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RESEARCH ARTICLE

# IMPROVING HEALTH SEEKING BEHAVIOUR FOR NON-COMMUNICABLE DISEASES IN SRI LANKA THROUGH HEALTH PROMOTION INTERVENTIONS

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## ABSTRACT

### OBJECTIVE:

We piloted evidence-based health promotion interventions to increase health seeking behaviour (HSB), as measured primarily by utilization of Healthy Lifestyle Centers (HLC). HLCs were introduced in Sri Lanka to increase screening of Non-Communicable Diseases (NCDs), but utilization has not met the pre-defined targets.

### DESIGN:

This case-control study involved: development and validation of a contextually adapted tool to assess HSB; examination of HSB for selected NCDs; co-design and delivery of interventions to promote HSB; and evaluation of how these interventions impacted proxy measures of HSB, such as HLC utilization. The HSB tool was developed based on the Health Belief Model (HBM) and validated by local experts. HSB was assessed using a survey involving 850 participants selected using multi-stage cluster sampling. Community-based and health-system interventions were developed through four focus group discussions (FGD). The impact evaluation was completed in study and control areas, with 85 individuals from each area selected through cluster-sampling.

### SETTING:

The intervention setting was the Kekanadura Medical Officer of Health (MOH) area and the control was Akuressa MOH area in Matara District, Sri Lanka

### MAIN OUTCOME MEASURES:

Pre-post survey results regarding HBM constructs, and awareness and utilization of HLCs, were conceptualised as proxy indicators of changes to HSB.

**RESULTS:**

Initially, only 46.5% of survey participants were aware of HLCs, 30.1% had ever visited a HLC and, of those, only 40.2% (n=102) were satisfied with HLC services. FGDs revealed lack of awareness, personal and service-related factors as common reasons for limited HLC utilization. Significant post-interventional improvements were identified regarding HLC utilization, but self-reported improvements to HBM constructs were not statistically significant.

**CONCLUSIONS:**

The structured, rigorous approach used in this study can be replicated in other resource-constrained settings to improve HSB, strengthen the identification and management of NCDs, and, in this way, reduce demand for curative services.

**KEYWORDS**

health seeking behaviour, health belief model, health promotion, outcome evaluation, mixed methods

## INTRODUCTION

Non-Communicable Diseases (NCDs) contribute to 74% of global deaths [1]. Almost one third of these deaths occur prematurely (between 30-69 years), with 85% occurring in Low- and Middle-Income Countries (LMICs) [1]. Reducing NCD rates is a major challenge for LMIC health systems, such as Sri Lanka.

The burden of NCDs in Sri Lanka is lower than the LMIC average (466.7 age-standardized mortality rate per 100,000 population compared to the 589–640.4 average in LMICs) [1], yet it remains a critical domestic health system challenge. Four major NCDs (cancers, cardiovascular diseases, chronic respiratory diseases, and diabetes) contributed to 24,507 deaths (56.2% of the total) and 791,519 hospital admissions (16.9% of the total) in government hospitals in 2020 [2]. Trend analysis indicates that achieving the 25x25[1] target [3] of a 25% reduction in premature mortality due to NCDs between 2010 and 2025 in Sri Lanka will be challenging [4].

The Sri Lankan Ministry of Health (MoH) implemented a large, national health reform in 2011, involving the creation of Healthy Lifestyle Centres (HLCs) in primary care settings to expand the screening of individuals for NCD risk factors [5]. Despite being well supported by the MoH, HLC screening from 2015 to 2019 revealed only 44.2% (n=3,914,509) of the cumulative target population screened [2]. These data indicate that increased HLC utilization may require new MoH approaches to better promote Health Seeking Behaviour (HSB).

HSB is defined as "any activity undertaken by individuals who perceive themselves to have a health problem or to be ill, for the purpose of finding an appropriate remedy" [6]. A widely used model to explain HSB is the "Health Belief Model" (HBM). The HBM proposes that a person's identified health behaviour is influenced by two major factors: The degree to which the disease (negative outcome) is perceived by the person as threatening to their health, and the degree to which the health behaviour is believed to be effective in reducing the risk of a negative health outcome [7].

The HBM has been widely used to assess HSB for different conditions in many national settings [8-12]. Compared to other models, the HBM constructs represent influential and comprehensive elements that have the ability to describe preventive behaviours [8, 12]. The levels of constructs of HBM provide guidance that can help to predict the effectiveness of interventions aiming to increase HSB [10]. However, a systematic review by Anuar et al. (2020) reported that there is only limited evidence for improving HSB by using HBM [8], and a meta-analysis by Carpenter (2010) mentioned that there is limited evidence, especially from LMICs, to predict the effectiveness of HSB using HBM variables [13].

1 WHO member states committed to reduce mortality from four major NCDs in people aged 30–70 years by 25% relative to their rates in 2010, by 2025 at a UN High-Level Meeting in 2011

Therefore, drawing from the above models and concepts, this study aimed to examine existing rates of HSB in one region of Sri Lanka, then co-design and pilot a package of evidence-based health promotion interventions (based upon the HBM) to evaluate their outcome on HSB proxy measures, including HLC utilization rates.

