19); positive correlation between work-life balance and positive mental health (n = 7); positive correlation between work-life imbalance and positive mental health (n = 4). Countries where research was conducted: Malaysia, South Korea, India, Indonesia, Pakistan, Spanish, Nigeria, Ghana, Australia, New Zealand Maori, China, UK, Chinese, New Zealand European, French, Italian, Brazil, Canada, Taiwan, Egyptian, Saudi, Switzerland, and America. Positive mental health variations that have a positive relationship with work-life balance are psychological well-being, resilience, life satisfaction, well-being, positive mental health, higher job satisfaction, lower turnover intention, psychological well-being, well-being, job performance, and work involvement. There are a variety of workers: priests, public servants, lecturers, campus administrative staff, bankers, high school teachers, academics, media workers, midwives, and professors. Depression, anxiety, mental burden, work stress, the severity of insomnia, burnout, turnover intention, and technostress are all variations of mental health problems that have a positive relationship with work-life balance. Worker variations include bankers, health care professionals, work-from-home moms, working students, bus transportation workers, and full-time insurance tech employees.

KEYWORDS

work-life balance; work-life imbalance; positive mental health; mental health problems; technostress; psychological well-being; burnout; turnover intention; depression; anxiety; employee

INTRODUCTION

Work-life balance is the most important thing for employees who want to live well. [1] Work-life balance is also defined as the capacity of individuals, regardless of age or gender, to successfully juggle work and domestic obligations. [2]

Each employee's work-life balance differs from the next. During their remaining time at work, employees have diverse life priorities. [3] Flexibility in the workplace is no longer only an option for innovative employee management. However, it is also a prerequisite for organizations to succeed in the current dynamic and competitive global business climate. The universality of

labor and space calls for greater schedule, hour, and location flexibility. [4] An individual's optimal work-life balance will fluctuate over time and frequently on a daily basis. It is possible that tomorrow's ideal equilibrium will differ from today's. When you are single or married, have children, start a new career, or are approaching retirement, the ideal balance will alter from what it is now. [5]

Employers can assist employees in balancing work and family by providing a healthy work environment, flexible working hours, a reduction in workload, and training on work-life balance for staff management. It is hypothesized that organizations that implement work-life balance policies and respect the needs of their employees are perceived as more positive and desirable and have a better reputation. Employees are more productive and dedicated, allowing the organization to achieve its success and goals more quickly and effectively. [6,7]

Mental health includes mental disorder and positive mental health. Most western countries' sick leave is due to mental health difficulties. (8) This study found that 90% of mental health-related sick lists in Sweden are due to stress disorders, common mental diseases, and depression, such as anxiety. [9] The US's most expensive presenteeism disorder is depressive disorder. [10] The company pays more for sick leave, lost productivity, and replacement and re-hiring owing to mental health problem absence. [10]

Positive mental health, for instance, occurs when a person feels happy at work and continues to feel happy at home. [11] Employees with healthier, more balanced lifestyles are more productive, loyal, and produce higher-quality work. [12] Greater influence on life satisfaction is exerted by job satisfaction. [13,14] Job satisfaction correlates directly with personal happiness and life satisfaction. [15,16] Work-life balance is associated with psychosocial well-being, even after controlling for factors related to work and factors specific to the individual. [17] Harmonizing life and work is beneficial for both mental and physical health. A good work-life balance increases job satisfaction, psychosocial well-being, and overall quality of life. [18] People who are in better psychosocial health are more committed to their jobs, more productive, and happier than average people. [19]

The harmony between work and life must exist in order to achieve balance. [20] When people struggle to balance their personal and professional lives, work-life balance

issues arise, which can lead to physical and mental health issues. Stress is one of the psychological disorders that increases a person's risk of illness, particularly heart disease and stroke. [21] Literature suggests that depression and distress are common outcomes of poor work-life balance, leading to decreased productivity, lower quality of work, higher absenteeism, and higher staff turnover. [22,23] Psychosocial well-being and a lack of work-life balance are related. [17]

An unbalanced work-life leads to lower job satisfaction, psychosocial well-being, and quality of life. [24–26] It's thought that the emotionally demanding nature of mental health work raises the risk of burnout, which is linked to lower employee satisfaction and a greater desire to leave one's job. [27–29] Emotional tiredness, low well-being (including good mood, vitality, and general interest), depression, bad feelings (such as anger, anxiety, annoyance, and resentment), sleep issues, and burnout were more common in people with higher work-life conflict. [30–33] In various populations, a poorer self-assessment of health was associated with greater work-life conflict or a poorer work-life balance. [30–33] Those who lack a work-life balance are more likely to suffer from musculoskeletal disorders, headaches/eyestrain [31,34] and physical weariness. [33]

On the Scopus data source, search results through publish or perish with the phrase "work-life balance systematic review" produced eight articles, in 2022 [35–38], in 2021 [39,40], 2000 [41], and in 2008. [42] No one has examined the relationship between work-life balance and mental health employees, according to the eight reviews listed above. The absence of a review of the relationship between work-life balance and mental health makes it essential to conduct this research. Little is known about the role of work-life balance in preventing workers' mental health problems and in promoting the mental health of workers. The objective of this study was to conduct a comprehensive literature review on the association between work-life balance and employee mental health.

This study will investigate the association between work-life balance (work-life balance and work-life imbalance) and mental health, making it distinct from previous studies conducted by the aforementioned researchers (positive mental health and mental health problems). The focus on the type-specific relationship between work-life balance and mental health is a novel aspect of this study. Every worker in this world must consider both their work environment and their living environment. Therefore,

mental health is required to successfully balance work and home life. Consequently, avoiding mental health issues is crucial to avoiding problems at work and at home. This research is significant because it will examine all aspects of work-life balance and mental health. Workers, organizational leaders, and policymakers will gain references for determining a supportive attitude, maintaining a work-life balance, and maintaining good mental health by understanding these relationships.

This review aims to synthesize in a systematic manner the existing literature that investigates the relationship between work-life balance and Employee mental health. There are three goals aimed at answering the following research questions: 1) Is there an association between work-life balance and mental health problems? 2) Is there an association between work-life balance and positive mental health? 3) Is there an association between work-life imbalance and positive mental health?

The publish or perish application and search terms created to capture as much pertinent research as possible were used to conduct a systematic search of Scopus, Google Scholar, Crossref, and PubMed data sources in order to find an answer to this question. Studies were analyzed and chosen in accordance with previously established inclusion and exclusion criteria.

LITERATURE REVIEW

WORK-LIFE BALANCE AND EMPLOYEE POSITIVE MENTAL HEALTH

Work-life balance is the development and upkeep of a welcoming and healthy workplace that enables employees to manage their personal and professional responsibilities, increasing employee loyalty and productivity. Less stress at work and home is associated with job satisfaction, according to research. [43] Researchers have discovered a correlation between work-life balance and mental health. Like, study [44]) 400 private sector bank employees (200 men and 200 women) from Chandigarh and the surrounding area, aged 32 to 55. Work-life balance is positively correlated with mental health, job satisfaction, and life satisfaction in men and life satisfaction in women. Result of study [45] shows that PT. X women's work-life balance affects their mental health. Working women with higher work-life balance have higher psychological well-being. Positive mental health, i.e., a positive sense of well-being, as well as the capacity to enjoy life and deal with

life's challenges. [46] Jahoda described positive mental health as individuals' attitudes towards themselves and the environment and their ability to adapt to situations. [47]

WORK-LIFE BALANCE AND EMPLOYEE MENTAL HEALTH PROBLEMS

The majority of a person's life is spent in the realm of work. Independent and productive individuals are expected to contribute to society. However, mental health problems can diminish the ability to be independent and productive. Problems with mental health are common in the workplace (48) and can affect productivity. Most workplaces are affected by mental health problems. [9,48] According to the evidence, employing mindfulness to manage competing role responsibilities can be advantageous. Mindfulness properties have also been discovered to enhance the quality and vitality of sleep, as well as subsequent reports on work-life balance. [49] Practitioners cite Mindfulness research as a cognitive-emotional segmentation strategy that enables employees to maintain a work-life balance. Voluntary organizational wellness and work-life balance programs should incorporate brief, cost-effective mindfulness interventions. [50]

WORK-LIFE IMBALANCE AND EMPLOYEE MENTAL HEALTH PROBLEMS

Harmony between work and life is necessary for balance to be reached. [20] Work-life balance problems happen when people can't keep their personal and work lives in balance, which can lead to physical and mental illnesses. Stress is one of the mental disorders. When a person is stressed, they are more likely to get sick, especially heart disease and stroke. [21] The research shows that depression and stress are common results of poor work-life balance, which can lead to lower productivity, lower quality of work, more absences, and staff turnover [22,23] Psychosocial well-being is linked to a bad work-life balance. [17]

The study [51] focuses on work-life balance and mental health among female managers in various organizations. The sample included 200 Delhi and NCR-based Indian women managers. 100 were private and 100 public. Descriptive analysis, t-test, correlation, and linear regression are used for analysis. The results demonstrate a substantial positive association between work-life balance and psychological well-being and mental health, and a significant negative correlation between work-life balance and female managers' psychological stress. There is also evidence that the link between job stress and bad mental health outcomes (like depression and anxiety) for workers is also mediated by work-life balance. [52]

METHODS

SEARCH STRATEGY

The reporting framework, using PRISMA (Preferred Reporting Items for Systematic Review and Meta Analysis), aims to identify, screen, and assess records for eligibility and inclusion. [53] Modified PICO method (population, intervention, comparison, and outcome), PEO (population, exposure, outcome) [54], objectives are used to describe the eligibility criteria. We searched the Scopus, PubMed, Crossref, and Google Scholar databases starting in January 2023, using the publish or perish application. Articles were initially identified by the relevant authors and screened and verified by the research team.

POPULATION

The use of population in this study refers to Timms, et al. [54] This review focuses on the employee population aged 15 to 50 years. This population accommodates origins from all countries with both male and female genders. Studies with employee populations that implement work-life balance for their mental health.

EXPOSURE

The use of exposure in the design of this study refers to Pollock and Berge. [54] The exposure is work-life balance. This includes studies investigating work-life balance [2], work-life imbalance. [24–26] This study will include research where work-life balances and work-life imbalances are included in the search criteria.

OUTCOME

The use of outcomes in the design of this study refers to Pollock and Berge. [54] When thinking about what outcomes should be included in this review, it's important to keep in mind that the employee's idea of positive mental health should be used [11,12] and talks about problems with mental health. [8–10] Studies that were not about positive mental health or problems with mental health were left out of the review.

INCLUSION CRITERIA

If these criteria were met, studies were entered: must be in English; Must be an abstract and full paper; must be employees; Must be between 15 and 50, the average working age; Balance and imbalance indicators are required. Mental health (both positive and negative); Must investigate work-life balance and mental health employee relationships. We did not specify information about the year of publication or a specific period in setting inclusion criteria.

IDENTIFICATION

Pearl harvesting is the process of expanding search terms to find many relevant studies as potential sources. [55] This method picks several studies that match at least one of the search terms. Next, all keywords in each "pearl" were extracted and combined with alternative terms to generate a comprehensive list of search terms for each database (see Table 1). Use publish or perish applications to search for data. Scopus, PubMed, Google Scholar, Crossref, and publish or perish are examples of data sources.

SCREENING

The eligibility criteria help screen articles based on title and abstract. The full text is read aloud to clarify. Criteria for exclusion (56): Systematic reviews or meta-analyses and books or book chapters Abbreviation Explanation: WLB (work-life balance); WL (work-life); WLC (work-life conflict); WLI (work-life imbalance); MH (mental health); M (mental); WB (well-being); MHP (mental health problem); PMH (positive mental health).

TABLE 1. DATABASE SEARCH TERMS ALTERNATIVES

	Population	Exposure	Outcome
Keyword alternatives	employee*	WLB* OR WL* or WLC* or WLI*	MH* or M* or WB* or MHP * or PMH *

DATA EXTRACTION AND DATA SYNTHESIS

Each study's data included work-life balance (balance and imbalance) exposure, which was tested in this study. Exposure, population, and gender were also recorded. Each study was also summarized. Later studies were quantitative or qualitative. [56] Synthesizing evidence is based on mental health. Learned mental health (positive mental health or mental problems). Some studies synthesise more than one mental health outcome per outcome.

ASSESSMENT OF TRUSTWORTHINESS

The Gorard Trust filter assigned points between 0 and 4 to studies based on their designs, scales, dropout rates, data quality, and other factors that could affect their reliability. [57]

RESULTS

In January 2023, we discovered n = 79 relevant articles in Scopus, n = 2 in PubMed, n = 147 in Google Scholar, and n = 4000 in Crossref (Figure 1. Study selection flowchart). After removing 2015 duplicates, there remain 2231 publications that are suitable for play. According to the title and abstract of the screening, the population, the exposure or intervention, and the results, 2178 reports did not meet the requirements. The search was restricted to 53 pertinent articles.

Twenty-three studies were excluded after screening for eligibility. The review included 30 studies. A majority of quantitative studies, two qualitative studies, and one mixed-methods study are PRISMA's recommendations for Figure 1. (53) The review's research question-based studies are listed in Table 1. This review's studies are listed in Table 2. Work-life balance and mental health were examined in 30 studies. The Gorard Trust filter rated 23 studies. 4 out of 4 and 7 studies 3.

