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RESEARCH ARTICLE

KNOWLEDGE, BARRIERS, AND MANAGEMENT IMPLICATIONS OF MAINTAINING HOSPITAL INFORMATION SYSTEM (HIS) AMONG STAFF NURSES IN UTTAR PRADESH, INDIA

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ABSTRACT

BACKGROUND:

Hospital Information Systems (HIS) are essential tools in hospital management, enabling nurse leaders and administrators to access accurate patient data, monitor performance, and make informed decisions that enhance care quality and operational efficiency. By supporting both clinical and managerial decision-making, HIS strengthens strategic planning, resource allocation, and coordination across departments.

AIM:

To assess the knowledge, to find out the barriers regarding Hospital Information System (HIS) among the staff nurses and to find out the association between the barriers faced by staff nurses in maintaining Hospital Information System (HIS) with their selected demographic variables in a selected hospital of Uttar Pradesh, India.

METHOD:

A quantitative research approach was adopted for the study with cross sectional research design was conducted in selected hospital of Uttar Pradesh, India. The study was conducted among 250 staff nurses. A structured knowledge questionnaire was used to assess the knowledge of staff nurses and structured rating scale was used to find out the barriers among staff nurses.

RESULT:

The findings revealed that 59.6% of staff nurses had adequate knowledge about HIS. Regarding barriers, 66.8% experienced moderate barriers, 17.6% experienced major barriers, and 15.6% experienced mild barriers and significant associations were found between barriers and any training attended related to HIS use (p=0.007) and any special training attended related to computer use (p=0.007), whereas with other demographic variables, no significant association was shown.

CONCLUSION:

The study concluded that a large proportion of staff nurses had inadequate knowledge and faced barriers in maintaining Hospital Information System (HIS). These findings have practical and policy implications for hospital administrators, highlighting the need for structured and continuous HIS training programs, supportive policies, and adequate resource allocation to ensure effective and sustainable system use.

KEYWORDS
hospital information system, barriers, staff nurses, knowledge.

INTRODUCTION

A Hospital Information System (HIS) refers to an integrated platform that enables hospitals to collect, store, process, and disseminate information efficiently. It typically encompasses clinical, organizational/financial, and personnel management divisions. HIS supports optimal treatment outcomes by streamlining clinical workflows, improving care coordination, and enhancing data-driven decision-making.[1]

Hospital Information Systems (HIS) also significantly enhance care coordination among health professionals by ensuring that essential patient data such as clinical history, laboratory test results, radiographic images, and other diagnostic information is readily available at the point of care. For example, lab technicians and radiologists can instantly access and disseminate test reports and imaging, facilitating streamlined clinical workflows and interprofessional collaboration. The increasing adoption of HIS is driven by the pressure to manage growing patient volumes and complex care pathways, as digital information ecosystems supported by HIS improve the generation, updating, exchange, and continuity of data across the patient journey.[2]

The Hospital Information System (HIS) is an essential mechanism for managing information and documentation in healthcare settings, equipped with various features that have the potential to transform hospital services dramatically. HIS saves valuable time, allowing healthcare providers to make faster, informed decisions regarding patient treatment. [3] Despite the availability of these advanced systems, nurses are not fully utilizing Hospital Information Systems (HIS) to document the care they provide to patients.[4]

This study is guided by the Technology Acceptance Model (TAM), which explains how perceived usefulness and ease of use influence the adoption of new technologies, such as Hospital Information Systems (HIS). This model provides a useful lens to assess both knowledge and the barriers staff nurses face in HIS usage.

There are not enough studies in regard to assess the knowledge and find out the barriers among staff nurses in maintaining Hospital Information System therefore this study aimed to assess the knowledge and barriers among staff nurses, through cross-sectional research design. The primary objective of the study was to assess the knowledge and to find out the barriers in maintaining HIS among staff nurses and the secondary objective was to find out the association between the barriers faced by staff nurses in maintaining Hospital Information System (HIS) with their selected demographic variables.

MATERIAL AND METHOD

STUDY SETTING AND DESIGN:

Between June and December 2024, we conducted a study by using a descriptive cross sectional research design in a selected hospital of Uttar Pradesh, that focused on the knowledge and barriers among staff nurses. A non-probability convenience sampling technique was adopted due to operational constraints in the clinical environment, such as varying nurse shift schedules, high workload periods, and the need to collect data without disrupting patient care. This approach was practical for accessing participants during their availability and enabled inclusion of actively practicing nurses across multiple departments. To minimize potential selection bias, we invited all eligible nurses present during the data collection period, ensured representation from all shifts, and avoided selecting only those personally known to the researchers. While this method limits broader generalization, it provided relevant, real-world insights into HIS-related challenges in routine hospital practice.