## METHODS

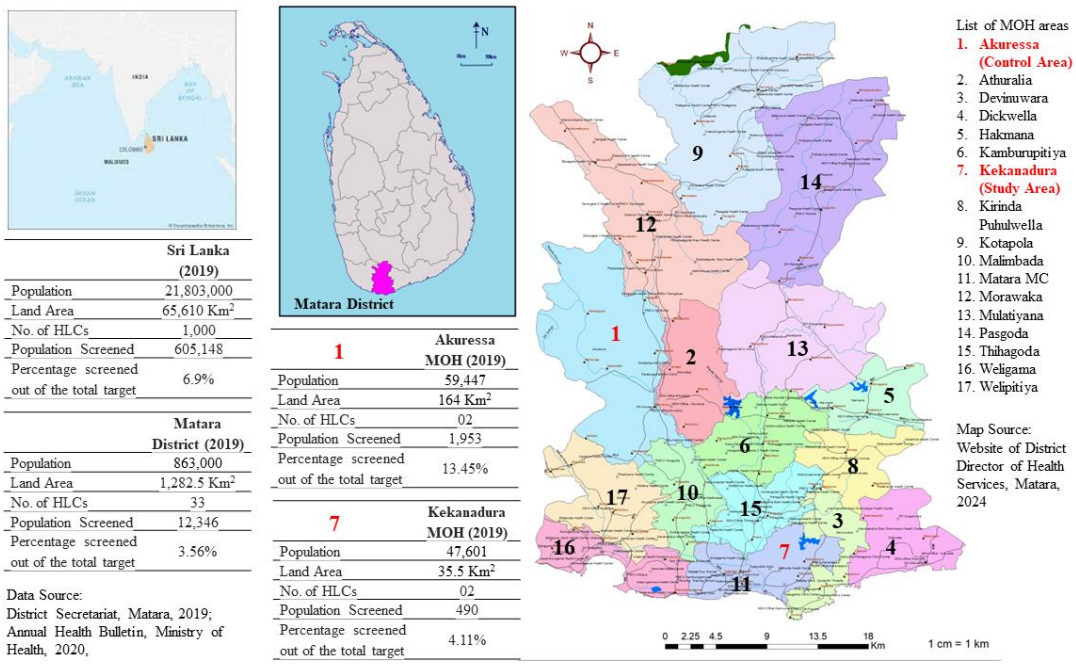
### STUDY DESIGN

A case-control design was undertaken, utilizing a mixed method approach. This was considered suitable for the design and evaluation of this type of complex, multi-phase, multi-component intervention [14-16].

### STUDY SETTING

The intervention setting was the Kekanadura Medical Officer of Health (MOH) area, and the control was the Akuressa MOH area in Matara District. Matara is one of the 24 administrative districts in Sri Lanka, and the primary care services are managed by the District Director of Health Services (DDHS). Kekanadura and Akuressa are two of the 17 MOH areas in Matara District, and have similar contextual factors in terms of demographic, ethnicity, and educational attainment, but are geographically placed distantly (40 Kms.), thus minimising the spill-over effect (Figure 1). MOH area is the lowest preventive health structure in Sri Lanka, which caters to approximately 60,000 population [2].

**FIGURE 1: LOCATION AND COMPARISON OF STUDY AREA WITH SRI LANKA, MATARA DISTRICT AND CONTROL AREA**




| | Sri Lanka (2019) |
|---|---|
| Population | 21,803,000 |
| Land Area | 65,610 Km$^2$ |
| No. of HLCs | 1,000 |
| Population Screened | 605,148 |
| Percentage screened out of the total target | 6.9% |

| | Matara District (2019) |
|---|---|
| Population | 863,000 |
| Land Area | 1,282.5 Km$^2$ |
| No. of HLCs | 33 |
| Population Screened | 12,346 |
| Percentage screened out of the total target | 3.56% |

Data Source:
District Secretariat, Matara, 2019;
Annual Health Bulletin, Ministry of Health, 2020,

| 1 | Akuressa MOH (2019) |
|---|---|
| Population | 59,447 |
| Land Area | 164 Km$^2$ |
| No. of HLCs | 02 |
| Population Screened | 1,953 |
| Percentage screened out of the total target | 13.45% |

| 7 | Kekanadura MOH (2019) |
|---|---|
| Population | 47,601 |
| Land Area | 35.5 Km$^2$ |
| No. of HLCs | 02 |
| Population Screened | 490 |
| Percentage screened out of the total target | 4.11% |

### INITIAL ASSESSMENT

An interviewer-administered questionnaire (IAQ) was developed based on the HBM, which was validated through key informant interviews (KII) followed by a focus group discussion (FGD) with a purposively selected panel of experts. These experts included two medical administrators, two public health specialists, a family physician, three primary care medical officers and a public health nursing sister. The IAQ was pre-tested among 20 persons in the Kirinda Puhulwella MOH area (outside the study and control areas).

The study population consisted of persons above 35 years of age who lived in the Kekanadura MOH area, as permanent residents for more than one year before the date of data collection. Sample size was calculated using the formula for estimating a population proportion with specified absolute precision [17], and the required sample was 425, allowing for

a 90% response rate. As cluster randomized sampling was used, this number was doubled to obtain the sample size of 850, to minimize the effect due to 'clustering' (design effect). A Grama Niladari Division (GND), which is the lowest administrative level in Sri Lanka, was taken as the Primary Sampling Unit (PSU). Sixty-two (62) subjects from each PSU were randomly selected from 18 GNDs, out of a total of 66 GNDs in the Kekanadura MOH area. Six trained research assistants collected data in September and October 2019.

## CO-DESIGN OF INTERVENTIONS

The views of stakeholders were gathered through four FGDs to design the interventions, which were conducted based on the findings of the IAQ survey. Two FGDs were conducted with the Members of the "Mothers' Support Group" [2], because of their experience working as volunteer health workers in the community. Field-level workers were chosen for another FGD as they play a significant role in delivering health care for NCDs. For the last FGD, a group of males were selected as low male participation was already identified as an important issue. Data were thematically analysed (18) by the first author using Microsoft Excel and a coding framework developed on the basis of the IAQ survey results, which was then validated by the co-authors. Design of the interventions was supplemented by IAQ results. This consultative approach to intervention development aimed to maximise the likelihood of effectiveness and sustainability.