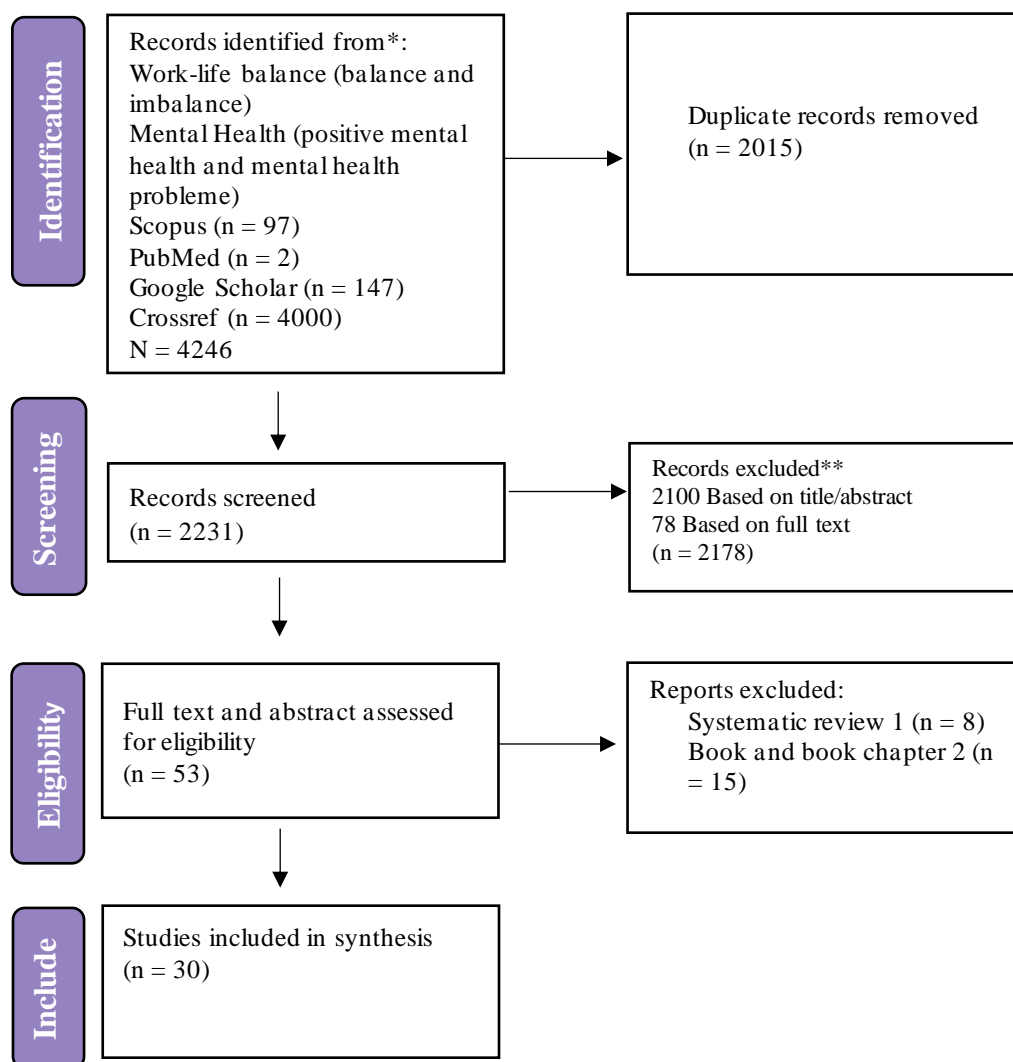**FIGURE 1. FLOWCHART FOR STUDY SELECTION**

TABLE 2. CLASSIFICATION OF REVIEWED STUDIES

Exposure	Outcome	Include	N
Work-Life Balance	Positive Mental Health	(58);(59); (60); (61); (62); (63); (64); (65); (66); (67); (68); (69); (70); (71); (72) ; (73); (71); (74); (75); (76).	19
Work-Life Balance	Mental Health Problems	(77); (78); (79); (80); (81); (82); (83).	7
Work-Life Imbalance	Mental Health Problems	(84); (85); (86); (87).	4
			30

TABLE 3. BRIEF DESCRIPTION OF THE CHARACTERISTICS OF STUDIES INCLUDED IN THE REVIEW

No	Author & Years	Country	Population	Mental Health Outcome	Work-Life Balance Exposure	Findings	Method	Text	Rate
1	(Pitt et al., 2021) (84)	America	215 Academic Workers	Anxiety	Work-life conflicts; life-to-work conflict	Work-life conflicts affect most postdocs' mental health. Anxiety increases with work-life conflict (R2=0.438, B=0.38, β=0.24, p<0.001). Higher life-to-work conflict increases anxiety (R2=0.408, B=0.25, β=0.16, p=0.02).	QT	Full	4
2	(Kotera et al., 2020) (72)	UK	144 Workers in the construction industry	Mental Health	Work-life balance	Mental health issues and attitudes were negatively impacted by work-life balance.	QT	Abs	4
3	(Haar et al., 2014)(73)	Malaysian, Chinese, New Zealand Maori, New Zealand European, Spanish, French, and Italian	1416 employees	Anxiety and depression	Work-life balance	In seven distinct cultures, work-life balance was connected with job and life satisfaction, but it was not associated with anxiety or sadness.	QT	Full	3
4	(Jang et al., 2011) (59)	South Korea	1,293 Employees	Mental health	Scheduling control and work–life balance programs	Policies that help people control their schedules and find a good balance between work and life improve job satisfaction and mental health.	QL	Abs	3
5	(Hämmig & Bauer, 2009) (85)	Switzerland	Aged 20 to 64 women = 1661; men = 1591	Mental health	Work-life imbalance	Over 17% of Swiss workers had trouble balancing work and personal life. Work-life imbalance affected both genders' mental health. Self-reported work-life conflict was associated with poor self-rated health (women: 2.6)	QT	Abs	3
6	(Hämmig et al., 2009) (86)	Switzerland	4371:20-64-Year-old workers	Mental health problems	Work-life conflict	Work-life conflict significantly impacts the emotional and physical health of both men	QT	Full	3

						and women. Self-reported health concerns, anxiety, sadness, a lack of vitality and optimism, severe back pain, headaches, sleep disorders, and weariness are connected to high or severely high work-life conflict.			
7	(Khalil et al., 2022) (77)	Egyptian and Saudi	403 Health Care Professionals	Mental health problems	Work-life balance	The study concluded that the Covid-19 incidence has a substantial effect on the work-life balance score and mental health of health care professionals who manage Covid-19 patients.	QT	Full	3
8	(Gaikwad et al., 2021) (60)	India	128 IT-employed women	Well-being	Work-life balance	Mental well-being, job performance, work-life balance, and work engagement are all positively correlated. In India, women handle all household tasks, so managing their work-life balance is crucial.	QT	Abs	4
9	(Atif & Zubairi, 2020) (78)	Pakistan	135 Female bankers ranging age of 22 to 45 years	Depression, anxiety	Work-life balance	An association between work-life balance and job satisfaction and depression and anxiety.	QT	Abs	4
10	(Badri, 2019)(58)	Malaysia	307 Academics	Turnover Intention	Work-life balance	There was a correlation between having a poor work-life balance and having poor mental health, lower job satisfaction, and a higher intention to leave the job. There was a correlation between having a healthy mental state, being satisfied in one's job, and having less intention to leave that job.	QT	Abs	4
11	(Boas & Morin, 2019) (75)	Brazil and Canada	274 Brazilian and 252 Canadian professors	Stress	Work-life balance	Brazilian professors have more work-life balance but more mental load. Canadian professors work harder than Brazilian ones. Psychological well-being negatively correlated with Work-related Stress and positively correlated with work-life balance.	QT	Abs	4
12	(Ko, 2022) (61)	South Korean	946 Public employees	Subjective well-being	Work-life balance	Through work-life balance and organisational commitment, family-friendly	QT	Abs	3

						policies positively and indirectly affect subjective well-being. The findings suggest that family-friendly policies as job resources can improve organisational outcomes and employee well-being through positive spillover effects.			
13	(Amrullah & Eva, 2022)(62)	Indonesia	131 Teacher	Psychological well-being	Work-life balance	there is psychological well-being on work-life balance with a significance value of 0.001 (p <0.05)	QT	Full	4
14	(Shahzadi, 2021)(63)	Pakistan	213 Selected media employees	Psychological well-being	Work-life balance	Work-life balance improves employee performance, while psychological well-being partially mediates it.	QT	Full	4
15	(Owolabi, 2021)(64)	Nigeria	264 Pentecostal Pastors	Psychological well-being	Work-life balance	Ibadan city Pentecostal Pastors' psychological well-being was significantly influenced by their work-life balance.	QT	Full	4
16	(John et al., 2020)(65)	Ghana	291 Lecturing and administrative staff	Well-being	Work-life balance	Work-life balance issues were statistically different for men and women, with women having more trouble. Work-life balance also affects employees' health, according to the study. The university's counselling centre should be used by employees at risk of work-related issues.	QT	Full	4
17	(Prasad & M, 2020)(66)	India	180 Teachers 90 male and 90 females from various colleges	Psychological well-being	Work-life balance	Based on the mean scores, teachers with high work-life balance have slightly higher psychological well-being than those with low work-life balance.	QT	Full	4
18	(Haider et al., 2018)(67)	Pakistan	284 Subordinates, 224 were male (79%) and 60 (21%) were female in the banking sector	Psychological well-being	Work-life balance	Work-life balance and job performance are mediated by psychological well-being.	QT	Full	4
19	(Kumari & Selvi, 2016) (87)	India	114 Telecom sector employees	Psychological health	Work-life balance	This study also found that high work-family conflict and poor work-life balance negatively affect work satisfaction and	QT	Full	4

						psychological health. Work and family pressures lower family satisfaction. Work demands and longer hours reduced family time and satisfaction. Work-family conflict decreased job satisfaction, employer commitment, distress, concentration, sleeping, happiness, and confidence.			
20	(Zheng et al., 2015) (68)	Australia	700 Employees	Well-being	Work-life balance strategies	Employees who used their own work-life balance strategies were healthier and better at work-life balance, according to the authors. Work-life balance programmes reduce employee stress but do not improve health. Age, working hours, education, and household income moderated employee health and well-being.	QT	Abs	3
21	(Yudiani & Istiningtyas, 2022)(69)	Indonesia	225 Female UIN Raden Fatah lecturers	Psychological well-being	Work-Life Balance	The R square test for work-life balance on psychological well-being yielded 0.081. Work-life balance affects 8.1% of psychological well-being.	QT	Full	4
22	(Nugraha & Adiati, 2022)(70)	Indonesia	111 Startup employees, age range 18-54	Emotional intelligence	Work-Life Balance	Startup employees' emotional intelligence does not affect work-life balance.	QT	Full	4
23	(Winata & Nurhasanah, 2022) (79)	Indonesia	199 Working Students	Burnout	Work-Life Balance	Work-life balance positively affects Burnout in working students	QT	Full	4
24	(Min, 2022)(74)	South Korean	155 RNs, average age 48.	Burnout	Work-Life Balance	Work-life balance was negatively correlated with burnout, but resilience was positively correlated ($r = 0.38$; $P <.001$). Work-life balance was affected by physical pain, resilience, and burnout.	QT	Abs	4
25	(Urba & Soetjiningsih, 2022)(76)	Indonesia	Bulog employees	Work stress	Work-Life Balance	Work-life balance and stress are negatively correlated (-0.606).	QT	Abs	4

26	(Riyono & Rezki, 2022)(80)	Indonesia	237 Working mothers who have children	Burnout	Work-Life Balance	Work-life balance and company support predict burnout. Organizational support, particularly for employee welfare, reduces burnout more.	QT	Full	4
27	(Suhardiman & Saragih, 2022) (81)	Indonesia	156 Banking employees	Technostress	Work-Life Balance	Technostress positively affected work-life balance.	QT	Full	4
28	(Wei & Ye, 2022) (71)	China	586 College teachers (367 females, 62.6%)	Emotional Exhaustion and well-being	Work-Life Balance	Work-life balance was positively associated with Emotional Exhaustion but negatively with well-being.	QT	Full	4
29	(Novitasari & Dessyarti, 2022) (82)	Indonesia	55 Bus employees	Turnover intention	Work-Life Balance	Work-life balance doesn't affect Bus employees' turnover intentions.	QT	Full	4

IS THERE AN ASSOCIATION BETWEEN WORK-LIFE BALANCE AND POSITIVE MENTAL HEALTH?

Nineteen studies examine the association between work-life balance and positive employee mental health. [58,59,68–76,60–67] This study was conducted in Malaysia, South Korea, India, Indonesia, Pakistan, Nigeria, Ghana, Australia, China, the United Kingdom, Chinese, New Zealand Maori, New Zealand European, Spanish, French, and Italian, Brazil, and Canada.

IS THERE AN ASSOCIATION BETWEEN WORK-LIFE BALANCE AND MENTAL HEALTH PROBLEMS?

There are seven studies that investigate association between work-life balance and positive mental health among employees. [77–83] This research report was conducted in countries: Indonesia, Pakistan, Taiwan, Egypt and Saudi.

IS THERE AN ASSOCIATION BETWEEN WORK-LIFE IMBALANCE AND MENTAL HEALTH PROBLEMS?

Five studies investigate the association between work-life imbalance and employee mental health problem. [84–87] This research report was conducted in countries: Switzerland, America, and India.

DISCUSSION

ASSOCIATION BETWEEN WORK-LIFE BALANCE AND POSITIVE MENTAL HEALTH

Nineteen research reports identified a correlation between work-life balance and positive mental health among employees. [58,59,68–76,60–67]

We note positive variations in mental health that have a positive relationship with work-life balance, including psychological well-being, resilience, life satisfaction, well-being, good mental health, higher job satisfaction, lower turnover intention, psychological well-being, mental well-being, job performance, and job engagement.

Human resource management and/or organizations are facilitating the creation of work-life balance for employees through programs like family-friendly policies [61], access to counseling and psychological services [65], availability of scheduling controls and work-life balance policies (programs) [59], work-life balance program [68]. Life and work balance promotes mental and physical health. A healthy work-life balance improves job satisfaction, psychosocial well-being, and quality of life in general. [18]

Those with higher levels of psychosocial well-being are more committed to their jobs, more productive, and happier than others. [19]

Work-life balance and positive mental health are negatively correlated among business, construction, and startup employees, according to reports. work-life balance According to reports, business, construction, and startup employees do not have stress, mental health issues, or emotional intelligence [70,72,76]. Priests, public servants, lecturers, campus administration staff, bankers, school teachers, academics, media workers, midwives, and professors have reported a positive correlation between work-life imbalance and employee mental health. All professions have the potential to have a positive work-life balance relationship with positive mental health, as shown here. The findings of this study support previous research; for example, job satisfaction is directly related to individual happiness and life satisfaction. [15,16] After controlling for work-related and personal factors, work-life balance was associated with psychosocial well-being.[17]

ASSOCIATION BETWEEN WORK-LIFE BALANCE AND MENTAL HEALTH PROBLEMS

Seven research reports found a correlation between work-life balance and employee mental health problems. [77–83] Of the seven reports, we note a variety of mental health problems that have a positive relationship with work-life balance, including depression, anxiety, mental burden, work stress, severity of insomnia, burnout, turnover intention, and technostress.

Work-life balance is associated to technostress in employees. It is found in [81] according to the findings of his study of 156 banking employees in Jayapura City, Indonesia, Technostress has a positive impact on work-life balance. In addition to technostress, there is evidence that bank employees experience stress [78] Possible association between work-life balance and job satisfaction and depression and anxiety in a sample of 135 female bankers aged 22 to 45 from Karachi (Pakistan).