STUDY POPULATION:

Our target population was the staff nurses in a selected hospital of Uttar Pradesh.

SAMPLE SIZE AND SAMPLING PROCEDURE:

Sample comprised of staff nurses working in a selected hospital of Uttar Pradesh, India. We determined the sample size using Rao software, considering a 95% confidence level and 5% margin of error, and therefore selected 250 staff nurses working in a selected hospital of Uttar Pradesh. Eligible nurses were informed about the study through departmental meetings and notice board announcements, and those willing to participate were approached in person and provided with detailed study information before obtaining written informed consent.

STUDY PROCEDURE

The study was commenced after getting approval from the administrative authority of the selected hospital and Ethics committee.

The purpose of the study was explained to participants, and written informed consent was taken. The sociodemographic details (age, gender, educational qualification, total working experience, area of work, designation, any special training attended related to HIS and any special training attended related to computer use) were collected through a semi structured questionnaire. The structured tool was developed by a researcher to assess the knowledge and barriers related to HIS among staff nurses, and was subjected to validation by a multidisciplinary panel comprising subject matter experts from Nursing, Healthcare and Pharmaceutical Management, Information Technology and Hospital Administration, who reviewed the content for relevance, clarity and adequacy in measuring the intended variables.

MAIN OUTCOMES

The main outcomes of this study were the assessment of the knowledge and to find out the barriers in maintaining Hospital Information System (HIS) among the staff nurses. For this purpose, the structured knowledge questionnaire was used to assess the knowledge of staff nurses in maintaining HIS among staff nurses and structured rating scale was used to find out the barriers in maintaining HIS among staff nurses. It is a valid and reliable tool, the content validity was established through expert validation by a multidisciplinary panel comprising subject matter experts from Nursing, Healthcare and Pharmaceutical Management, Information Technology and Hospital Administration, who reviewed the content for relevance, clarity and adequacy in measuring the intended variables. The reliability of tool was assessed using Cronbach's Alpha, yielding coefficients of 0.80 and 0.90 for the respective sections, indicating high internal consistency. Structured knowledge questionnaire that sought to gather information regarding knowledge of staff nurses comprised of 20 questions. Structured rating scale that sought to gather information regarding the barriers among staff nurses comprised of 30 questions. The scale was divided into 3 categories that is organizational barriers, hardware barriers and human barriers and scored on a liked scale of 0 to 4.

STATISTICAL ANALYSIS

We employed descriptive and inferential statics, such as frequency, percentage, mean and standard deviation to describe the socio demographic characteristics, knowledge of staff nurses and barriers regarding HIS among staff nurses. To find out the association between the barriers faced by staff nurses in maintaining Hospital Information System (HIS) with their selected demographic variables, Chi square / Fisher's Exact Test was used. The criteria for statical significance were set at $P < 0.05$. For the purpose of statical analysis, statical package for the social sciences (SPSS) 26.0 software was used.

STUDY VARIABLES

We selected the study variables based on previous researchers about factors associated with the HIS.

We considered the following socio demographic variables: age, gender, educational qualification, total working experience, area of work, designation, any special training attended related to HIS and any special training attended related to computer use

DATA COLLECTION

Method used for data collection in the study was through paper and pencil method and face to face interaction. For this, we employed Questionnaire for demographic profile. For assessing the knowledge and barriers of staff nurses a structured tool was used.

RESULTS

TABLE 1: FREQUENCY AND PERCENTAGE DISTRIBUTION OF SAMPLES AS PER THEIR DEMOGRAPHIC CHARACTERISTICS (AGE, GENDER, EDUCATIONAL QUALIFICATION, WORKING EXPERIENCE). N=250