## IMPLEMENTATION OF INTERVENTIONS

Multiple community-based health promotion interventions were identified by the FGD participants to address complex lifestyle modifications to alleviate risk factors in relation to HBM constructs [9]. Health-system interventions were required to improve access to NCD screening at HLCs. The interventions were implemented by the principal investigator, supported by two experts at Kekanadura MOH (Table 1). Standard and routine programmes were implemented at the Akuressa MOH (Control).

**TABLE 1: SUMMARY OF HEALTH-SYSTEM AND COMMUNITY BASED INTERVENTIONS**

| | Target audience | Intervention |
|---|---|---|
| | **Community Based Health Promotion Interventions** | |
| 1. | Community leaders, including government officials and field officers | Conduct an advocacy-type lecture, discussion |
| 2. | Medical Officer of Health, Medical Officer in charge of HLC, Public Health Inspectors, Public Health Midwives, Mothers' Support Group Members | Conduct an advocacy-type lecture, discussion Program |
| 3. | Students at Nursing Training School Matara | Conducting advocacy-type lectures, discussion programs |
| 4. | School-based interventions | Conducting lecture discussion programmes targeting school children |
| 5 | General public | Distribution of Brochures through Field Health Staff (PHI, PHM), community leaders, Government Officers and field officers |
| 6. | General public | Displaying posters in public places (MOH Office, Offices of PHI, PHM, Grama Niladari Field Officers and Temples |
| 7. | General public | Conducting lecture, discussion series with the participation of PHM, Field Officers of Save the Children and Mothers support groups |

[2] Mothers Support Group is a group of mothers, who have children under the age of five and engaged in a supportive role as volunteers for the public health midwife, at the community level

| | Target audience | Intervention |
|---|---|---|
| 8. | General public | Conducting discussion series with the support of Nursing students at Nursing school, Matara and area PHMs and Mothers support Groups (Brochure and poster) |
| | **Health System Interventions** | |
| 9 | General public | Conducting outreach programs – With the support of MOH in the field outreach programs were conducted in identified places |
| 10 | General public | Improvement of Diagnosis facility in HLCs – Provision of cholesterol checking facility in HLCs (Cholesterol strips were provided) |
| 11 | General public | Quality improvement in clinics – Infrastructure improvements (improving seating facilities, sanitary facilities etc.) in HLC, and strengthening of quality and productivity |
| 12 | Medical Officer of Health, Medical Officer in charge of HLC, Public Health Inspectors, Public Health Midwives, Mothers' Support Group Members | Strengthen health education activities – Health education materials were developed and distributed based on SLDRISK risk tool (19). Health staff and volunteers were trained. |
| 13 | Medical Officer of Health, Medical Officer in charge of HLC, Public Health Inspectors, Public Health Midwives, Mothers' Support Group Members | Use of Risk Tool for Diabetes Risk Assessment - Risk assessment tool was designed based on SLDRISK (19) and distributed. Health staff and volunteers were trained on risk assessment using the tool. |

(PHI – Public Health Inspector; PHM – Public Health Midwife; SLDRISK – Sri Lankan Diabetes Risk Score)

### OUTCOME EVALUATION

Post-implementation evaluation was undertaken after three months using the same IAQ, in Kekanadura and Akuressa. Three months was selected for follow up period for two reasons: first, prior research has reported this as being sufficient for a health educational intervention to impart a statistically significant behavioural change [20]; second, this was the maximum period that could be supported in this study due to financial and human resource constraints. The required sample size was calculated using Lwanga & Lemeshow, (1991) formula [17], considering that this intervention package was intended to increase the proportion of HLC coverage to 15%, from 2%, which was the HLC coverage of the first quarter of 2019 in Kekanadura. The required sample size was 82, and three GN Divisions from both MOH areas were randomly selected, with 30 participants from each Division.

Pre- and post-interventional quantitative data were analysed using descriptive statistics including means, standard deviations (SD) and proportions. Z test for proportions was used to elicit statistical significance.

Ethical approval was obtained from the Postgraduate Institute of Medicine, University of Colombo (ERC/PGIM/2019/149).

## RESULTS

The specific results of each study phase are reported separately below (initial assessment, co-design and implementation of interventions, outcome evaluation).

### INITIAL ASSESSMENT

A total of 838 out of 850 (non-response rate=1.4%) participants responded. Mean age was 43.14 years (+/-SD=10.17). Among the study participants, 46.5% (n=390) were aware of HLCs. Only 30.1% (n=252) of participants had visited a HLC, and out of those, 40.2% (n=102) were satisfied with the service. Mean distance to the nearest HLC from home was 4.41 km

(SD +/- 4.87). Socio-demographic characteristics are illustrated in Table 2 and the distribution of risk factors is depicted in Table 3.

**TABLE 2: SOCIO-DEMOGRAPHIC AND DISEASE RELATED CHARACTERISTICS OF THE PRE-INTERVENTIONAL STUDY POPULATION IN KEKANADURA MOH AREA**

| Characteristic | Frequency (n=838) | Percentage (%) |
|---|---|---|
| **Gender** | | |
| Male | 206 | 24.6 |
| Female | 632 | 75.4 |
| **Highest educational status** | | |
| No Schooling | 6 | 0.7 |
| Up to Primary Education | 48 | 5.7 |
| Passed Primary Education | 60 | 7.2 |
| Up to Secondary Education | 96 | 11.5 |
| Passed Ordinary Level | 352 | 42.0 |
| Passed Advanced Level | 214 | 25.5 |
| Higher education | 38 | 4.5 |
| Vocational training | 2 | 0.2 |
| Missing | 24 | 2.9 |
| **Literacy level** | | |
| Can read complete sentence | 744 | 88.8 |
| Can read a partial sentence | 8 | 1.0 |
| Unable to read | 6 | 0.7 |
| Missing | 80 | 9.5 |
| **Employment status** | | |
| Permanent Government | 64 | 7.6 |
| Permanent Private | 18 | 2.1 |
| Non-permanent Private | 60 | 7.2 |
| Self Employed | 28 | 3.3 |
| Daily Paid Casual | 26 | 3.1 |
| Not employed | 623 | 74.3 |
| Other | 19 | 2.3 |
| **Individual monthly income (SLR)** | | |
| Less than Rs. 20000 | 394 | 47.0 |
| Rs. 20001 – 40000 | 155 | 18.5 |
| Rs. 40001 - 60000 | 69 | 8.2 |
| More than Rs. 60000 | 9 | 1.1 |
| Not mentioned | 55 | 6.6 |
| No income | 156 | 18.6 |
| **Family income (SLR)** | | |
| Less than Rs. 20000 | 182 | 21.7 |
| Rs. 20001 – 40000 | 265 | 31.6 |
| Rs. 40001 - 60000 | 252 | 30.1 |
| More than Rs. 60000 | 93 | 11.1 |
| Not mentioned | 43 | 5.1 |
| No income | 3 | 0.4 |
| **Number of members in the family** | | |