Work Interference with personal life (WIPL) partially mediated the relationship between job stress and insomnia severity in a sample of 369 full-time Taiwanese technology and insurance workers (158 men and 184 women between 23 and 62; mean = 36.11, SD = 7.34) similar to bank employees. Work-life imbalance can cause occupational stress-induced insomnia. Establishing clear work-life boundaries may reduce the risk of insomnia in stressed

workers. [83] The difference is that IT workers are stressed due to high demands and work pressure, whereas bank employees are stressed due to intensive technology use.

403 Egyptian and Saudi health care workers in Jeddah and the Menoufia Governorate who treat Covid-19 patients are affected. Their work-life balance and mental health are in danger. Most people who work in health care are depressed, anxious, or stressed out. In terms of life balance, behavioural control, psychological well-being, and total mental health, health care professionals in Egypt had lower mean scores than those in Saudi Arabia. To improve mental health, health care professionals need to act quickly and psychologically. [77] Work-life balance has a significant effect on the turnover intention of 55 employees at PO JAYA Ponorogo. [82] Further research is needed to determine what factors cause work-life balance to have a positive effect on employee turnover intentions at PO JAYA Ponorogo.

In 237 home-based working mothers, a tendency toward burnout predicted work-life balance. By focusing on employee welfare in terms of compensation and benefits and fostering a conducive work environment, human resource management can reduce the prevalence of female employees. [80] A survey of 119 students at Esa Unggul University, Indonesia, confirmed the positive relationship between work-life balance and burnout. [79] Seven reports from a variety of workers, including bankers, health care professionals, mothers working from home, students who are temporarily employed, bus (transportation) workers, and full-time employees of insurance technology, indicate a positive relationship between work-life balance and employee mental health issues.

ASSOCIATION BETWEEN WORK-LIFE IMBALANCE AND MENTAL HEALTH PROBLEMS

According to research reports, there is a connection between employee mental health problems and work-life imbalance. [84–87] This report is based on differences in countries and types of workers. In this report, work-life imbalance is found to cause great difficulties in combining work and personal life (85,86), work-family conflicts [87], and work-life conflicts. [84]

Workers who report having mental health problems include Swiss workers, telecom sector workers, and postdoctorals. We identify numerous mental health problems that are positively correlated with work-life imbalance, such as poor health, anxiety and sadness, loss of vigor and optimism, severe back pain, headaches, sleep disruptions, and exhaustion. [85,86] Conflict between work and family life leads to decreased job satisfaction and commitment to employers, as well as elevated levels of stress, difficulty concentrating, disturbed sleep patterns, unhappiness, and a lack of self-confidence [87], anxiety levels which is higher. [84]

This study's findings that there is an association between work-life imbalance and mental health problems support earlier studies. People who report higher levels of conflict or poorer life-work balance are more likely to experience stress, emotional exhaustion, low levels of well-being (which include positive mood, vitality, and general interest), and depression. emotions (like rage, anxiety, annoyance, and resentment), restlessness, and mental exhaustion. [30–33]

LIMITATION AND RECOMMENDATION

Our research is limited to three areas: 1) the relationship between work-life balance and employee positive mental health; 2) the relationship between work-life balance and employee mental health problems; and 3) the relationship between work-life imbalance and employee mental health problems. The review excludes sources not found in the literature. Publish or perish limits our data sources to Scopus, PubMed, Google Scholar, and Crossref.

We advise that workers examine the research on the connection between work-life balance and mental health. Thus, workers will learn to utilize time in a productive manner, both at work and with their families. It becomes a more effective stand-alone remedy for work-life balance and mental illness. Organizational leaders and resource management must implement work-life balance program policies and human resource management practices in each sector to support the welfare of work-life balance employees. Workers who make extensive use of media and technology must have access to counseling services regarding technostress. In addition to the program, it is anticipated that mental health services will be provided through the provision of work counseling service units, counselors, or psychologists, programs that can improve the work-life balance of workers.

We recommend that workers improve their work-life balance and mental health through counseling or psychological guidance sessions (88), which aim to reduce mental stress. We also advise organizational leaders to implement policies or actions that can create or

encourage a healthy work-life balance, for example, "family-friendly [89], "scheduling We also advise organizational leaders to implement policies or actions that can create or encourage a healthy work-life balance, for example, "family-friendly" (89), "scheduling control" [90]. Scholars, including psychologists, sociologists, organizational behavior researchers, management researchers, and feminists, have examined the effects of family-friendly policies and the relationship between such policies and perceived work-life balance [59], well-being-oriented management will be very helpful. [91]

CONCLUSION

We conclude that work-life balance and positive mental health and mental health problems in employees, as well as work-life imbalance and mental health problems, have a positive relationship. Poor work-life balance is a problem for workers in both their professional and personal lives. Poor mental health negatively impacts work and family life. And vice versa, if both the work-life balance and the mental health of workers are positive, then both work and family life will be positive. Here, a multidisciplinary study is necessary that examines not only the connection between work-life balance and mental health but also the connection between work-life balance and the religiosity and spirituality of workers, the status of widows or widowers with children, and career women. Future research focuses on work-life balance and technostress among workers who are intensely exposed to the media.

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EXPLORING TECHNOLOGY DOMAINS FOR DIABETES CARE AND MANAGEMENT UNDER PANDEMIC: A PRELIMINARY SCOPING REVIEW

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ABSTRACT

OBJECTIVE:

Technology innovation emerged in diabetic care and management during COVID-19. To tackle emerging opportunities, this scoping review aims to analyze current technology used for diabetic care by employing WHO technology initiatives to reveal technology use potentials for future research and development.

MATERIALS AND METHODS:

We conducted a review following PRISMA. We initiated a search of related terms for peer-reviewed publications in PubMed and Web of Science, including those themed in diabetic care and management and published in English.

RESULTS:

We reviewed 42 articles following the guidance of WHO technology conceptualization, including mHealth (12%), eHealth (76%), and dHealth (12%). These initiatives are used to reveal six areas of technology utilization for diabetes care during the pandemic, including (1) social media; (2) sensor; (3) teleconference; (4) virtual care; (5) artificial intelligence; and (6) data mining.

DISCUSSION:

Based on the identified dimensions related to technology and health, we presented seven diabetes-related health events and their associations with technologies. Implications such as technology's association with diabetes disease progression, technology diagramming for interdisciplinary collaboration, and technology features for health outcomes provide direction for future research and development.

CONCLUSION:

This review illustrates current technology utilization in diabetes care during the pandemic. It also uncovers innovation opportunities across technology and diabetic healthcare domains and provides direction for future pursuits in academia and practice.

KEYWORDS

diabetes, Covid-19, mobile health, electronic health, digital health, mHealth, eHealth, WHO

INTRODUCTION

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2, or commonly known as COVID-19) has direct and indirect repercussions on regular operations in medicine and healthcare for individuals with chronic diseases. Diabetes has been highlighted as an important one requiring clinical attention [1] because patients with diabetes are more susceptible to pandemic risks than non-diabetic individuals, making it more challenging to control, manage, and provide services and care for diabetes [2].

With diabetes being a chronic condition requiring continuous healthcare services, technology provides potential solutions to address the changes demonstrated in primary care visits during the pandemic. Additionally, diabetic care during the pandemic initiated unprecedented technological innovation opportunities as showcased by the values presented in novel technology development and use [3]. To mitigate the risk of pathogen exposure, apps use and platforms during the pandemic increased when compared with their use before the pandemic [4, 5]. As a result, the use of technology as a response to pandemic outbreaks provides an opportunity to deploy state-of-the-art tools for tackling new challenges across two disciplines of technology and diabetic healthcare [6].

However, there is limited research regarding how the two disciplines relate, which may hinder innovators seeking cross-disciplinary collaboration. The COVID-19 pandemic offers new technological use opportunities [7]. COVID-19 provides a context for health informatics to explore innovation opportunities [8], but current research focuses on disaggregated use cases [9], [10] and does not show connections across domains under two disciplines of technology and diabetic healthcare. It remains unclear how technology developments resonate with digital development trends. This inspires us to analyze and integrate technology use inspired by WHO initiatives mHealth, eHealth, and dHealth, which have identified innovation in settings of chronic illness [11].

The mHealth domain encompasses the use of mobile or wireless technologies for healthcare service [12]. The domain of eHealth embraces a broader scope than mHealth, primarily encompassing the use of information and communications technologies, including health care services, health surveillance, health literature, and health education, knowledge and research [12]. The dHealth domain refers to latest technology realms. The digital health expands the concept of eHealth to include digital consumers, with a wider range of smart and connected devices, including data mining and artificial intelligence, etc. [12].

While WHO initiatives offer valuable perspectives to examine technology, however, there lacks official document specifying their distinctions. Based on major technology uses in included literature, we refined mHealth, eHealth, and dHealth scopes for the purpose of study: The mHealth refers to technology primarily built on platforms for users to socially interact such as social media. In contrast, dHealth refers to the most recent types of technology, including artificial intelligence, and data mining, etc. The eHealth relates to technology types not encompassed by the preceding two. Hence our goal is to unveil: What categories of technology are utilized for diabetic care and management during a pandemic? Which contexts of diabetic care and administration utilize the technologies?

MATERIALS AND METHODS

STUDY DESIGN

This scoping review was reported following the Joanna Briggs Institute (JBI) Manual for Evidence Synthesis in Scoping Reviews [13], which provides a rigorous framework in the planning, development, study selection, and management of results to ensure that the search and report in a systematic fashion to support a field of research, identify the types of available evidence in a given field, identify and analyze knowledge gaps, identify key characteristics or factors related to a concept, and clarify the conceptual boundaries of a topic [13, 14]. To this, we conducted this review within our re-defined WHO initiatives to conceptualize technology with components of mHealth, eHealth, and dHealth [15].

INCLUSION AND EXCLUSION CRITERIA

This scoping review focused on (1) original research articles published in peer-reviewed publications, case reports, or conference proceedings applying technologies to diabetes management; (2) articles published in or after 2020, the year when COVID-19 appeared worldwide; and (3) articles written in English. We excluded articles that broadly discussed COVID-19 disease severity in diabetic patients without focusing on diabetes care and

management and that discussed diabetes along with other chronic diseases (e.g., hypertension) management. Identification and Selection of Evidence

We searched for peer-reviewed publications on PubMed and Web of Science (WoS) databases. Searches were refined to only include peer-reviewed articles published in English between January 2020 and April 2022. Based on Medical Subject Headings (US National Library of Medicine. Medical Subject Headings (MeSH, https://meshb.nlm.nih.gov/search) and literature browsing, we identified three groups of search terms to retrieve relevant articles meeting the eligibility criteria: (1) disease-related terms [e.g., diabetes mellitus, diabetes, diabetic], (2) technology-related terms [e.g., Internet-of-Thing, Sensor Internet-of-Thing, Blockchain, ledger, wireless, 5G, Zoom, Skype, WhatsApp, Facebook messenger, cell phone, Artificial Intelligence, machine learning, virtual], and (3) COVID-19-related terms (e.g., COVID-19, Severe acute respiratory syndrome coronavirus 2, SARS-CoV-2).

SEARCH OUTCOMES

Our initial search yielded 316 publications. After removing the review, editorial, commentary, letter, and practical guideline publications, 214 unique publications were identified. Of the 214 publications whose titles and abstracts were screened by two researchers (MYC and YSL) for relevance to the study purpose; 64 were identified as eligible for full-text review. Nevertheless, four of the 64 publications were excluded for its publication in a language other than English. After the full-text reviews, 18 additional publications were excluded because diabetes care was not their primary focus. Eventually, 42 publications were identified and included in the final synthesis. A flow diagram for the scoping review process adapted from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement was reported in (Figure 1) [13].

FIGURE 1. FLOW DIAGRAM FOR THE SCOPING REVIEW PROCESS ADAPTED FROM THE PRISMA STATEMENT BY MOHER AND COLLEAGUES (2015)
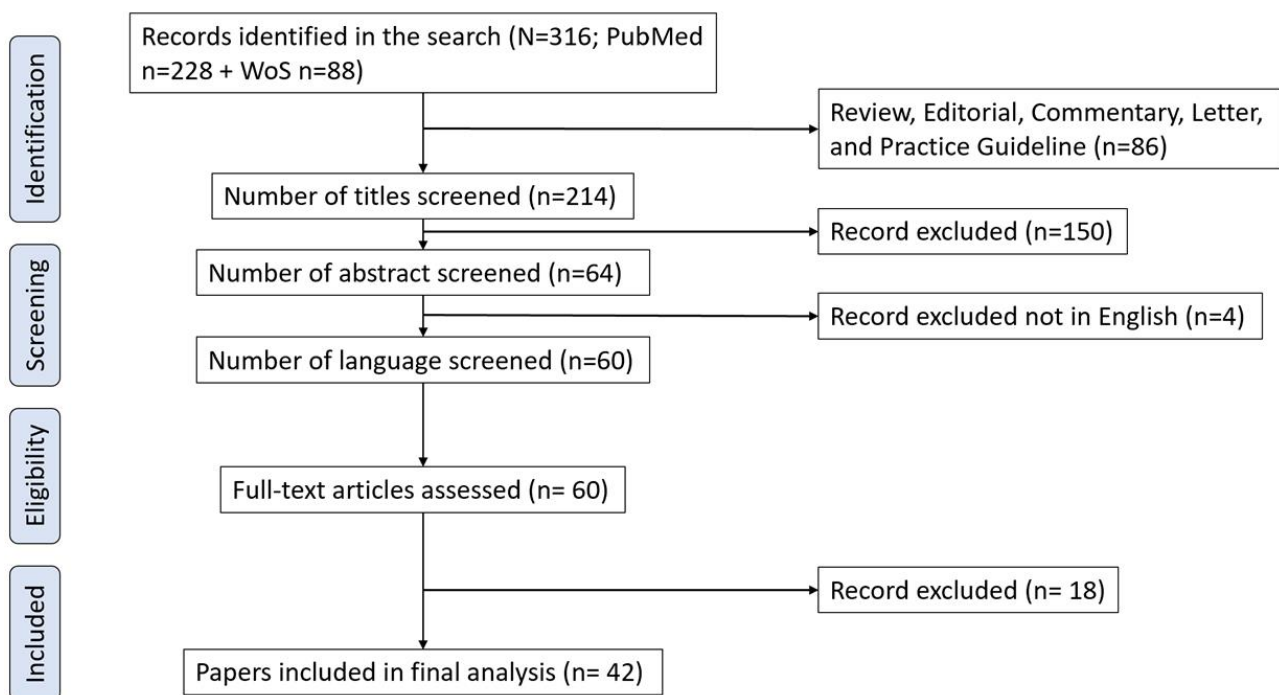
ADDITIONAL SEARCHING

The reference lists of those 42 identified publications were hand-searched to identify additional publications which were relevant but not been identified from the first-round literature search.