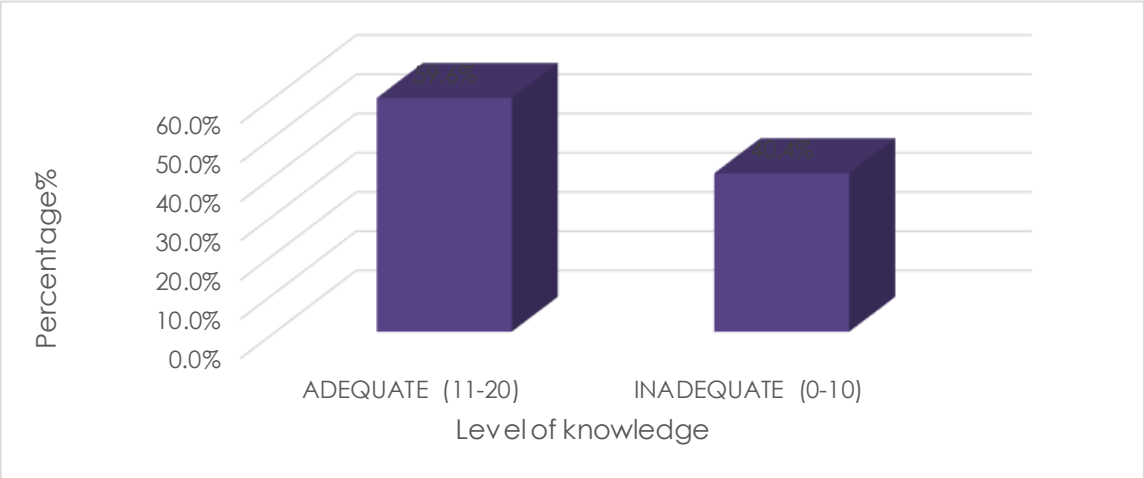
S. No.	Sample characteristics	Frequency (f)	Percentage (%)
1	**Age (in years)**		
	20-29	173	69.2
	30-39	39	15.6
	40-49	26	10.4
	≥ 50	12	4.8
2	**Gender**		
	Male	45	18
	Female	205	82
	Transgender	0	0
3	**Educational Qualification**		
	Diploma in Nursing	136	54.4
	Bachelor's Degree in Nursing	100	40
	Master's Degree in Nursing	12	4.8
	Others (ANM, etc.)	2	0.8
4	**Total working experience including previous organization in years**		
	1-5	157	62.8
	6-10	57	22.8
	More than 10	36	14.4
5	**Area of work**		
	Emergency Department	18	7.2
	ICU	36	14.4
	Medical surgical unit	76	30.4
	OPD	14	5.6
	Others (ortho, gynae, etc)	106	42.4
6	**Designation**		
	Nursing officer	216	86.4
	Ward in charge	34	13.6
	ANS/DNS	0	0
7	**Any special training attended related to HIS**		
	Yes		
	No	210	84
		40	16
8	**Any special training attended related to computer use**		
	Yes	210	84
	No	40	16

THE DEMOGRAPHIC DATA PRESENT IN TABLE 1 SHOWS:

Most of the respondents 173(69.2%) were in age group of 20-29 years. In relation to the educational qualification, most of the respondents i.e., 136(54.4%) were Diploma in Nursing. Regarding total working experience including previous organization, more than half of the respondents, 157(62.8%) had working experience of 1 -5 years.

Regarding areas of work, most of the respondents 106(42.4%) work in other areas that is orthopedics, gynecology etc. Regarding designation, majority of respondents 216(86.4%) are Nursing Officers. With regard to any special training attended related to HIS, majority of respondents 210(84%) have attended training related to HIS. With regard to any special training attended related to computer use, majority of respondents 210(84%) have received training related to computer use.

FIGURE 1: BAR DIAGRAM SHOWING THE PERCENTAGE DISTRIBUTION OF STAFF NURSES BY THEIR LEVEL OF KNOWLEDGE REGARDING HOSPITAL INFORMATION SYSTEM.



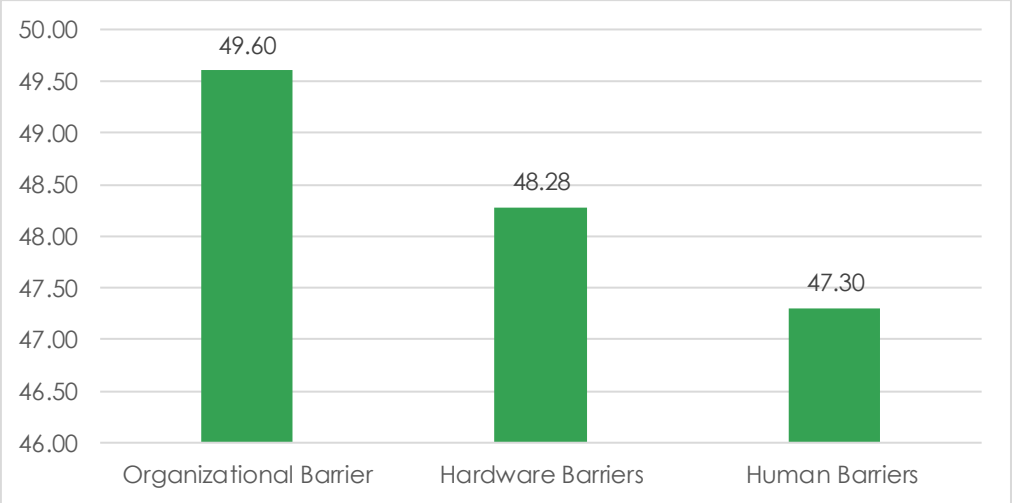
The data presented in Figure 1 shows that a large proportion of staff nurses 149(59.6%) had adequate knowledge and on the other hand, 101(40.4%) had inadequate knowledge regarding Hospital Information System.