| Characteristic | Frequency (n=838) | Percentage (%) |
|---|---|---|
| 1 | 4 | 0.5 |
| 2 | 38 | 4.5 |
| 3 | 108 | 12.9 |
| 4 | 276 | 32.9 |
| 5 | 234 | 27.9 |
| 6 | 120 | 14.3 |
| Missing | 58 | 7.0 |
| **Number of dependents** | | |
| 1 | 176 | 21.0 |
| 2 | 332 | 39.6 |
| 3 | 178 | 21.2 |
| Missing | 152 | 18.2 |

SLR = Sri Lankan Rupees (1 USD approximately equals to 180 SLR in 2019)

| Characteristic/Disease | Frequency (n=838) | Percentage (%) | Mean duration with SD (in years) |
|---|---|---|---|
| **No. of participants with** | | | |
| Diabetes | 56 | 6.7 | 5.37 (4.19) |
| Hypertension | 50 | 6.0 | 4.33 (3.81) |
| Hypercholesterolemia | 34 | 4.1 | 3.83 (2.94) |
| Ischemic Heart Diseases | 6 | 0.7 | 2.0 (0.0) |
| Cerebrovascular Diseases | 4 | 0.5 | NR |
| Renal Failure | 2 | 0.2 | NR |
| Cancer | 4 | 0.5 | NR |
| No reported NCD | 682 | 81.38 | NR |
| **No. of participants with a family member having** | | | |
| Diabetes | 192 | 22.9 | 7.94 (6.66) |
| Hypertension | 196 | 23.4 | 8.12 (7.55) |
| Hypercholesterolemia | 118 | 14.1 | 7.59 (6.2) |
| Ischemic Heart Diseases | 66 | 7.9 | NR |
| Cerebrovascular Diseases | 18 | 2.1 | NR |
| Renal Failure | 18 | 2.1 | NR |
| Cancers | 50 | 6.0 | NR |
| **No. of participants who reported death of a family member due to NCD** | | | |
| No deaths | 744 | 88.8 | NR |
| One member | 74 | 8.8 | NR |
| Two members | 20 | 2.4 | NR |

NR = Not Recorded

**TABLE 3: DISTRIBUTION OF RISK FACTORS OF NCD'S AMONG THE STUDY POPULATION**

| | Smoking n=206 (%) (only Male) [3] | Alcohol usage n=206 (%) (Only Male) [4] | Betel chewing n=838 (%) | Engage in Exercises [5] n=838 (%) | Consume fatty food at home. n=838 (%) | Consume fatty food from outside. n=838 (%) |
|---|---|---|---|---|---|---|
| Daily | 24 (11.7) | 16 (7.86) | 70 (8.4) | 261 (31.1) | 282 (33.7) | 106 (12.6) |
| Few times a Week | 8 (3.9) | 24 (11.7) | 74 (8.8) | 227 (27.1) | 288 (34.4) | 327 (39.0) |
| Occasional | 12 (5.8) | 12 (5.8) | 95 (11.3) | 271 (32.3) | 166 (19.8) | 197 (23.5) |
| No | 155 (75.2) | 150 (72.8) | 588 (70.2) | 72 (8.6) | 100 (11.9) | 199 (23.7) |
| Missing | 7 (3.4) | 4 (1.9) | 11 (1.3) | 7 (0.8) | 2 (0.2) | 9 (1.1) |

### *Perceived Susceptibility*

Most participants believed their chances of acquiring a NCD was not high (54.3%, n=455), and that their level of physical health made it unlikely in the future NCD (64.6%, n=541). Additionally, 30.8% believed their risk of a NCD in the future was not high, with 87.0% (n=729) also unconcerned about of the consequences of acquiring a NCD.

### *Perceived Seriousness*

Most participants reported that the "thought of NCDs" didn't scare them (85.4%, n=716), and thinking of NCD didn't make them uncomfortable (77.1%, n=646). Few (29.4%, n=246) believed that their career would be endangered, if they acquired a NCD. Only one third (32.5%, n=272) mentioned that they become anxious when thinking of NCDs, and only 6.1% (n=51) thought that a NCD might endanger their relationships. Conversely, 56.6% (n=474) thought that their financial security would be endangered if they acquired a NCD.

### *Perceived Benefits*

Somewhat at odds to the above results, most participants (90.0%, n=754) believed future problems could be prevented by screening for NCDs. Most (89.7%, n=752) mentioned it was more likely that a NCD would be discovered by chance through an emergency admission if they have not participated in screening, and 88.8% (n = 744) noted that, screening would help in finding hidden diseases.

### *Perceived Barriers*

A minority of participants identified barriers for regular screening for NCDs, including a painful process 5.0% (n=42), time-consuming 2.4% (n=20), embarrassing, 5.7% (n=48), and interfere with their routine activities 10.5% (n=88). It was interesting to note that 30.3% (n=254) reported that undergoing regular screening would require starting a new habit, and 4.5% (n=38) were concerned that they would not be able to complete regular screening.