DATA EXTRACTION

Data was extracted by two reviewers (MYC and YSL) working together on the 42 included publications. Data was extracted into a Microsoft Excel spreadsheet to allow for easy comparison between the outcomes from the extracted studies. Extracted data included author, year of published, study period, location of research, study design,

technology factors, health impacts, and diabetes care-related health events (Table 1). (See the appendix)

RESULTS

We investigated the links between the main technological conceptualization components of mHealth, eHealth, and dHealth to find insights from the literature. Within the 3 technology domains, the 39 evaluated publications indicated six technological categories: social media, sensor, teleconference, virtual care, data mining, and artificial intelligence. Seven diabetes care-related events are categorized under technological conceptualization by the American Diabetes Association clinical practice guidelines [16] (Figure 2).

FIGURE 2. TECHNOLOGY INNOVATION DIAGRAM: DIABETES-RELATED HEALTH EVENTS, RE-DEFINED WHO TECHNOLOGY CONCEPTUALIZATION, AND THEIR CONNECTIONS

Table 1 contains WHO technology conceptualization and diabetes care-related health events-reviewed literature. In the following, we describe these findings by domains: mHealth, eHealth, and dHealth.

MHEALTH
Twelve percent of mHealth diabetics care and management used social media.

SOCIAL MEDIA
Social media (n=5) was the sole technology or devices under mHealth employed in diabetes care and management (Table 1) [17, 18, 19, 20, 21], including popular providers Facebook, WhatsApp, TikTok, WeChat, and LINE, etc. mHealth technology was employed in diabetes education, lifestyle change (diet and exercise), and glucose control (Table 1 and Figure 2). Three papers

employed social media for diabetes education [17, 18, 20], while one used WhatsApp for diabetes education and glucose management. One article used mHealth for lifestyle change (exercise) and diabetes management [19]. One research employed this technology for dietary behavior change curriculum [21]. Asia has the most studies (n=3; 60%) [18, 19, 20], followed by North America (n=1; 20%) [21] and the Middle East (n=1; 20%) [17].

EHEALTH

eHealth generally incorporates pandemic-related diabetes care using information or communication technology. The research we conducted found sensor, teleconference, and virtual care eHealth technologies. Teleconferences are online communication technologies as chatrooms or multi-media conferences. We defined virtual care as situations using other technology features in a teleconference. eHealth is the most applied domain, including sensor, teleconference, and virtual care. It had been used in 32 COVID-19 pandemic investigations (76%) (Figure 2).

SENSOR

Ten studies used sensor technologies [6, 22, 23, 24, 25, 26, 27, 28, 29, 30] (Table 1). Sensor technology in eHealth was employed for various diabetes care purposes. Glucose management (n=7), including continuous glucose monitoring [23, 24, 25, 26, 27, 30] and gestational diabetes management [28], was the most common application of this technology. The hybrid closed loop system or insulin pump is another diabetic care in eHealth. One study integrated eHealth for insulin treatment [29], whereas the other three used it also for glucose management [24, 25, 26]. Two (18.2%) studies used sensors for diabetic retinopathy and visual care [6, 22]. Queiroz photographed retinas with smartphone platform. Only one research used eHealth for lifestyle changes, including diet and exercise, showing that glucose control in people with diabetes requires more technology than lifestyle change. In prior studies, mHealth and eHealth are both used for diabetes education. Only one study indicated using eHealth in health education (Table 1 and Figure 2).

North America and Europe had the most studies (n=6; 60%) [6, 23, 25, 26, 28, 30], followed by South America (n=2; 20%) [22, 24], the Middle East (n=1; 10%) [29], and Asia (n=1; 10%) [27].

Nomenclature for similar or related technologies is inconsistent throughout reviewed literature. Thus, for the purpose of this research, the term teleconference refers to videotelephony primary used for conversation purposes. The term virtual care, on the other hand, pertains to scenarios in which videotelephony is used for purposes beyond conversation or in conjunction with other technology devices. Two categories are analyzed:

TELECONFERENCE

All seven studies used phone, Zoom Video, Videoconference, or Facetime for pandemic teleconferences. Three diabetes education, diet, and glucose control studies used Zoom Video consultations [31, 32, 33] (Table 1 and Figure 2). In glucose management (n=4) and insulin administration (n=2), three papers used implanted phone interviews or consultations [33, 34, 35]. Another research only mentioned online foot care consultation [36]. The Middle East (n=3; 43%) [31, 33, 35], North America (n=3; 43%) [32, 34], and Asia (n=1; 14%) [36] were the most studied regions.

VIRTUAL CARE

Fifteen eHealth studies have used virtual care technology (Table 1) [37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49]. Diabetes care uses virtual care most. In virtual care, diabetes treatment included virtual health education (n=4), glucose management (n=12), insulin treatment (n=6), eye health (n=1), foot health (n=2), and exercise (n=1). One study used an insulin pump [39]. Two studies developed diabetes care protocols [40, 42], two used apps [44, 50], five discussed continuous glucose monitoring [45, 46, 47, 48, 49], one examined photocoagulation [41], and one described a hybrid closed loop [43]. Lifestyle changes in diet did not employ virtual care. Teleconference and virtual care, despite their technology application differences, were the most used eHealth technologies for diabetes care health events (Figure 2).

Three studies were from Asia (n=3, 20%) [40, 41, 47], three from Europe (n=3, 20%) [39, 45, 51], two from the Middle East (n=2, 13%) [42, 43], four from North America (n=6, 40%) [46, 48, 49, 50], and one from South America (n=1, 6%) [44].

DHEALTH

Data mining and artificial intelligence are identified in following articles:

Artificial Intelligence /Data Mining

During COVID-19, only foot health, glucose management, and insulin treatment used dHealth (12%) (Table 1 and Figure 2). Three of the 42 diabetic foot care dHealth research employed artificial intelligence [18, 36] and data

mining [52]. Kong's study calculated diabetic ulcer wound size with artificial intelligence algorithm evaluating foot lesion images for phenotype development [36]. Data mining focuses on improving diabetic ulcer triage. In gestational DM, artificial intelligence adjusted insulin administration by blood sugar level [53]. Another study used artificial intelligence to improve HbA1c data, which is essential for diabetes care [54]. Only glucose management, as a diabetes care-related event, is used in all three WHO technology domains (Figure 2). Most studies were from North America (n=3) [18, 52, 54], Asia (n=1) [36], and Europe (n=1) [53].

SUMMARY OF TECHNOLOGY USE

Technology use is found to associate with diabetes progress: Diabetes education, glucose management, exercise, diet, and insulin treatment used mHealth and eHealth technology. dHealth was mostly utilized for diabetes management, eye care, and foot care. Health education is crucial for diabetes management and lifestyle change (e.g., glucose management, exercise, food, and insulin administration). The concepts of health education and diabetic foot and eye care are associated (represented by bidirectional arrows). Diabetic eye and foot care need comprehensive health education, while health education playing a crucial role in promoting and facilitating proper care for individuals with diabetes, particularly in the context of eye and foot health. Untreated diabetes can be causally associated with most diabetic eye and foot complications (represented by uni-directional arrows) [55]. Proper management and control of diabetes are crucial in preventing these complications. Technology in eHealth domain was used in eye and foot care (Figure 3).

FIGURE 3. RELATION BETWEEN DIABETES DISEASE PROGRESSION AND WHO INITIATIVES
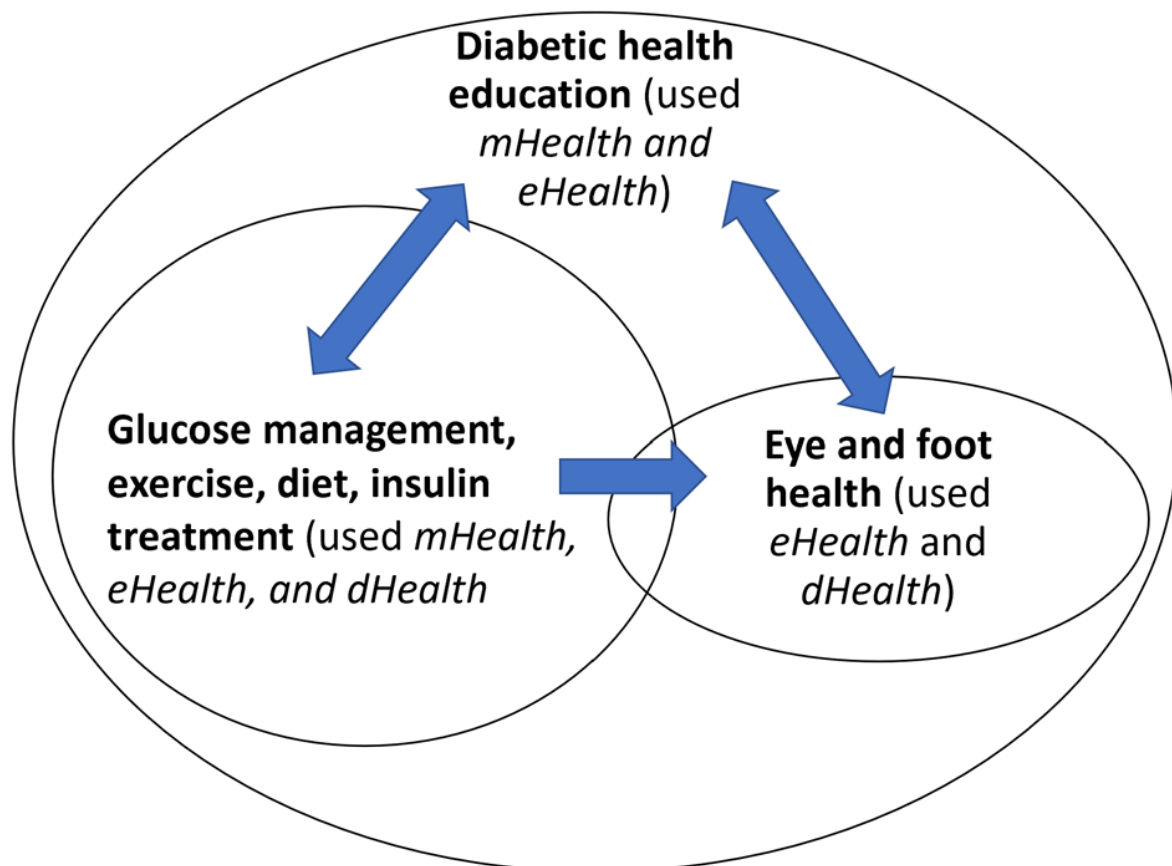
DISCUSSION

The discoveries from our literature review are supported by our analysis based on WHO technology initiatives. We identified six fields of technologies, including social media, sensor, teleconference, virtual care, data mining, and artificial Intelligence. While analyzing the literature, we built a taxonomy of technologies used for diabetic care during the pandemic based on technology conceptualization. More specifically, mHealth, eHealth, and dHealth are found to correspond to distinct technology fields: mHealth (12%) involves social media, eHealth (76%) includes

teleconference and virtual care, and dHealth (12%) involves data mining and artificial intelligence.

In addition, by examining the contexts or situations in which technologies are used for diabetic care during the pandemic, we identified seven types of diabetic care-related health events, including education, lifestyle change (diet and exercise), glucose management, insulin treatment, eye health, and foot health. These events are found to associate with certain components for technology use: mHealth and eHealth are used for education glucose management, lifestyle (exercise/ diet) change, and insulin treatment, while eHealth and dHealth are used for eye and foot health.

We unveiled the relationship among mHealth, eHealth, and dHealth, along with six technology fields and seven contexts or situations in which technologies are used for diabetic care during the pandemic, namely diabetic care-related health events. With the complexity of diabetic care and management in pandemic, these events define areas valuable to innovators across two disciplines of technology and diabetic healthcare, making it easier to identify congruous opportunities for investing collaborative efforts [7].

TECHNOLOGY VALUE FOR HEALTH IMPACT

The integration of technology in diabetic care-related health events has revolutionized the safety, effectiveness, and efficiency of diabetes care compared to traditional modes, resulting in significant health impacts [26, 47, 62]. Technology also reduced the need for in-person visit and has overcome the transportation barriers for patients in healthcare resource-limited areas [26, 46, 49]. Saving time on transportation allows patients to better manage diabetes at their places [25, 53]. In addition, the integration of technology in diabetic care-related health events can have positive health impacts. Based on our finding from this review, we have summarized the following health impacts associated with diabetes: (1) promoting patient engagement, (2) remote monitoring capabilities, (3) reducing healthcare providers' workload, (4) improving timeliness of intervention, (5) data-driven decision-making, and (6) contributing to better health outcomes for individuals with diabetes. The use of mHealth has been found to enhance patient engagement in managing diabetes. Patients can access comprehensive educational resources on exercise and glucose management through this technology [17]. Healthcare providers are able to remotely monitor patients' illness through eHealth and

dHealth, including TIR, diet consultation, eye care, and foot care [16, 22, 23, 24, 25, 26, 28, 32, 36]. The implementation of eHealth and dHealth, such as patients' health education on diet, exercise, glucose management, and insulin treatment, mainly aims to reduce healthcare providers' workload [27, 53]. Both eHealth and dHealth enhanced the flow of information between patients and healthcare providers as well [27, 33, 36, 53, 63]. A study revealed the value of eHealth on diabetic associated health impact was to improve timeliness of intervention to support people with diabetes to successfully manage their glucose and illness [31]. There are also studies that found data-driven decision-making to be benefited by the use of eHealth and dHealth [36, 50, 54]. The use of teleconference and virtual visits of eHealth has contributed to better health outcomes in diabetic patients, making technology a significant factor in healthcare during the pandemic [26]. As technology continues to evolve and become more integrated into healthcare systems, it has the potential to significantly improve diabetes management.

IMPLICATIONS

Diagramming Technology Innovation for Interdisciplinary Collaboration

Our research reveals the connections across knowledge domains in technology and diabetic healthcare, as illustrated with three rings: inner, middle, and outer (Figure 2). The inner ring depicts WHO technology conceptualizations, including mHealth, eHealth, and dHealth. The middle ring specifies major technology fields, including social media, sensor, teleconference, virtual care, data mining, and artificial intelligence. The outer ring shows two meanings: technical settings and diabetes care events from medical or health viewpoints.

The diagram links professional disciplines with respective specialized knowledge, competency, and vocation. This image depicts several knowledge or skill disciplines by closeness, size for relationship valuable for future cooperation. From the inner rings outward, this graphic shows how technology conceptualization may emphasize for diverse use settings, or care events. When read from outside rings inward, this figure shows how health events may use specific professional technologies while alluding to WHO's policy and development initiatives.