TABLE 2: FREQUENCY, PERCENTAGE, MEAN, MEDIAN, STANDARD DEVIATION (S.D) AND RANGE OF OBTAINED SCORES OF STAFF NURSES N=250

Category of the barrier	Frequency (f)/ Percentage	Mean and (S.D)	Median	Range of obtained score
Major barrier	44 (17.6)	58.07 ± 20.48	59	2-100
Moderate Barrier	167 (66.8)			
Mild Barrier	39 (15.6)			
No Barrier	0			

The data presented in Table 2 shows that 167(66.8%) staff nurses experience moderate barriers, 44 (17.6%) experience major barriers, while 39 (15.6%) experience mild barriers. Notably, none of the participants experienced the absence of barriers 0(0.0%), with a mean score of 58.07 with median of 59. The score ranged from 2-100. The Standard Deviation (SD) was 20.48.

FIGURE 2: BAR DIAGRAM SHOWING MEAN PERCENTAGE DISTRIBUTION OF RANKING OF BARRIER CATEGORIES IN MAINTAINING HOSPITAL INFORMATION SYSTEM AMONG STAFF NURSES.



The data presented in Figure 2 reveals that 49.60% staff nurses face barriers related to Organization, 48.28% face related to Hardware and 47.30% face related to Human.

TABLE 3: ITEM WISE MEAN AND RANK ORDER OF ORGANIZATIONAL BARRIER, HARDWARE BARRIER AND HUMAN BARRIER AMONG STAFF NURSES N=250

Organizational Barrier	**Mean**	**Rank**
Limited time during shifts to update patient records on the system	2.388	I
Lack of time under clinical pressure	2.328	II
Lack of clarity in hospital information system policies and procedures	2.152	III
Lack of coordination between IT department and nursing staff	2.06	IV
Lack of proper training on hospital information system	2.024	V
Inadequate nursing staffing levels affecting the use of the system	1.968	VI
Poor communication regarding updates and changes to the system	1.92	VII
Inadequate feedback mechanism for reporting issues with the system	1.792	VIII
Lack for proper incentives for effectively using the system	1.68	IX
Insufficient technical support for system-related issues	1.528	X
Hardware Barrier	**Mean**	**Rank**
System downtime from hardware failure delaying patient care	2.204	I
Frequent interruptions in my work due to hardware issues (e.g., frozen screens, system crashes)	2.116	II
Insufficient system availability in the unit to maintain patient information efficiently	2.016	III
The hardware (e.g., barcode scanners, printers) frequently malfunctions during work hours	1.984	IV
Systems are often outdated and slow	1.936	V

The network connection often fails while accessing the Hospital Information System	1.912	VI
The current hardware setup is insufficient for the demands of the Hospital Information System	1.852	VII
Complex and difficult to use system interface	1.844	VIII
Difficulty of access to information	1.768	IX
The hospital does not provide adequate technical support for resolving hardware issues quickly	1.68	X
Human Barrier	**Mean**	**Rank**
Time consuming work with HIS	2.264	I
Difficulty in balancing clinical and HIS responsibilities	2.244	II
Reduced communication with other healthcare personnel	2.06	III
Lack of role clarity regarding HIS responsibilities	1.98	IV
Negative attitude of colleagues towards HIS	1.848	V
Uncertainty regarding the system's utility	1.832	VI
Lack of interest to work with computer	1.72	VII
Lack of sufficient skill for working with computer	1.712	VIII
Resistance to switching from manual to computerized systems	1.636	IX
Reduced communication with patients	1.624	X

The data in Table 3 shows that the topmost organizational barrier in maintaining Hospital Information System among staff nurses was limited time during shifts to update patient records on the system mean score (2.388), lowest organizational barrier in maintaining Hospital Information System among staff nurses was insufficient technical support for system-related mean score (1.528), and the topmost hardware barrier in maintaining Hospital Information System was system downtime from hardware failure delaying patient care mean score (2.024) and lowest hardware barrier in maintaining Hospital Information System among staff nurses was the hospital not providing adequate technical support for resolving hardware issues quickly mean score (1.68), the topmost human barrier in maintaining the Hospital Information System was time consuming work with HIS mean score (2.264) and lowest human barrier in maintaining Hospital Information System among staff nurses was the reduced communication with patients mean score (1.624).