### *Motivations*

In relation to motivational factors, most participants reported that they consume a well-balanced diet to enhance health (72.6%, n=608). Similarly, 71.4% (n=598) declared that they frequently practice "healthy habits". It was interesting to note that 74.2% (n=622) acknowledged that they always follow medical advice, because they believe it will benefit their health. However, only 30.7% (n=257) mentioned that they practice the routine yearly physical examinations in addition to visits to

[3] No females mentioned that they ever smoked.

[4] Only two females mentioned that they take alcohol occasionally

[5] Engage in exercise is a protective factor

a medical practitioner during an illness, and only 10.7% (n=90) reported undertaking physical exercises regularly (at least three times a week).

## CO-DESIGN AND IMPLEMENTATION OF INTERVENTIONS

Results of the pre-interventional assessment from the IAQ were analysed to determine positive and negative factors for HSB, with a special emphasis on seeking services for NCDs from HLCs. A summary of findings and their implications for developing strategies to promote HSB are presented in Table 4.

**TABLE 4: SUMMARY OF FINDINGS OF THE SOCIO DEMOGRAPHIC AND HBM STUDY AND THEIR IMPLICATIONS IN CO-DESIGNING OF INTERVENTIONS TO PROMOTE HEALTH SEEKING BEHAVIOUR.**

| | Findings of the study | Influence on HSB / Themes emerged from HBM | Implication in designing strategies |
|---|---|---|---|
| | **Study Based on Socio-Demographic Data** | | |
| 1 | Almost all the participants were Sinhala Buddhists | Cultural adaptation should be done accordingly in designing strategies. | Irritating, sensitive, and antagonizing messages to the existing context should not be included |
| 2 | Having a satisfactory level of education (> 80% of the participants had secondary education or above). | It Means, there is a positive factor to improve HSB | It can adjust general messages according to that level |
| 3 | Known prevalence of NCD's (detected so far) is lower than national figures | It Means, the study population seems to be healthier or selection bias | Need to further strengthen the situation. |
| 4 | Mean duration of having the disease is lower (knowledge of having the disease). | It Means, there is a possibility of a high proportion of late detection | Need to stress the importance of early detection and its benefits |
| 5 | There is a HLC in the proximity. | Positive factor to attract population | Need to mention in promotional messages that 'It's within your proximity' |
| 6 | A convenient method of public transport is not available at the location of HLC | Accessibility and availability of easy transport are two important factors to ensure. Yet, it needs to be fulfilled by other sectors | Need to discuss with relevant authorities and take necessary action, like starting new/extra bus services and necessary road development. or conduct out-reach clinics |
| 7 | Many people referred to multiple methods of media in seeking information. Television was the information source, which was exposed by the majority, and only a few referred to the internet. | Understanding the habit of media use is important in changing HSB | Since television is regarded as the most used method (though it's out of the scope of this study), can make a recommendation to relevant authorities to advocate television channels to pay more attention on delivering health messages in an accurate and reliable way and to guide them on referring to correct sources |

| | Findings of the study | Influence on HSB / Themes emerged from HBM | Implication in designing strategies |
|---|---|---|---|
| 8 | The most preferred method of acquiring information pertaining to health and diseases was by health professionals, and mainly by Western medical doctors, both in government and private sector. There were very few who relied on information given by doctors in other systems | Understanding the habit of health information seeking is important in changing HSB | This is a positive factor which can be capitalized. Authorities should create more opportunities (time and resources) to allow health professionals to deliver health messages in hospital settings. Promoting delivery of NCD messages through health professionals in other systems should be reviewed and ensure a supplementary approach. |
| | **Study Based on HBM** | | |
| 1 | • 'NCD didn't scare them.'<br>• 'Not afraid to think of NCDs. | **Not feeling fear of NCD's**<br>This is a negative theme and important in understanding their view and how to challenge that | Need to stress the devastating consequences of NCDs (secondary complications). In addition to that, the asymptomatic nature at the early stage of the disease should be highlighted. |
| 2 | • 'Didn't worry about their risk of getting an NCD.<br>• 'Didn't believe that NCD is a hopeless disease.' | **Not worrying about NCD's**<br>This is a negative theme and important in understanding their view and how to challenge that | It is needed to stress the social and domestic consequences of NCDs to self or a family member. Financial consequences of NCDs can be used to gain attention, as majority expressed that 'their financial security will be endangered' if they get a NCD |
| 3 | • 'Their chances of getting an NCD is not high.'<br>• 'Their physical health makes it unlikely to cause an NCD'<br>• 'Within next year they will not get an NCD' | **Not perceiving the susceptibility of NCD**<br>This is a negative theme and important in understanding their view and how to make them realize the individual risk. | It is needed to provide current statistics (prevalence) in a simple way and highlight the trends in Sri Lanka to make them realize the individual susceptibility using the risk tool i.e. Sri Lanka Diabetes Risk Score (SLDRISK) (19) |
| 4 | • 'Screening for NCDs will prevent future problems for them.'<br>• 'Can gain a lot by screening for NCDs' | **Knowing the importance of screening**<br>This is a positive theme. It can be used to capitalize the HSB. | It can be used the perception of benefits; they can gain as promotional content |
| 5 | • 'By regular screening for NCDs, they may find a disease before it is discovered by | **Knowing the importance of early screening**<br>This is a positive theme. It can be used to capitalize the HSB. | It can use the perception of benefits; they can gain as promotional content. |