Refined Connections from Health Events to Technologies

We found more technology-diabetic healthcare links. Glucose control encompassed the most eHealth, mHealth,

and dHealth technologies, from social media to artificial intelligence. Diabetes patients must maintain their blood glucose levels during the epidemic. Smartphone-connected continuous glucose monitoring managed glucose. These wearable technologies assist diabetics manage their condition in real time [56, 57]. Continuous glucose monitoring was used before the epidemic but expanded throughout it [57]. In some studies, insulin treatment by hybrid closed loop was used along with CGM in either eHealth or dHealth to stabilize patients' blood glucose levels during the pandemic. Both diabetes care-related events (glucose management and insulin treatment) used sensor, teleconference, virtual care, and artificial intelligence technologies. This reflected the complexity of these care events for diabetes patients and healthcare providers. The virtual educational sessions helped to maintain this effectiveness [42]. A study found that 86% of diabetes patients are interested in virtual clinics. In addition, more than 56% of diabetes patients are prepared for every visit to be in the virtual format [58]. The suspension of face-to-face clinic visits significantly impacted glucose level maintenance among diabetes patients. Healthcare providers have been making efforts to find a feasible way to provide quality care comparable to traditional face-to-face visits. Virtual care technology is an alternative way to provide health care to diabetes patients.

We found that foot care utilized both eHealth and dHealth, including artificial intelligence technology. On the other hand, we found that eye care used only eHealth. In this systematic review, we did not find the use of sensor technology for diabetes complications such as kidney disease, skin complications, hearing loss, and neuropathy.

Technology Features for Health Outcomes

When technology is used for health intervention, features such as alert messages [58] and user data uploading [59] can have impacts on population's health outcome. Unfortunately, included literature discussed interventions with technology features considered as a whole, and failed to separately analyze how each feature affects efficacy. While technological intervention improves health outcomes, related findings suggest that future study may focus on specific qualities like simplicity or ease of use [31]. Other topics include: (1) how end-users assess the usefulness of a design feature [59], (2) how adding new features may improve users' experiences [44], and (3) how merging features into new platforms helps produce a new healthcare solution [41]. IT developers can utilize this

research to create and build novel tools for various user scenarios.

Our scoping review is limited to literature within PubMed and Web of Science access and is not as inclusive as a systematic review. Other databases might be incorporated for more comprehensive topics [60].

CONCLUSION

Diabetes care during the COVID-19 pandemic presented an unprecedented opportunity to use technology. To illustrate this unknown landscape, our research reviewed and analyzed extant research and delineated the technologies used in various settings. Relevant factors meaningful for technology innovation were discovered such as technology factors, health impacts, and diabetes care-related health events.

Inspired by WHO initiatives of technology conceptualization—mHealth, eHealth, and dHealth, our research aims to uncover domains and their mutual connections for promoting opportunities. Three components were found to associate with certain diabetes care-related health events and disease progression. With our findings and diagramming considered, implications for future research and development were suggested. Findings help academia and professionals chart knowledge domains for building future collaborative endeavors.

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APPENDIX

TABLE 1. SUMMARY OF INCLUDED STUDIES

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
mHealth						
Social media	Odeh, 2020 [17]	March 17 to May 24, 2020	Jordan	1. T1D patients received information regarding COVID-19 and diabetes from physicians via WhatsApp and Facebook for T1D care 2. Patients contacted the medical team through telemedicine by phone calls and/or WhatsApp	Using technologies to provide guidance and support for T1D patients during lockdown was possible	Diabetes education + glucose management
	Kong, 2021 [18]	Not specified	China	Evaluate the diabetes-related videos in TikTok	The overall video quality for diabetes management is averagely acceptable	Diabetes education

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
	Kang, 2021 [19]	May to August 2020	China	1. The WeChat app was used to send DM health education knowledge videos and to investigate the management of blood glucose, blood pressure, body mass index (BMI), time in range (TIR), and incidence of hypoglycemia in the intervention group 2. Traditional medical treatment was used in the control group 3. Tracking physical activity	Remote management can increase TIR without increasing the risk of hypoglycemia Remote management also improves patients' self-management during the pandemic	Glucose management + exercise
	Leong, 2021 [20]	July 2020 to January 2021	Taiwan	Usual care + Taipei Medical UniversitLINE Oriented Video Education (TMU-LOVE) for T2D patients	The social media-based program effectively enhanced the knowledge, attitudes, and self-care activities of T2D patients	Diabetes education

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
	Sharma, 2021 [21]	June to November 2020	USA	Videos about A Prescription for Healthy Living (APHL) culinary medicine curriculum to change dietary and cooking behavior among T2D patients in lockdown	The virtually implemented culinary medicine curriculums improved health outcomes among low-income patients with T2D	Diet
EHealth						
Sensor	Queiroz, 2020 [22]	February 6 to March 14, 2020	Brazil	A smartphone-based (Eyer, Phelcom Technologies, and EyerCloud platform) technology was used to take the retinal images of T2D patients	A handheld device such as a smartphone is feasible and has the potential to increase coverage of DR screening in underserved areas	Eye health
	van der Linden, 2021 [23]	January 6 to June 14, 2020	USA	Used G6 rtCGM System (Dexcom, Inc., San Diego, CA)	The CGM provided adequate glycemic control during the COVID-19 pandemic	Glucose management

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
	Khurana, 2021 [6]	August 30, 2017 to January 12, 2018	USA	Provide a series of letters on the phone screen to the patient one at a time, progressively decreasing the size. The patient identifies the correct letter by selecting the corresponding matching letter shown in large typeface at the bottom of the mobile application (Correlation of Paxos Checkup Mobile App to Standard in Office Visual Assessment)	The study yielded a strong agreement between the Checkup group and standard in-office procedures for assessing near-corrected visual acuity	Eye health
	Gomez, 2021 [24]	March to July 2020	Colombia	Use a hybrid closed loop (HCL) system in managing disease for T1D	HCL systems allow T1D patients to improve TIR, TBR, and glycemic variability	Glucose management + insulin treatment
	Hakonen, 2022 [25]	March 18 to May 13, 2020	Finland	Use CGM or insulin pumps to monitor the TIR	The use of CGM is more effective to control blood glucose in TIR among T1D children during the lockdown	Glucose management + insulin treatment

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
	Choudhary, 2022 [26]	March 15, 2019 to March 14, 2020	USA	Use CGM to monitor the TIR	The use of CGM is more effective to control blood glucose in TIR among T1D children during the lockdown	Glucose management + insulin treatment
	Jiang, 2022 [27]	September 2020 to March 2021	Singapore	Smartphone app for diabetes health education, self-management for blood sugar, diet, and exercise (a nurse-led smartphone-based self-management program)	The use of technology effectively reduced nurses' workload by delegating tasks to individuals through self-management strategies. This enabled nurses to increase contact time with patients, and individuals to take the onus of their disease through increased self-efficacy, facilitated by technology	Diabetes education + glucose management + diet + exercise

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
	El Moazen, 2021 [28]	March to June 2020	Austria	Use DiabCare mobile app to remotely monitor glycemic levels among GDM pregnant women	The benefits of remote monitoring to support conventional therapy cannot be dismissed, especially in times of the pandemic	Glucose management
	Magliah, 2021 [29]	June 21 to June 23, 2020	Saudi Arabia	Use of insulin pump therapy during lockdown	Two-thirds of T1D patients reported difficulty obtaining at least one variety of insulin pump supplies. Most patients indicated no change in adherence to insulin pump behaviors	Insulin treatment
	Evin, 2020 [30]	In 2020	Turkey	Use CareLink or FreeStyle LibreLink to monitor the CGM of eight T1D patients	Most T1D patients had less variation (coefficient of variation < 36%) in blood sugar level by using CGM	Glucose management

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
Teleconference	Al-Moteri, 2021 [31]	July 2020	Saudi Arabia	Zoom Video to interview the diabetes management experiences	The findings could be used to devise interventions and instructions to support people with diabetes to successfully manage their illness during such crises or any public emergencies	Glucose management
	Lee, 2021 [32]	December 2019 to August 2020	USA	Telemedicine via Zoom, Videoconference, FaceTime, etc.	Zoom was the most popular video platform followed by Videoconference Telemedicine continued the maintenance of T1D care during the pandemic	Diabetes education + diet
	Alguwaihes, 2021 [33]	April 26 to May 7, 2020	Saudi Arabia	Patients reported benefits from virtual communication with physicians by phone and Zoom	Maintaining two-way virtual communication channels between physicians and their	Glucose management

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
					T1D patients should be encouraged	
	Steinhardt, 2021 [34]	May to June 2020	USA	Phone interview about self-management of diabetes during COVID-19	Qualitative findings guided the appropriate implementation of technology for the study, which facilitated a successful restart. High retention of participants through the study transition provides evidence that participants are invested in learning how to manage their diabetes despite the challenges and distractions imposed by COVID-19	Glucose management

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
	Magliah, 2021 [35]	January 23 to February 10, 2021	Saudi Arabia	Virtual phone visit	T1D patients are satisfied with the virtual phone visits during COVID and have a high interest in continuing their use of virtual visits in the future	Insulin treatment
	Kavitha, 2020 [36]	Not specified	India	Online consultation was used in the management of diabetic foot disease Use of telepodiatry in the management of diabetic foot disease in low-risk subjects	Telemedicine is an adequate screening tool for diagnosing and managing low-risk subjects with diabetic foot problems and enables a triaging system for deciding on hospital visits and hospitalization	Foot care
	Fung, 2020 [61]	March to May 2020	Canada	Virtual and phone-mediated conferences are implemented for clinical visits	Usability of virtual and phone visits are recognized, and are hoped to be kept used in the future	Education + Glucose management + Insulin Treatment

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
Virtual care	Schiller, 2021 [37]	March and June 2021	Israel	Virtual care is used to accommodate Type 1 diabetic patients' needs as a result of the pandemic lockdown	About half of the T1D patients are interested in continuing their use of telemedicine care in the future, validating the benefits of using virtual care for diabetic care.	Education+ Glucose management + Insulin Treatment
	Aubert, 2022 [38]	March to Nov 2020	US	Virtual visits are used for US veterans.	Favorable virtual care results for T2D care with higher-risk concerns from the pandemic among veterans aged 65 and up. Physical-visit comparable applicability for future use was demonstrated.	Glucose management

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
	Forde, 2022 [39]	November to December 2020	UK	Diabetes care is delivered remotely primarily in two modalities during the pandemic: phone or video consultation, for starting insulin pumps.	Training effectiveness was evaluated—the number of new starts and renewals of pumps after warrantee expiration is reduced.	Insulin treatment
	Rastogi, 2021 [40]	March 2020 to September 2020	India	Virtual care is incorporated into healthcare-providing protocols, facilitating efficient triage for foot care and limb salvage services. Service includes clinical history, online examination and assessment of foot wounds, home-based wound care, and more. Additionally, real-time messaging enables the medical provider to grade the lesion, categorize the risk, and provide homecare modes.	Virtual care teleconsultation provides similar ulcer and limb outcomes to traditional physical face-to-face foot care settings, validating the effectiveness of virtual care for diabetic foot ulcers. Also, virtual communication makes it possible to provide continuing service for patients with uncomplicated	Foot health

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
					DFU or who are at risk of DFU.	
	Chen, 2021 [41]	October 2019 to July 2020.	China	Online 5G-based laser photocoagulation was used to successfully treat diabetic retinopathy. A teleophthalmology platform is used for conducting telelaser planning and intervention with laser-based remote computer control.	Teleophthalmology is developed and used based on an online platform treating diabetic retinopathy without delay.	Eye health
	Al-Sofiani, 2021 [42]	Unspecified	Saudi Arabia	A protocol of a Diabetes Telemedicine Clinic is depicted, using technology or digital tools readily available to most patients and clinics.	The use of telemedicine helps to maintain good glucose control during the pandemic and virtual educational sessions are helpful to maintain effectiveness and satisfaction.	Diabetes education + glucose management + insulin treatment

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
	Petrovski, 2021 [43]	Not specified	Qatar	Using a hybrid closed loop (HCL) system in managing disease for T1D teenagers and Skype for a weekly meeting	Patients and healthcare providers reported high satisfaction with virtual care	Glucose management + insulin treatment
	Leon-Vargas, 2021 [44]	3 months in 2021	Colombia	Using a free App (Tidepool) and Mobile to monitor and manage the disease	Users agreed the use of Tidepool achieved better disease management and communication with the healthcare team	Glucose management + insulin treatment
	Parise, 2020 [45]	March 10 to June 3, 2020	Italy	Two virtual visits by phone were conducted CGM was used to monitor the TIR	Virtual visits allow the persistence and improvement of glycemic control.	Glucose management
	Grag, 2020 [46]	In 2020	USA	Zoom, e-mail, and telephone calls were used to manage new-onset T1D CGM with Dexcom G6 sensor was used	Telemedicine showed feasibility and effectiveness in new-onset diabetes education and insulin dosage management.	Diabetes education + Glucose management + Insulin treatment

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
	Lian, 2021 [47]	April 7 to June 1, 2020	Singapore	Phone consultations were used for moderate-risk patients; diabetes education videos were made available CGM was used to monitor the blood sugar level	Virtual health applications were found to be safe, effective, and efficient to replace current in-person visits.	Diabetes education + Glucose management
	Jones, 2020 [48]	January 2020 to April 2020	USA	Teleconference by phone to monitor the TIR	Transitioning to virtual care models does not limit the glycemic outcomes of inpatient diabetes care and should be employed to reduce patient and provider exposure in the setting of COVID-19.	Glucose management

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
	Carlson, 2021 [49]	Not specified	USA	Investigated the experience of using remote monitoring of CGM	The use of telemedicine and remote monitoring of CGM and insulin data enabled healthcare providers to assess glycemic control and make therapy adjustments without the potential hazards and patient burden of in-person clinic visits.	Glucose management
	Hernandez-Jimenez, 2021 [62]	June to November 2020	Mexico	Virtual intervention is introduced for self-care, metabolic, and emotional parameters	Virtual care program is proven effective, offering a feasible solution the management of diabetic patients during COVID-19.	glucose management+ foot health + exercise
	Underwood 2022 [63]	Unspecified	USA	CGM is employed	Virtual care helps efficiently manage CGM users, leading to improved clinical	Glucose Management

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
					workflow, decisions, and health outcomes.	
DHealth						
Artificial intelligence	Grossman, 2021 [54]	Unspecified	USA	AI helps improve diabetic patients' long-term health through CGM via hemoglobin A1c (HbA1c) monitoring disruption during Covid-19. Despite HbA1c data absence, CGM is used to estimate HbA1c via AI assistance.	AI techniques including machine learning and linear regression models are developed for improved approximation by reducing HbA1c estimation error in comparison with the current protocol, providing values of clinical trials remotely under Covid constraints.	Glucose management
	Kong, 2021 [50]	June 2020 to January 2021	Canada	AI-powered machine-imaging technology is employed to focus on the wound and determine its	This AI algorithm replaces the traditional manual "ruler-and-paper-	Foot health

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
				accurate area size by using s smartphone camera.	based" diagnosis while reducing the time and effort needed to make a physical visit.	
	Kavitha, 2020 [36]	Unspecified	India	AI helps assess diabetic patients' foot health by analyzing foot lesion images from diabetic patients for developing clinical phenotypes.	Design of typical tele-visit workflows which help streamline the diagnosis and treatment of diabetic foot health	Foot health
	Albert, 2020 [53]	March 31 to May 14, 2020	Spain	Using App (SineDie) with AI to adjust diet and insulin treatment by blood sugar level in gestational diabetes mellitus	Prevent unnecessary hospital visits, maintain the best quality health care, and reduce clinicians' workload	Insulin treatment
Data mining	Schmidt, 2020 [52]	March 2020 to the end of May 2020	USA	Data mining helps in the development of strategies to improve the triage process to manage risks for diabetic foot ulcer care. Data are collected and traced from diabetes patients with foot ulcer care needs.	Data mining outputs help build a risk stratification, which helps prevent deadly complications related to Covid-19 or late-stage diabetic foot exacerbation. This	Foot health

WHO technology conceptualization domains and corresponding fields of technology used for diabetes care and management	Author, Year	Study period	Location	Technology factors	Health impacts	Diabetes care-related health events
					strategy also helps avoid additional risks for inpatients, especially those who are from high-risk populations.	