TABLE 4: CHI SQUARE TEST/ FISHER'S EXACT TEST SHOWING ASSOCIATION BETWEEN THE BARRIERS IN MAINTAINING HOSPITAL INFORMATION SYSTEM AMONG STAFF NURSES WITH THEIR SELECTED DEMOGRAPHIC VARIABLES.

Demographic Data		Barriers Score			df	Chi square/ Fisher Exact Test	P value
Variables		**Major Barrier**	**Moderate Barrier**	**Minor Barrier**			
Age	20-29 years	32	119	22	6	7.311 (Fisher)	0.293
	30-39 years	9	22	8			
	40-49 years	2	17	7			
	≥ 50 years	1	9	2			
Gender	Male	10	25	10	2	3.248	0.197
	Female	34	142	29			
	Diploma in Nursing	28	88	20	6	4.628 (Fisher)	0.592

Educational Qualification	Bachelor's Degree in Nursing	15	70	15			
	Master's Degree in Nursing	1	8	3			
	Others	0	1	1			
Total Working Experience including previous organization in years	01 – 05	31	104	22	4	2.154	0.707
	06- 10	7	39	11			
	More than 10	6	24	6			
Area of work	Emergency Department	3	11	4	8	13.041 (Fisher)	0.110
	ICU	4	28	4			
	Medical Surgical Unit	14	57	5			
	OPD	1	10	3			
	Others	22	61	23			
Designation	Nursing Officer	40	143	33	2	0.952 (Fisher)	0.621
	Ward In charge	4	24	6			
Any special training attended related to HIS use	Yes	38	133	39	2	9.973	0.007*
	No	6	34	0			
Any special training attended related to computer use	Yes	38	133	39	2	9.973	0.007*
	No	6	34	0			

$p \leq 0.05$, significant *

The data in Table 4 shows that there was a significant association between the barriers in maintaining the Hospital Information System among staff nurses with variable any special training attended related to HIS use ($p= 0.007$) and any special training attended related to computer use ($p= 0.007$) as per $p \leq 0.05$ level of significance.

DISCUSSION

The present study assessed knowledge in maintaining Hospital Information System among staff nurses. The present study revealed that 59.6% of staff nurses had adequate knowledge. This suggests that more than half of the staff nurses possess sufficient level of knowledge on the Hospital Information System. On the other hand, 40.4% had inadequate knowledge, indicating that significant portion of sample subjects have limited knowledge regarding Hospital Information System.

The mean knowledge score of staff nurses were 11.00 with median of 11.00. The Standard Deviation was 3.72, reflecting moderate variability in knowledge levels. Consequently, the findings of the present study were consistent with the cross-sectional study findings conducted by Punita et. Al [5] conducted a study to evaluate the knowledge and attitudes of nursing staff toward the use of a Hospital Information System (HIS) in a specific tertiary care hospital in North India. A significant finding of the study was that fewer than half of the staff answered each question correctly regarding HIS usage.

The present study found that staff nurses experienced several barriers in maintaining Hospital Information System. The present study revealed that 66.8% of staff nurses experience moderate barriers, 17.6% experience major barriers, while 15.6% experience mild barriers. Notably, none of the participants experienced the no barriers 0(0.0%). It was noted that staff nurses face 49.60% barriers related to organization, 48.28% related to hardware barriers and 47.30% related to human barriers.

The staff nurses experience moderate barriers in maintaining Hospital Information System with a mean score of 58.07 with median of 59. The Standard Deviation (SD) was 20.48 indicates a significant variation in the responses and these findings are consistent with the findings of the previous research by Keshvari Mohammad. et. al [6] which aimed to explore the barriers for the use of Information Systems in a hospital. They found that the main challenges were organizational factors, hardware factors, and knowledge factors, where knowledge factor being the most important factor. The study showed that knowledge factors were the biggest obstacle to effectively using Information Systems.