| | Findings of the study | Influence on HSB / Themes emerged from HBM | Implication in designing strategies |
|---|---|---|---|
| | emergency hospital admission. | | |
| 6 | • 'Screening will help in finding hidden diseases' | **Knowing the asymptomatic nature of NCDs**<br><br>This is a positive theme and can be used in designing appropriate health messages. | It is needed to include these facts in developing health messages |
| 7 | • 'It's not a painful process'.<br>• 'It's not a time-consuming process. '<br>• 'To follow NCD screening regularly, they don't have to give up certain things in their lives'.<br>• 'It will not interfere their routine activities' | **Undergoing NCD screening is not a difficult and unwieldy process.**<br><br>This is a positive theme, as people find that it's not a painful or a time-consuming process. | It can be capitalized in the promotional process. |
| 8 | • 'It's an embarrassing thing to go for NCD screening.'<br>• 'Family or society will not make fun of them if they do regular screening' | **There is no related stigma for NCD screening.**<br><br>This is a positive theme and direct us to widen the promotion. | It can be included in more target groups. |
| 9 | • 'Undergoing regular screening would require starting a new habit, which is not difficult.<br>• 'Can continue to do regular screening if starts | **Inculcating the habit of regular NCD screening is not difficult.**<br><br>This is a positive theme, and there is a possibility of making it a trend. | Social marketing strategies can be used to make it as a trend. The Branding would be a better option. |
| 10 | • 'They always follow medical advice because they believe that it will benefit their health.'<br>• 'Like to search for new information related to their health' | **Readiness to accept medical advice and knowing it has a value.**<br><br>This is a positive theme and suggests that, community is enthusiastic for health information. | It is important to make accurate health information available for the community. |
| 11 | • 'Only a small proportion undergo regular physical examination.'<br>• 'Only a small proportion undergo regular oral examination.' | **People are not undergoing regular physical and dental examinations.**<br><br>This is a negative theme and tells us that though they understand the importance of screening and have an interest in medical | It is needed to find mechanisms to transform good perceptions and attitudes to correct health practices. |

| | Findings of the study | Influence on HSB / Themes emerged from HBM | Implication in designing strategies |
|---|---|---|---|
| | | information, they are not practicing it | |

Perceptions from the FGDs informed the design of the interventions. Most of the participants from Mothers' Support Groups knew about NCDs, but some did not know about HLCs. The reasons for low participation were difficult to inculcate screening as a habit, and not being afraid of diseases such as diabetes and hypertension, and were reported to be due to poor awareness and health-system related factors. Overall the generated themes are categorized and illustrated in Table 5.

**TABLE 5: GENERATED MAIN THEMES, SUB-THEMES, AND PROPOSED STRATEGIES DURING FGDS FOR CO-DESIGNING OF INTERVENTIONS**

| Main Theme I | Main Theme II | Main Theme III |
|---|---|---|
| Perceptions on<br>• Reasons for the low participation of HLC | Perceptions on<br>• "Why people think screening is a difficult habit to inculcate".<br>• "Lack of motivation for screening" | Perceptions on<br>• "Not thinking I will not be getting any Diabetes and Hypertension".<br>• "Not being afraid of Diabetes and Hypertension, with opposite perception to Cancer, Stroke and Heart attack |
| **Sub Themes** | **Sub Themes** | **Sub Themes** |
| a. Lack of awareness<br>b. Not taking diseases seriously or not afraid of the diseases<br>c. Lack of time due to the busy schedules of people or the need for a lot of time to attend the clinic.<br>d. Lack of motivation | a. People do not think that they will get the disease when they are healthy.<br>b. Personal factors, Stigma, economic factors, and a busy schedule.<br>c. People do not like to have long term treatment or behavioural changes for NCD.<br>d. System / service-related factors | a. Poor knowledge of diseases – thinking these diseases are inherited, do not know the pre symptoms and complications.<br>b. Disease related factors – Cost, Quality of life<br>c. Service factors – Non availability of screening for cancers. |
| **Proposed Strategies** | **Proposed Strategies** | **Proposed Strategies** |
| a. Conduct awareness programs<br>b. Provision of incentives<br>c. Improve access to screening at the local level<br>d. Checking cholesterol<br>e. Reducing the time spent at the HLC<br>f. Improve attitudes for NCD screening by health staff | a. Implement innovative strategies to increase awareness<br>b. Provide cholesterol testing facility and other incentives<br>c. Strategies to increase male participation<br>d. Increase coordination between the curative and preventive sector, and other non-health sectors | a. Improving awareness of complications<br>b. Having a screening tool for NCD<br>c. Improving awareness and publication of results of screening at HLC |

| | | |
|---|---|---|
| g. Participation of volunteer groups<br>h. Engagement of health staff augmented by volunteer groups | | |

Based on these findings, a package of community-based, health promotion, and health-system interventions, were implemented in the study setting, as outlined in Table 1.

## OUTCOME EVALUATION

Socio-demographic characteristics of the post-interventional participants in the study and control settings were not statistically significant (p >0.05). (Table 6).

**TABLE 6: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE PRE- AND POST-INTERVENTIONAL STUDY POPULATION IN KEKANADURA AND AKURESSA MOH AREAS**