DETECTION AND MANAGEMENT OF LOWER BODY DEFORMITY AND ULCERATION EXTREMITY IN PEOPLE WITH A LIVED EXPERIENCE OF DIABETES

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ABSTRACT

BACKGROUND:

Diabetes is a silent killer, wherein prolonged poor glucose control could lead to acute diabetic ulcers that are responsible for foot ulcers in the lower body extremities. A diabetic foot is a skin sore formed as a result of skin tissue breaking down and exposing the tissue layers underneath. Chronic conditions of the disease lead to amputation of the limb which is a lifelong disability as well as morbidity.

OBJECTIVE:

We have compiled an interesting and informative review on diabetic foot ulceration. Topics and subtopics discussed in the article have scientific relevance for the readers of health management journals.

MAIN OUTCOME AND RESULTS:

The cascade of events that lead to ulceration is responsible for degrading vascular changes in nerve fibers, resulting in poor motor neuropathy in the lower extremities. Therefore, detection of diabetic foot and ulceration in the early stage is crucial for proper disease management. Various tools in this regard have been used to detect and monitor diabetic foot occurrence apart from a conventional assessment such as the severity of the infection, infection of the skin, extent or size of the ulcer, depth of tissue infection, and loss of sensation from various parts of the lower body. Furthermore, recent advancement in medical technology has also given some critical diagnostic tools EMG (Electromyography), NCV (Nerve Conduction Velocity), PPG (Photoplethysmography), and SSEP (Somatosensory Evoked Potential).

CONCLUSION:

The review discusses various complications related to people with a lived experience of diabetic foot ulcers and some advanced tools to diagnose them. Furthermore, a conclusive discussion on a holistic view of diabetic foot diagnosis methods and available treatments has been summarized which could be more explored for better detection/management of the disease.

KEYWORDS

Diabetes; foot ulcerations; diagnosis methods; available treatment; effective management.

Detection And Management of Lower Body Deformity And Ulceration Extremity In People With A Lived Experience of Diabetes   **1**

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INTRODUCTION

Diabetic foot in chronic form gives rise to complications of foot infection, followed by ulceration and destruction of the tissues leading to amputation of the limb [1]. Around 6% of people living with diabetes are affected by diabetic foot complications [2] and other related lower body extremities leading to foot amputations between 0.03% and 1.5% of cases [3]. The complication causes deep lesions in tissues related to peripheral vascular disease and neurological disorders [4]. The occurrence of diabetic foot disease has increased globally due to the prolonged expectancy of people with a lived experience of diabetes [5]. The lower limb in such cases is detached every 30 s, and it costs (average) $US8,659 per diabetic foot patient annually. The total medical cost for treating the disease of diabetic foot ranges from $US9 to $US13 billion in the USA [6]. Thus, the awareness of diabetic foot problems is increasing including by the International Diabetes Federation (https://idf.org/) which could be helpful to reduce substantial medical, social, and economic burdens.

Out of amputated patients with diabetic foot disease, 85% are headed by ulceration in the foot which consequently worsens to an infection (severe) and decay [7]. To the best of our knowledge, no comprehensive study on the prevalence of diabetic foot ulceration has been investigated globally despite the increasing significance of this disease. Reported studies evaluated the prevalence of diabetic foot ulcers only within a certain period in specific areas and varied considerably in the design of the study or analysis of the population. Therefore, a contemporary evaluation and comprehensive epidemiology of diabetic foot ulcers is critical worldwide. Obtained information from such epidemiological studies could be used to prevent diabetic foot ulcers and improve the quality of a person's life by reducing the economic burden. Looking at this scenario, this article aims to discuss some important available studies dealing with diabetes-related lower body part complications, ulcerations, detection tools or methods currently in use, and available treatment for people with a lived experience of diabetes to understand the current prevalence of diabetic foot ulceration.

METHODS

Lower body deformity and ulcerations are chronic and severe complications observed in a diabetic that consist of lesions in the deep tissues, and lower limbs associated with peripheral vascular disease, neurological disorders and other related conditions [8]. We have done a scoping review on existing literature on the topic. We have searched the topic using PubMed and Scopus with "diabetes-related complications in the lower part of the body, methods of detection, and current treatment options". The literature survey included only peer reviewed papers mostly from 2001 and available in the English language.

DIABETES-RELATED ULCERATIVE COMPLICATIONS

People having Type 1 or 2 diabetes mellitus have a lifetime risk that results in various macrovascular and microvascular complications [9] and some have diabetic foot ulcer disease and other complications (cardiovascular disease and neuropathies). We have discussed some diabetes-related ulcerative complications, in brief, to acquaint with the problem.

FOOT DEFORMITIES

Deformities in the bones, toenails, and soft tissues of the foot are not only prevalent but also more challenging in people with a lived experience of diabetes. Bone deformities cause new pressure points against the foot that can be triggered leading to a cut on the leg or its part. A wound develops once the skin is infected/injured which may cause the collapse of the mid-foot and amputation. It may further induce neuropathy.

NEUROPATHY

Foot bone deformities cause peripheral neuropathy, which further results in muscle atrophy. Peripheral neuropathy affects feet, toes, and legs. Insensitivity to pain, numbness, prickling sensation, etc. are the symptoms of peripheral neuropathy that may include loss of coordination and balance. Peripheral neuropathy may cause loss of reflexes in the ankle and weakness in muscles. Due to unnoticed pressure and injury, blisters and sores may appear on numb areas of the foot. The infection may spread to the bone if an infection occurs and there is no prompt treatment, which ultimately may lead to the removal of a foot from the body [10]. At the site of pressure, loss of sensation takes place, which is accompanied by trauma. Increased pressure further contributes to skin breakdown which is often accompanied by the formation of ulcers. Elevated pressure on the plantar foot contractures in particular areas at the ankle joint, anterior leg musculature, and weakness may contribute to equinus deformity with lack of ample

Detection And Management of Lower Body Deformity And Ulceration Extremity In People With A Lived Experience of Diabetes **2**

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dorsiflexion and upraise plantar pressures in the forefoot [11]. Vascular complications in diabetic feet further develop diabetic ischemia and ultimately diabetic neuropathy (Figure 1). Ischemia may contribute to the persisting or developing foot ulcers in people with a lived experience of diabetes. [12].

FIGURE 1: VASCULAR COMPLICATIONS OF DIABETES FOOT PLAY A KEY ROLE IN THE INITIATION AND DEVELOPMENT OF DIABETIC ISCHEMIA AND DIABETIC NEUROPATHY
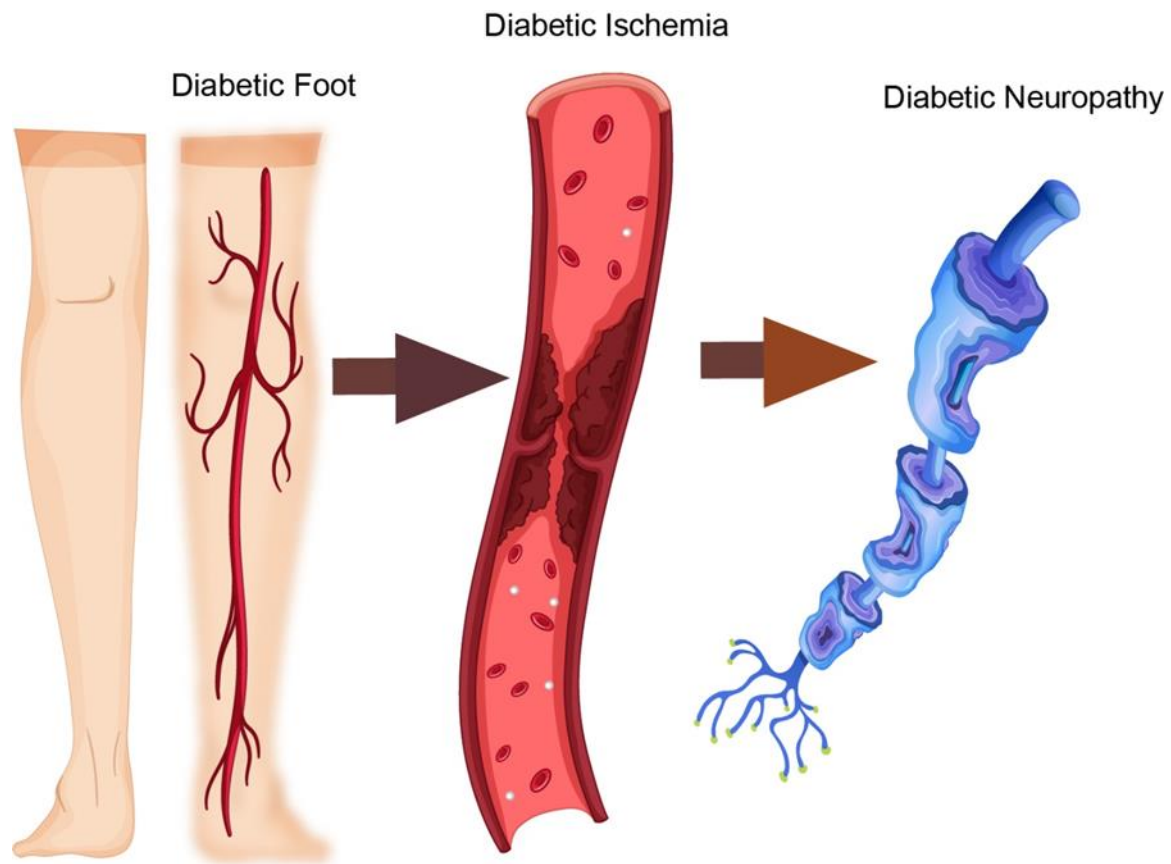
Source: Authors artwork

VENOUS ULCERS

Venous hypertension is the cause of venous ulceration. Venous hypertension contributes to venous obstruction. With the local effects, the result leads to the transmission of elevated venous pressure from the deep to the superficial system of the veins to the ulceration [13]. Multiple hypotheses exist that attempt to explain the direct cause of ulceration the most accepted one is venous hypertension plays a major role in ulceration development. Venous hypertension results in decreased fluid flow and circulation in the capillaries, which results in white blood cell accumulation. These white cells may interfere with tissue oxygenation and release proteolytic enzymes [14]. In the case of venous hypertension, another hypothesis suggests that various macromolecules leak into the region of the dermis and trap the growth factors [15].

ARTERIAL ULCERS

Peripheral arterial occlusive disease is caused due to atherosclerosis. This predominantly affects the superficial popliteal and femoral vessels, reducing the flow of blood to the lower body extremities [16]. Ulceration develops when the ischemia is enough severe. The inflammatory segmental thrombotic disease of the small and medium vessels of lower body extremities is usually associated with smoking. This is considered a prime cause of ulceration and peripheral arterial disease (PAD). When proximal plaques break off and travel distally, atheroembolism may cause peripheral arterial occlusion. This is called blue toe syndrome or cholesterol emboli [17].

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DETECTION TOOLS/METHODS CURRENTLY IN USE

Physical examination, claudication, skin examination, palpation of arteries, auscultation of the vessels, etc can be performed in all people with a lived experience of diabetes having trouble in lower body extremities. We have compiled some methods (Table 1) that are used for the detection of the complication.

TABLE 1. DETECTION TOOLS AND METHODS IN DIAGNOSIS OF DIABETES WITH SOME CASE STUDY.