Consistent to this study, a cross-sectional learning was conducted by Leila et. al [7] to investigate the challenges of using Information System from the nurse perspective They found that the most significant challenges were related to the human environment and human factors.

The present study also revealed the significant association between the barriers in maintaining a Hospital Information System among staff nurses with variables of any special training attended related to HIS use ($p= 0.007$) and any special training attended related to computer use ($p= 0.007$) as per $p \leq 0.05$ level of significance. There was no significant association of barriers in maintaining Hospital Information System among staff nurses with other variables (age, gender, educational qualification, total working experience including previous organization in years, area of work, and designation).

Consistent to this study, a cross-sectional study was conducted by Leila et.al [7] to investigate the challenges of using Information System from the nurse's perspective with the findings that there was no significant association between variables of participants (age, job, educational degree, work experience in the healthcare environment), but there was a significant association between experience with HIS and the mean score assigned to human challenges.

The findings of this study have meaningful implications for nursing leadership and hospital administrators. The identified barriers particularly those related to organizational and human factors- highlight the need for structural interventions. To enhance the effective use of Hospital Information Systems, managers should considers implementing structured and ongoing training programs for nursing staff, improving coordination between IT and nursing teams, and ensuring adequate technical support.

The findings of the present study are supported by other studies conducted in similar settings. A study by Keshwari et al. [6] in Iran reported that organizational and hardware issues were the main challenges in using HIS among healthcare professionals. Similarly, Ahmadian et al., [7] also from Iran, identified human- related and environmental barriers as key factors affecting HIS usage among nurses. These results align with the present study and show that such barriers are common in clinical settings beyond India.

In addition, a study conducted in Saudi Arabia by Alasmary et al. [8] reported that electronic health records were not well integrated into clinical practice, and poor communication existed between the IT departments and nursing teams. A study from Nigeria by Ogunyemi et al. [9] reported similar challenges, including lack of formal training, limited computer access, poor network infrastructure, and system design problems. A qualitative study from China by Zhou et al. [10] revealed that nurses experienced difficulty using the system, frequent errors, and fragmented information, which reduced their willingness to adopt HIS. These findings confirms that barriers in HIS implementation are not limited to India but are commonly reported in many countries.

IMPLICATIONS

- Provide ongoing HIS and computer training, encourage peer support, and promote feedback to improve system use. Nursing leaders should monitor HIS challenges and address them.
- Integrate practical HIS training and digital literacy in nursing programs, with strong collaboration between schools and hospitals.
- Include HIS training in orientation, assign mentors, monitor HIS use, and work with IT to enhance system usability.
- Conduct further studies on HIS challenges and its impact on patient care across varied settings.

LIMITATIONS

- The study was conducted in a single hospital, which may limit the generalizability of the findings to other healthcare settings, especially those with different resources, infrastructure, and HIS implementation maturity.
- The data collection process was time-consuming, as many nursing staff members were often engaged in patient care responsibilities or restricted by their shift schedules, which may have affected participation and response rates.
- Since the data was collected through self-reported measures, there is a possibility of recall bias or social desirability bias, which may have influenced the accuracy of responses.

RECOMMENDATIONS

Based on the findings, the following recommendations are offered for future research:

- The study used descriptive cross-sectional design, further the study can also be done incorporating qualitative components.
- The sample size of study was 250 so the study can also be conducted on a large population for better generalization and more diverse sample from multiple hospitals and healthcare settings.
- A qualitative study can be conducted on barriers and perception of nurses regarding HIS, including methods such as interviews or focus groups, to gain deeper insight into the specific barriers nurses face and their perceptions of HIS training and support.
- A study can also be done to explore how nurses' proficiency in using HIS impacts clinical decision-making, patient safety, and overall healthcare outcomes, providing evidence of the broader benefits of effective HIS use.
- A comparative study can be conducted to evaluate the differences in knowledge, barriers, and perceptions of HIS use among nursing staff across multiple hospitals.

CONCLUSION:

The study concluded that a large proportion of staff nurses had inadequate knowledge and faced barriers in maintaining Hospital Information System (HIS).

ETHICAL APPROVAL

The study was approved by the Jamia Hamdard Institutional Ethics Committee New Delhi with reference no 12/24 on 13/11/2024. We obtained informed consent in writing. This study followed established ethical guidelines for Medical Research involving Human subjects and the Helsinki declaration of 1975, as revised in 2008.

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Nil

CONFLICTS OF INTEREST

There is no conflict of interests.

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