| **Characteristic** | **Kekanadura MOH area (n = 80)** | | **Akuressa MOH area (n = 78)** | |
|---|---|---|---|---|
| Mean Age | 42.25 | | 39.85 | |
| | **No** | **%** | **No** | **%** |
| **Gender** | | | | |
| Male | 21 | 25.7 | 23 | 29.5 |
| Female | 59 | 74.3 | 55 | 70.5 |
| **Education status** | | | | |
| No schooling | 1 | 1.3 | 2 | 2.6 |
| Up to Primary Education | 4 | 5.0 | 2 | 2.6 |
| Passed Primary Education | 5 | 6.3 | 8 | 10.3 |
| Up to Secondary Education | 8 | 10.0 | 13 | 16.7 |
| Passed O/L | 36 | 45.0 | 34 | 43.6 |
| Passed A/L | 22 | 27.5 | 15 | 19.2 |
| Higher education | 4 | 5.0 | 3 | 3.8 |
| Missing | 0 | 0.0 | 1 | 1.3 |
| **Occupational status** | | | | |
| Permanent Government | 5 | 6.3 | 3 | 3.8 |
| Permanent Private | 2 | 2.5 | 3 | 3.8 |
| Non-permanent Private | 6 | 7.5 | 9 | 11.5 |
| Self Employed | 3 | 3.8 | 2 | 2.6 |
| Daily Paid Casual | 2 | 2.5 | 4 | 5.1 |
| Not employed | 61 | 76.3 | 55 | 70.5 |
| Other | 1 | 1.25 | 0 | 0.0 |
| **Individual income (SLR)** | | | | |
| Less than Rs. 20000 | 41 | 51.3 | 45 | 57.7 |
| Rs. 20001 – 40000 | 19 | 23.6 | 21 | 26.9 |
| Rs. 40001 - 60000 | 5 | 6.3 | 3 | 3.8 |
| More than Rs. 60000 | 2 | 2.5 | 1 | 1.3 |
| Not mentioned | 7 | 8.8 | 1 | 1.3 |
| No income | 6 | 6.3 | 7 | 9.0 |

SLR = Sri Lankan Rupees (1 USD approximately equals to 180 SLR in 2019)

There were no statistically significant differences in risk factors between pre- and post-intervention periods, except for engaging in physical activities in the study area. However, there were significant improvements in all HLC utilization parameters between pre- and post-intervention periods in the study setting, but only female HLC participation was improved significantly in the control setting (Table 7).

**TABLE 7: OUTCOME EVALUATION BETWEEN PRE- AND POST-INTERVENTION PERIODS IN STUDY AND CONTROL SETTINGS IN RELATION TO RISK FACTORS AND HLC UTILIZATION PARAMETERS.**

| Risk Factor / HLC Utilization Parameter | Kekanadura MOH (Study) | | | Akuressa MOH (Control) | | |
|---|---|---|---|---|---|---|
| | Pre- | Post- | z Value * (Significance) | Pre- | Post- | z Value * (Significance) |
| Smoking | 22 | 23 | z = -0.17 (p = 0.85) | 19 | 17 | z = 0.39, (p = 0.70) |
| Alcohol | 26 | 22 | z = 0.69, (p = 0.50) | 30 | 30 | z = 0.0, (p = 1.0) |
| Betel Chewing | 29 | 27 | z = 0.33, (p = 0.74) | 34 | 35 | z = -0.16, (p = 0.87) |
| Physical Activities | 40 | 76 | **z = -6.37, (p = <0.001)** | 38 | 37 | z = 0.16, (p = 0.87) |
| Fatty food consumption | 34 | 26 | z = 1.3, (p = 0.20) | 30 | 28 | z = 0.32, (p = 0.74) |
| Heard about HLC | 41 | 85 | **z = - 8.50, (p = <0.001)** | 37 | 38 | z = -0.16, (p = 0.87) |
| Knows the difference of HLC and hospital | 26 | 50 | **z = - 3.80, (p = 0.001)** | 20 | 18 | z = 0.39, (p = 0.70) |
| Visited HLC | 28 | 65 | **z = - 5.90, (p = <0.001)** | 39 | 45 | z = -0.96, (p = 0.34) |
| Satisfied with HLC | 42 | 55 | **z = - 2.10, (p = 0.04)** | 38 | 43 | z = -0.80, (p = 0.42) |
| Percentage screened | 1.02% | 3.00% | **z = -10.85, (p=<0.001)** | 3.36% | 3.72% | z = -1.65, (p=0.99) |
| Male Participation | 0.33% | 0.52% | **z = -2.28, (p=0.02)** | 1.1% | 0.82% | z = 2.47, ** (p=0.01) |
| Female Participation | 0.69% | 2.47% | **z = -11.04, (p=<0.001)** | 2.26% | 2.89% | **z = -3.41, (p=0.001)** |

* Significance was calculated using the z-score test for two population proportions

** There was a reduction in male participants, despite the significant difference

Pre- and post- analysis of constructs of HBM indicated that 16 out of 47 statements (Perceived susceptibility - 2/6; Perceived Seriousness – 5/12; Perceived Benefits – 0/5; Perceived Barriers 8/16; Motivation 1/8) were statistically significant between pre- and post-intervention periods in the study setting (Figure 2), but none of the statements in the control setting showed significant differences.

FIGURE 2: SIGNIFICANT STATEMENTS IN HEALTH BELIEF MODEL CONSTRUCTS BETWEEN PRE- AND POST INTERVENTION

**Perceived Susceptibility**

- "My physical health makes it more likely that I will get a Non communicable disease" (z = -2.10, p=0.04)
- "There is a good possibility that, I will get a Non communicable disease" (z = -3.49, p=<0.001)

**Perceived Seriousness**

- "If I had a Non communicable disease my career would be endangered" (z = -2.18, p=0.03)
- "A Non communicable disease would endanger my marriage (or a significant relationship)" (z = -2.18, p=0.03)
- "Non communicable diseases are hopeless diseases" (z = -3.17, p=0.002)
- "My feelings about myself would change if I got a Non communicable disease" (z = -3.36, p=<0.001)
- "I am afraid to even think about a Non communicable disease" (z = -2.97, p=0.003)

**Perceived Benefits**

- No statements were significant.