Detection Tool	Case Study	Diagnosis/Observation	References
EMG	Patients with diabetic peripheral neuropathy were tested by EMG	Lower limbs than in upper limbs were found to have abnormal motor nerve conduction. However, EMG was not recommended as standalone technique for diabetes management	[21]
	EMG patterns in diabetic neuropathic observed during step ascending and descending	EMG, three-dimensional motion capture techniques was used to determine the lower limb muscle relaxation and motor neuron behavior. It showed the relation between Diabetic peripheral neuropathy and early muscle activation	[22]
	Ppatients with diabetic neuropathy-distal and proximal nerve behavior was studied	Irregular sensory potential was found in diabetic neuropathy with multiple peaks of short duration demonstrating muscle wasting and dysfunctional motor neuron conduction	[23]
	Use of EMG for Type 2 diabetic neuropathy patient's prognosis based on oxidative stress markers and Body fat mass.	Increased oxidative stresses were observed in Type 2 diabetic patients correlating with decreased nerved conduction. Increased body mass further assisted the increased oxidative stress and Type 2 diabetes	[24]
NCV	Patients with Long duration diabetes leading to diabetic neuropathy	Various factors (Age, duration of diabetes and gender (prominent in male) could significantly contribute to abnormal nerve conduction velocity abnormal (with ankle and knee motor nerve being most affected.	[18]
	10 years survey of NCV correlation with retinopathy and diabetes Type 2	Decrease in NCV was noted when retinopathy increased, even maintaining the HbA1c to balanced level had had no major effect to NCV reduction	[25]
	Type 2 Diabetes patients and occurance of Diabetic Retinopathy	Diabetic Retinopathy patients were found to have reduced sural sensory conduction velocity and tibial motor conduction velocity. The reduced NCV thus was correlated with early onset of Diabetic Retinopathy	[26]

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	Patients with Type 2 diabetes mellitus correlating with duration of glycaemic control, NCV and Diabetic neuropathy	Glycosylated haemoglobin had association with HbA1c levels and sural nerve amplitude.	[27]
SSEP	Tibial nerve stimulation was observed in healthy subjects and diabetic patients dependent on insulin	The SSEP result correlated with the peripheral and autonomic response test. The finding was that in insulin dependent individuals somatosensory dysfunction is dependent upon extant of peripheral neuropathy and not on the duration of diabetes or glycaemic control.	[28]
	Patients with Type 2 diabetes	It was observed that central as well as peripheral somatosensory were affected in the diabetic Type 2 group, evident from the latency in sensory nerves responsible for progression to severe diabetic neuropathy condition.	[29]
	Study in Diabetes mellitus women patients	Abnormal findings in motor and urodynamic studies correlated with diabetic neuropathy (Urinary dysfunction) and diabetic cystopathy (sexual dysfunction).	[30]
	Chronic diabetes mellitus effect to the brain (cranial diabetic neuropathy)	Lengthening of SSEP in diabetes mellitus Type 2 were observed and postulated for occurrence of diabetic encephalopathy	[31]
PPG	Healthy control and diabetic subject were taken to study Auto-Regressive Moving Average using a black box system	State of diabetes were predicted close to 92.1% specificity leading to control of insulin administration	[32]
	Direct Non-invasive Monitoring of Blood Glucose	Deuterated water with 5% glucose showed distinct absorption spectra was observed by developed TensorTip Combo Glucometer	[33]
	Measuring of Arterial Stiffness by PPG for patients with HbA1c<8% and those with HbA1c>10%	Patients with HbA1c<8% showed higher curve area as compared to those with HbA1c>10% in PPG graph, corresponding to increase in patients with HbA1c>10%	[34]
	Use of Logistic Regression Modeling on PPG data for diabetes management	The model showed the confidence rate of 92.3%, predicting early onset of diabetes by correlating with Type 2 diabetes if HbA1c value exceeds 6.5%.	[35]

ELECTROMYOGRAPHY (EMG)

It is a diagnostic procedure that is highly useful in the management of diabetic neuropathy through electrical stimulus-based tests to determine the health of muscle and motor neurons. According to the action potential pattern in the electromyography, the nervation ratio could be determined. Also, motor conduction could be determined from distal conduction time, peak-to-peak amplitude, and shape of the polyphasic (composed of various phases). Another parameter that could be investigated by EMG is sensory conduction by distal conduction velocity, shape, and duration of conduction potential.

NERVE CONDUCTION VELOCITY (NCV)

This method evaluates the nerve conduction velocity in people with a lived experience of diabetes by relating it with the tendon reflexes. The procedure for NCV is to observe the conduction in sensory branches and motor (Peroneal nerve, Ulnar nerve, Sensory, and Sural nerve). According to the study by Tehrani et al. investigating NCV across wide age groups have a normal conduction frequency of 81.8% [18].

## SOMATOSENSORY EVOKED POTENTIAL (SSEP)

This is one of the non-invasive techniques to determine the neurophysiological phenomenon in the dorsal column-lemniscal system (brain) and spinothalamic system (spinal cord). The SSEP potentials are elicited by stimuli that are largely used for the diagnosis of neural disorders. Important to note that SSEP evaluates motor function by detection of vibration and texture including determination of joint position and force movement. At present, the SSEP method still needs more studies to understand the inconsistent deviation readings that are largely affected by age, body type, and glycemic index of people with a lived experience of diabetes.

PHOTOPLETHYSMOGRAPHY (PPG)

This technique specifically targets PAD, which occurs commonly in people with a lived experience of diabetes [18]. PAD warrants special attention due to being a life-threatening disease with high chances of amputation and morbidity. 8-MHz Doppler probes are generally used for Doppler imaging of prominent body areas such as finger, toe, ankle, and brachial. However, in the case of PPG, the predictive model is used to classify diabetes based on the waveform data from the photodiode. This non-invasive technique applies statistical regression, machine learning, and artificial neural networks to determine the severity and classification of diabetes. The electrical output from optical interference thus determines the systolic and diastolic phases, wherein the diastolic notch in-between is of prime significance such as closer of valve and receding of blood flow. Another important data that could be derived from the PPG is arterial stiffness (calcification due to diabetes) by knowing the subject height and PPT, as represented in Figure 2.

FIGURE 2: DETERMINATION OF STIFFNESS INDEX THAT COULD BE DETERMINED FROM SUBJECT HEIGHT/ PPT.
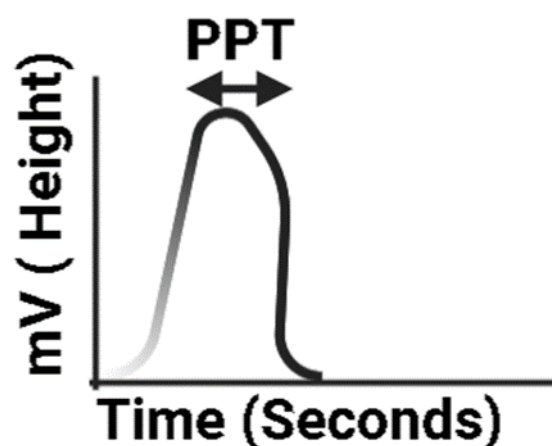
AVAILABLE TREATMENT AND FUTURE THERAPY

The best treatment for lower extremity ulceration is prevention and mechanical therapy is the considered gold standard for treatment for venous ulceration. The best prevention strategy for diabetic foot people is never to go barefoot. Washing of feet every day is advised in warm water, not hot water, and dry feet completely before applying lotion. Elevation of the legs above the heart level may reduce and improve ulcer condition if it is done for 30 minutes 3-4 times daily. Swelling in the lower extremities can be reduced by elevating the legs while sleeping at night. A compression stocking is considered a good approach for the treatment once a venous ulcer develops. For the individual with a lived experience of diabetic foot, the compression stocking is used not only to increase the rate of ulcer healing but also to reduce the rate of recurrence. Compression therapy has the confidence to exert a positive effect on venous ulcers by reducing venous hypertension, improving microcirculation at the cutaneous level, and increasing fibrinolysis. Exerting a pressure of 30-40 mm of Hg is typically useful in settling venous ulceration.

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Multilayered compression bandages are also effective in the reduction of amputation. Some patients require compression therapy to attain the healing of ulcers. Some patients are reported with venous ulcers in association with arterial occlusive disease. It needs extreme pharmacologic and compression therapy. Pentoxifylline has been shown to improve the healing of venous ulcers with and without compression therapy. A clinical trial (randomized, and double-blind) of twenty patients treated with enteric-coated aspirin daily dose of 300 mg, was performed by Layton et al., 1994 [19]. They found that the aspirin-treated group had a better reduction in the ulcers' size.

Neuropathy is the entryway to foot ulceration development in people with a lived experience of diabetes. Therefore, the risk of foot ulceration could be reduced by regular screening of neuropathy conditions, the use of custom footwear, intensive podiatric care, etc. Once ulceration develops, treatment should focus on pressure relief and avoidance of infection. For off-loading the diabetic foot, the total contact casting method is a gold standard. With pressure relief, the cast cannot be removed, which further reduces the risk of patient noncompliance. The cast application is more demanding, but they are applied in the presence of technical expertise with proper care. Cast application is not applied in the presence of infection or excessive drainage. Removable cast walkers are used commonly to off-load the diabetic foot in place of the total contact cast. Because the device is removable, therefore, the wound can be supervised daily and can be used even in the presence of infection because infection management is the most critical aspect of diabetic foot treatment. People with a lived experience of diabetes may remove the device during bathing and sleep. Infected foot ulcers are life-threatening. Infections should be treated empirically, and beta-lactamase and cefazolin are used in case of infections. Definitive therapy may then be instituted when results are reported with resistant microbial culture. Incision and drainage should be performed when an abscess or deep infection is observed. Antibiotic therapy combined with surgical removal of infected bone is necessarily done in case of osteomyelitis.

A specialist from vascular surgery and vascular medicine should be consulted for the treatment of arterial ulcers. Gangrenous tissue must be removed, and it often requires amputation partially. Vascular consultation is needed in amputation to determine the appropriate level of care. It must be determined whether the patient is a candidate for the process of peripheral revascularization. The wound does heal without sufficient oxygenation in tissue. Therefore, radiologists also perform procedures which is less invasive vascular, which may increase blood flow peripherally. To promote granulation and prevent infection, wounds must be kept moist and clean. Due to these complications immunity of the body becomes weak. Therefore, the immunopathy approach could be effective and may delay the healing of the wound. Some of the complications of immunopathy include adverse reactions to drugs and foreign body reactions [20] but it could be a futuristic therapy.

CONCLUSIONS

Hyperglycemia, vascular abnormalities, and metabolic changes play a vital role in the development of foot deformities and ulcerations in people with a lived experience of diabetes. There are some products in terms of wound care and dressings available in the market that give temporary relief only to people with a lived experience of diabetic foot and there should be a better longer-term treatment option. Living skin equivalents, negative pressure wound therapy, silver-impregnated dressings, topical growth factors, etc. are some modalities available and used for ulcerative diabetic foot treatment and care. However, these things are not satisfactory for people with a lived experience of diabetic feet. Wounds in the case of diabetic foot are resistant to healing and some peoples benefit from an available treatment option, however, effective modalities for the healing of chronic diabetic foot ulcers and their appropriate management are needed by establishing some cost-effective therapies. Clinicians have to think about some new approach for its early detection and proper management because cellular events involved in its development is the common denominator between the vascular abnormalities and metabolic factors detected in the case of people with a lived experience of diabetic foot ulcer. Available detection and treatment methods could be explored more judiciously in the future for better detection and to provide well-coordinated care and management to the people with a lived experience of diabetic foot ulcers and further clinical studies are needed for the development of new approaches for the treatment of diabetic foot ulcers.

DECLARATIONS

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CONFLICT OF INTEREST

The authors do not have any conflict of interest.

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KNOWLEDGE LEVEL OF NURSES ABOUT HOSPITAL TRIAGE: A SYSTEMATIC REVIEW

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ABSTRACT

OBJECTIVE:

Triage prioritizes patient care based on the severity of the injury or condition and aims to facilitate the best possible recovery for the majority of individuals within the shortest possible timeframe. This concept holds paramount importance in the realm of emergency care. The objective of this study was to assess the knowledge level of triage nurses working in hospitals.

METHODS:

This systematic review study encompassed an extensive analysis of relevant literature, drawing from international databases such as PubMed, Scopus, Web of Knowledge, and Google Scholar, as well as Iranian databases including SID, Magiran. The search spanned the period from 1980 to 2023.

RESULTS:

In the present study, 22 articles were selected for data extraction. Across all these articles, it was consistently observed that the knowledge level of the nurses ranged from low to moderate. Furthermore, two interventional studies reported a notable increase in knowledge levels among nurses following training.

CONCLUSION:

Based on the findings from multiple studies, it is evident that the knowledge level of triage nurses generally falls within the low to moderate range. Consequently, it is advisable to conduct further studies in a similar vein and implement necessary actions to address this issue.

KEYWORDS

knowledge, nurse, hospital, Iran

INTRODUCTION

Given the critical and unpredictable nature of hospital emergency departments, nurses in these settings contend with a substantial workload. The widespread issue of overcrowding in emergency departments, prevalent throughout the country, results in prolonged patient wait times and delays in delivering care [1]. This concern holds significant importance as it directly impacts patient satisfaction levels [2]. Consequently, the need for an initial assessment and prioritization of patients arriving at these departments is imperative. This examination is commonly referred to as triage in emergency departments [3]. Triage involves the prioritization of patient care based on the severity of their injuries [4] and aims to deliver optimal treatment to the greatest number of individuals in the shortest possible time. This is undeniably one of the cornerstone concepts in emergency department operations [5, 6]. Armstrong outlines the essential attributes of standard triage, emphasizing its simplicity for efficient implementation amidst chaotic and disorganized situations, its time efficiency when mere moments can determine life or death, and its reliance on predictability and reliability [7]. Given the dynamic and ongoing nature of the triage process, it is imperative to designate the most competent and proficient individuals for this responsibility. Nurses, as the largest and most crucial professional cohort within the healthcare system, assume a pivotal role in the domain of triage [8]. Hence, the paramount objective of the triage nurse is to conduct a rapid assessment of patients, assigning priority according to their clinical requirements [9] Ultimately, the decision to assign a triage code to a patient hinge on their condition and adherence to the triage scale [10]. Triage must be executed in a manner that prioritizes patients not based on their arrival sequence but rather on the severity of their injuries and the urgency of emergency interventions. This approach ensures that essential treatments are promptly administered, deviating from the conventional routine as necessary [11].

A robust foundation of professional knowledge serves as a critical underpinning for accurate triage decision-making. The significance of this issue becomes glaringly evident when a patient, facing a health threat, is assigned to lower triage classes due to an erroneous decision by the triage nurse [12]. Research has discerned that the primary reason behind such occurrences is the insufficient knowledge in the realm of triage, with findings indicating that possessing comprehensive knowledge about triage outweighs the importance of work experience [13]. Consequently, the absence of requisite and standardized knowledge in the domain of triage can lead to detrimental consequences [12]. Numerous studies have probed into the knowledge levels of nurses regarding triage, sparking considerable apprehension within this domain. For instance, a study conducted in Sweden revealed the absence of a standardized triage methodology in the country's emergency departments, coupled with inadequate training for nurses in this domain [14]. Similarly, Mirhaghi and Roudbari [12] study uncovered nurses' unfamiliarity with hospital triage knowledge and identified a lack of mandatory adoption of a valid and dependable triage scale within the emergency departments of the scrutinized hospitals.

In Iran, the responsibility for triaging patients in emergency departments typically falls on nurses. The inception of hospital triage in these departments is a relatively recent development. Initially, hospital triage was introduced in larger urban centers, particularly in social security hospitals, and subsequently in university-affiliated medical centers [15]. Regrettably, to date, no comprehensive study has been undertaken to consolidate existing research in this area. Hence, the present study was conducted with the objective of assessing nurses' knowledge levels concerning hospital triage.

METHODS

A comprehensive systematic review of pertinent studies was undertaken. It followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to ensure transparency and rigor in the reporting process [16]. The study used international databases including PubMed, Scopus, Web of Knowledge, and Google Scholar, alongside internal databases such as SID (the Scientific Information Database of the Academic Center for Education, Culture and Research, Iran) and Magiran (a database of Periodicals published in Iran), encompassing the years from 1980 to 2023. The search employed keywords including "Nurse," "Emergency department," "Knowledge," "Triage," "Iran," and "Hospital," combined using the OR and AND operators to refine the results. The titles and abstracts of articles were independently assessed by researchers to determine their relevance to the topic. All original articles were gathered and scrutinized for inclusion in the study. Inclusion criteria encompassed: 1) the

presence of the keywords in the title or abstract and 2) the provision of awareness levels in the form of descriptive statistics. Studies in the form of theses, books, and abstracts from congresses and conferences were excluded from consideration."

SELECTED STUDIES QUALITY ASSESSMENT

A quality score, adapted from the Newcastle-Ottawa scale, was employed to assess the suitability of research design, recruitment strategy, response rate, sample representativeness, objectivity/reliability of outcome determination, provision of power calculation, and utilization of appropriate statistical analyses [17]. Studies receiving a score on this scale below seven on quality assessment were subsequently excluded from the analysis.

DATA EXTRACTION AND ANALYSIS

During the subsequent phase, data extraction was carried out from each of the articles that met the inclusion criteria. The extracted information encompassed the first author's name, year of publication, study type, number of participants, their average age, the type of study tool employed, and the level of awareness assessed. To ensure the qualitative content validity of the assessment tool, input was sought from ten experts. The scale was distributed to these experts, and their feedback was collected and taken into consideration. Subsequently, the scale was refined and its content validity was confirmed.

RESULTS

In the initial search across the aforementioned databases, a total of 42 articles were retrieved. Following a meticulous evaluation based on the detailed steps outlined in Figure 1, 22 articles were deemed suitable for inclusion in the study [12, 15, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37]. Conversely, 28 articles were excluded from the study for various reasons, including lack of relevance to the study's objectives (14 articles), absence of explicit documentation of nurses' knowledge levels in descriptive statistics (6 articles), and inadequacy in the methodological quality upon thorough examination (8 articles).

FIGURE 1. PRISMA DIAGRAM OF HOW ARTICLES ARE INCLUDED IN THE STUDY
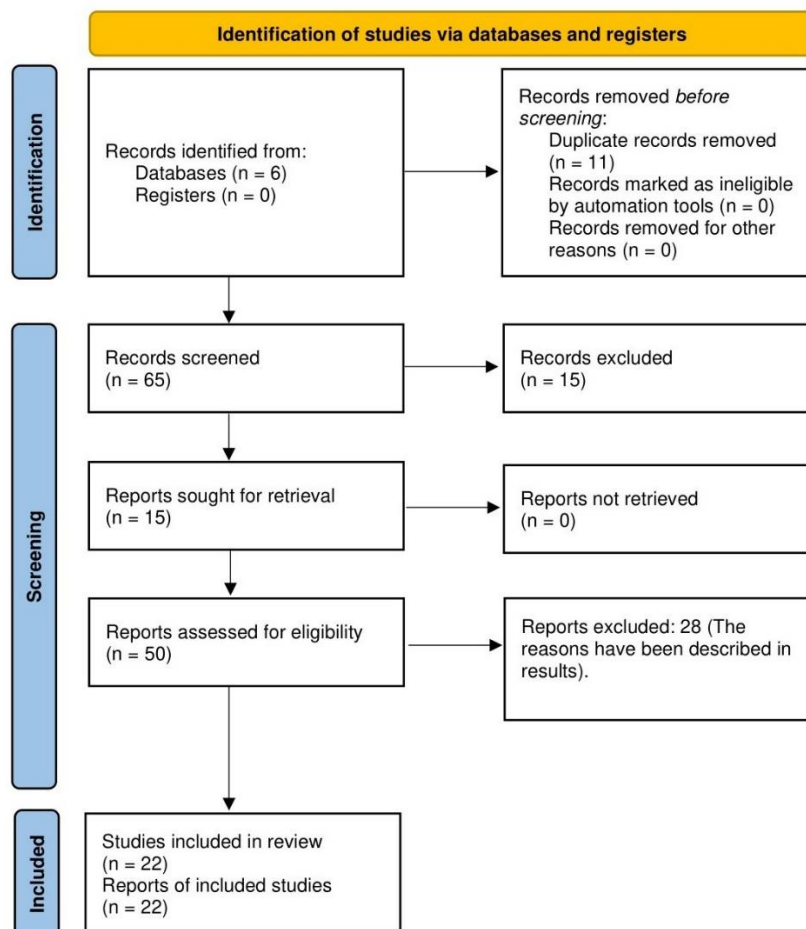
Table 1 provides an overview of the studies, indicating that the majority of them employed a cross-sectional research design. Notably, only one study involved nursing students [22]. The average age of participants in these articles ranged from 21 to 49 years old. It is noteworthy that, except for four studies [19, 25, 33, 37], the remaining studies utilized researcher-developed tools to gauge the knowledge level of nurses regarding triage. This underscores the imperative need for designing a standardized assessment tool for the broader utilization of researchers in this field. In terms of knowledge levels, the findings consistently indicated that nurses' knowledge fell within the moderate range across all studies. However, it is worth highlighting those two experimental studies reported a significant increase in awareness levels following training [20, 23].

TABLE 1. DETAILS OF THE ARTICLES INCLUDED IN THE STUDY

Item	Author [year]	Study type	Study place	Sample [size]	Mean age [SD] or N [%]	Scale	Mean of knowledge (SD) or N (%)
1	Fathoni (2010) [19]	Cross-sectional	Indonesia	Nurses [266]	-	Triage Knowledge Questionnaire	55.26 (13.16) [Weak level]
2	Aloyce (2014) [18]	Cross-sectional	Tanzania	Nurses [66]	-	Questionnaire developed by the researcher	33% had no knowledge
3	Kalantarimeibidi (2014) [20]	Experimental	Iran [Shiraz]	Nurses [50]	33 [3.2]	Questionnaire developed by the researcher	Previous of intervention: 7.5 (2.1) and after intervention: 14 (1.6)
4	Javadi (2016) [21]	Cross-sectional	Iran [Yazd]	Nurses [45]	34 [6.80]	Questionnaire developed by the researcher	6.33 (1.96) [Average level]
5	Mirhaghi (2011) [12]	Cross-sectional	Iran [Zahedan]	Nurses [102]	29.46 [4.09]	Questionnaire developed by the researcher	5.64 (1.54) [Weak level]
6	Tabatabai (2013) [22]	Cross-sectional	Iran [Tehran]	Nursing students [124]	-	Questionnaire developed by the researcher	9 (2.7) [Weak level]
7	Haghdoost (2009) [23]	Experimental	Iran [Rasht]	Nurses [40]	Upper than 33 [32.5%]	Questionnaire developed by the researcher	Previous of intervention: 16.25 (5.73) and after intervention: 30.67 (5.51)
8	Sardar (2013) [24]	Cross-sectional	Lahore	Nurses [100]	27.55 [6.31]	Questionnaire developed by the researcher	9.51 (2.91) [Weak level]
9	Haghigh (2017) [15]	Cross-sectional	Iran [Ahvaz]	Nurses [70]	31 [9.05]	Questionnaire developed by the researcher	36 nurses (51.4%) were weak
10	Robison (2002) [25]	Cross-sectional	USA	Nurses [82]	-	Darnall MASCAL Triage Test	51.25 (2.85) [Average level]

11	Phukubye (2019) [26]	Cross-sectional	South African	Nurses [84]	35-49 [51%]	Questionnaire - developed by the researcher	61% of nurses were good
12	AlShatarat (2022) [28]	Cross-sectional	Saudi Arabia	Nurses [172]	36 [5.60]	Triage Knowledge and Practices Questionnaire	11.78 (3.01) [High level]
13	Asgari (2018) [29]	Cross-sectional	Iran [Ilam]	Nurses [160]	30 [4.11]	Questionnaire - developed by the researcher	10.44 (2.11) [Average level]
14	Al-Metyazidy (2019) [30]	Cross-sectional	Egypt	Nurses [46]	34.59 [7.12]	Questionnaire - developed by the researcher	Majority of nurses had poor level of knowledge
15	Esmaealpour (2022) [31]	Cross-sectional	Iran [Jahrom]	Nurses [74]	-	Questionnaire - developed by the researcher	15.06 (3.12) [Average level]
16	Twagirayezu (2021) [32]	Cross-sectional	Rwanda	Nurses [96]	-	Questionnaire - developed by the researcher	63.6% of nurses demonstrated low level of triage knowledge
17	Elgazzar (2021) [33]	Cross-sectional	Saudi Arabia	Nurses [48]	31.79 [5.81]	Phukubye,s Triage Knowledge Questionnaire	10.94 (2.18) [Average level]
18	Afaya (2017) [34]	Cross-sectional	Ghana	Nurses [65]	21-30 [70.8%]	Questionnaire - developed by the researcher	62.6% of nurses demonstrated good level of triage knowledge
19	Sherafat (2019) [35]	Cross-sectional	Iran [Yazd]	Nurses [84]	34.8 [6.6]	Questionnaire - developed by the researcher	6 (1.9)
20	ALI (2013) [36]	Cross-sectional	Pakistan	Nurses [100]	27.55 [6.31]	Questionnaire - developed by the researcher	9.16 (2.56) [Weak level]
21	AlMarzooq (2020) [37]	Cross-sectional	Saudi Arabia	Nurses [138]	26-35 [66.6%]	Mohammed,s Triage Knowledge Questionnaire	Majority between moderate level and high level
22	Duko (2019) [27]	Cross-sectional	Addis Ababa	Nurses [101]	28.50 [4.32]	Questionnaire - developed by the researcher	9.54 (2.32) [Weak level]

DISCUSSION

The present review study was undertaken to assess nurses' knowledge levels regarding triage. In a study conducted by Mirhaghi and Roudbari [12], the findings revealed that 94.39% of the sample's responses to the questionnaire were deemed incorrect, signifying a weak level of knowledge. Furthermore, in the research conducted by Abbasi, Nosrati [38], the knowledge level of doctors pertaining to triage and nuclear treatment was reported to be at 39.69%. However, in a national study conducted by Göransson, Ehrenberg [14], the level of knowledge among nurses regarding triage was categorized as average. Likewise, in a study by Malekshahi and Mohammadzadeh [39], which aimed to assess the knowledge and attitudes of nurses concerning the triage of injured patients admitted to

Shohdai Ashair Hospital of Khorramabad in 2012, the overall knowledge about triage was reported at 53.9%, falling within the average range. Indeed, it's important to note that in their research, Malekshahi and Mohammadzadeh focused on the broader aspects of triage for the injured and did not specifically assess hospital triage. In another study conducted by men in Ahvaz to evaluate the knowledge and attitudes of nursing students regarding triage, the results showed that 57.1% of the samples possessed good knowledge about triage [40]. In contrast, Mirhaghi and Roudbari [12] study found that 20% of the participants had no knowledge of triage. In their study, Moaddab and Bahrami [41], which aimed to identify the challenges and issues related to triage from the perspective of nurses in a selected medical training center, reported that 86% of the participants had not completed a triage training course. Additionally, 68.8% of the respondents believed that there was no unified triage system in the healthcare system, and the lack of coordination and consistency in triage implementation had undermined its effectiveness. In the study conducted by Dadashzade, Abdolahzade [42], 38.2% of the participants had not undergone specialized training to learn triage.

Accurate and timely triage of patients represents a cornerstone of successful operations within the emergency department. Choosing an incorrect triage level, stemming from misinterpretation or the disregard of patient variables and triage criteria, often attributable to inadequate knowledge or performance, can result in a triage error for the nurse [43]. Triage errors can manifest in various ways, including the assignment of patients to a lower level or 'light' triage category, which can result in prolonged waiting and the deterioration of their condition. Conversely, overclassifying patients into a higher or 'heavy' triage category may impede access for other patients in need of immediate care [12]. The primary factors contributing to light triage include a lack of awareness and adequate knowledge, negligence regarding high-risk situations, and the failure to correctly interpret vital signs. Light triage not only leads to delays in diagnosing and treating severely injured patients but can also result in serious consequences, including fatalities [44]. Light triage in the emergency room can indeed have adverse effects on hospitalized patients during their hospital stay. Conversely, heavy triage primarily poses challenges related to resource allocation and can divert hospital staff from other critical activities [45]. Numerous studies conducted in Iran and around the world have consistently pointed to a lack of knowledge as the primary driver of triage errors. In summary, many of these studies have assessed the knowledge level of nurses regarding triage as weak. Given that nurses are the frontline personnel responsible for triage in medical centers, this underscores the substantial risk associated with triage errors.

LIMITATIONS AND RECOMMENDATIONS

This study encountered several limitations, including the scarcity of available studies for a more comprehensive summary. The high degree of heterogeneity among the identified studies precluded the possibility of conducting a meta-analysis. It is recommended that, given the importance of this topic in enhancing public health, descriptive studies be conducted to gather foundational information and assess the situation nationwide. Subsequent research efforts could focus on exploring effective and practical strategies to enhance the knowledge and performance of nurses and other healthcare personnel in triage, thereby contributing to improved patient care in emergency settings.

IMPLICATIONS FOR PRACTICE

Triage stands as one of the foremost critical measures in emergency wards, underscoring the importance of comprehending and assessing nurses' knowledge about triage. The outcomes of this study hold the potential to serve as a stepping stone for future research, enabling more precise evaluations of nurses' knowledge and performance in triage. Additionally, by consolidating previous research findings, this study has provided a comprehensive overview, serving as a noteworthy cautionary note regarding nurses' knowledge in this vital area.

Assessing nurses' knowledge of hospital triage can reveal specific areas where they may lack understanding or competence. This information can be used to tailor educational programs and training interventions to address these gaps effectively. A comprehensive study can help healthcare institutions identify weaknesses in their triage systems. When nurses are well-versed in triage, it can lead to more accurate assessments, which, in turn, can contribute to higher-quality patient care and better outcomes. Understanding nurses' knowledge levels in triage can directly impact patient safety. Nurses who are better educated in triage are less likely to make errors in prioritizing patients, which can reduce the risk of adverse events and patient harm. Regular assessments of nurses' triage knowledge can serve as a foundation for ongoing

improvement efforts. Healthcare institutions can use this data to track changes in knowledge levels over time and adapt their training programs accordingly.

CONCLUSION

Based on the results gleaned from diverse studies, it is evident that the knowledge and awareness levels of nurses concerning triage generally fall within the weak to moderate range. It is strongly recommended that additional related studies be undertaken to further explore and address this issue. Moreover, healthcare authorities should take significant measures aimed at enhancing this crucial knowledge among nurses, ultimately leading to improved patient care in emergency settings.

CONFLICT OF INTEREST:

The authors declare that they have no competing interests.

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