**Perceived Barriers ('false' statements were taken into the consideration for z test)**

- It is embarrassing for me to do regular screening for Non communicable diseases (z = 2.39, p=0.02)
- To do regular screening for Non communicable diseases, I have to give up quite a bit (z = 3.16, p=0.002)
- Regular screening for Non communicable diseases can be painful (z = 2.32, p=0.02)
- Regular screening for Non communicable diseases is time consuming (z = 2.44, p=0.02)
- My family or society would make fun of me, if I did regular screening for Non communicable diseases (z = 3.33, p=<0.001)
- The practice of regular screening for Non communicable diseases interferes with my activities (z = 4.96, p=<0.001)
- Doing regular screening for Non communicable diseases would require starting a new habit, which is difficult (z = 2.86, p=0.004)
- I am afraid, I would not be able to do regular screening for Non communicable diseases (z = 2.39, p=0.02).

**Motivation**

- I exercise regularly- at least three times a week (z = -2.43, p=0.02)

# DISCUSSION

## SUMMARY OF KEY FINDINGS

HLCs were established in Sri Lanka to screen vulnerable groups for NCDs using primary healthcare settings and resources. However, the expected level of coverage was not achieved due to various reasons, and poor HSB was considered as the most important factor. Therefore, this case control study was conducted with the objectives of describing the HSB for NCDs, then co-designing and evaluating a package of evidence-based interventions to improve HSB in a selected region. The interventions were developed consultatively following quantitative pre-assessment of HSB, and FGD analysis of key stakeholder perceptions. Evaluation of this multi-component intervention showed significant improvements in HSB in relation to perceived susceptibility, perceived barriers, and utilization of HLCs compared with the control setting. However, there were only non-significant improvements in other HSB constructs and risk factors, except for engagement in physical activities. Overall, these results indicate that the multi-component intervention should be implemented at a broader scale across Sri Lanka, though some refinements may be required to design and implementation.

## PRE-INTERVENTIONAL ASSESSMENT

Our pre-interventional assessment reported that participants had higher levels of "perceived benefits", with lower levels of "perceived seriousness" and "perceived susceptibility". These results indicated that the participants neglected the seriousness and susceptibility of NCDs, despite holding knowledge on benefits of screening. Similarly, a recent systematic review and meta-analysis reported "perceived benefits" as the highest construct and "perceived susceptibility" as the lowest construct determining the beliefs of diabetic patients [10]. Multivariate logistic regression analysis of health behaviours towards prevention of NCDs in China reported that HBM constructs are directly or indirectly related with such behaviours, and "perceived barriers" had the greatest impact [21]. However, a similar analysis in Saudi Arabia for screening of colorectal cancers, reported no relationship of acceptance of screening with the HSB constructs [22], which may be due to limitations of the study or other contextual factors. Studies by Wang et.al. (2022), Khosravizadeh et.al. (2021), and our study highlight the importance of analysing HSB using HBM, prior to the planning of interventions to improve HSB.

## IMPROVING HLC UTILIZATION

The main goal of our study was to improve utilization of HLCs for the screening of NCDs. Post-interventional health services utilization was significantly improved with the improvements in "perceived susceptibility" and "barriers" in our study. Similarly, a narrative synthesis of African studies reported that "perceived barriers" and "benefits" were the major determining constructs in HBM on behaviour towards screening for cervical cancer, but "perceived susceptibility" was also highlighted in more recent studies [11]. In contrast, a systematic review of European studies on breast cancer screening mentioned a significant association of all HBM constructs with attendance to mammography [12]. Additionally, a USA study on breast cancer screening using mammogram in the rural population indicated that fewer "perceived barriers" led to significantly improved screening and "perceived susceptibility" led to marginally improved screening, but other HBM constructs were unable to predict the screening frequency [23]. Similarly, a lack of perceived susceptibility, despite providing knowledge on complications of NCDs, and a significant correlation between screening practices and perceived susceptibility ($P<0.05$) was reported among Chinese individuals with Diabetes [24]. Additionally, the significant association between perception of susceptibility and adherence with lifestyle modifications was noted among Indonesian elderly people with hypertension [25]. All these studies highlight the importance of improving "perceived barriers" and awareness of "perceived susceptibility" to improve HSB, in any setting.

## OUTCOMES

Our study employed multiple and complex interventions to improve HBM constructs through awareness of the community on NCD susceptibility and seriousness through community engagement and inter-sectoral collaboration. Additionally, a risk assessment tool for Diabetes, which was designed based on the Sri Lanka Diabetes Risk Score (SLDRISK) [19], was incorporated into the design of health education materials and training of volunteer groups and health staff in the

assessment of susceptibility. Furthermore, the study incorporated system related interventions to minimise barriers to screening. Analysis of system level interventions for improving screening for diabetes among women who had gestational diabetes, highlighted the importance of having integrated and multiple interventions to bridge the gap between recommended guidelines and actual practice [26]. For example, improving the quality of care is strongly linked with increased attendance to community screening services [27], and obtaining patients' feedback enabled health care providers to understand how patients and their families perceive the quality of healthcare [28]. Additionally, these types of multiple interventions are recommended in several studies to improve HSB of chronic NCDs and related risk factors [10, 11, 21].

Nevertheless, except for engaging in physical activities, none of the other lifestyle practices had significant improvements in the study area. Quiroz-Mora, et.al. (2018), noted that self-perceived importance of quality-of-life is the most important factor which promotes engagement with physical activities [29]. However, improving other risk factors (smoking, alcohol, unhealthy diet) would need more complex interventions than those implemented at the community level [30, 31].

### LIMITATIONS

There are relationships of HSB with socio-demographic factors, as highlighted in HBM [32]. A systematic review of African studies reported a range of socio-demographic factors contributing to HSB in cervical cancer screening [11]. For example, Tanzanian women from lower socio-economic backgrounds had more chance of inaccurate information, and less chance of screening [33]. Therefore, it is vital to analyse the HSB relationships with socio-demographic factors, to identify specific and targeted interventions for high risk groups [26]. However, our study did not analyse these relationships, as the intention was to design community level intervention without targeting any specific groups, except for males, as identified through the FGDs as a group of low HLC utilization.

Multiple, complex interventions were employed to improve HSB in a local community, but we did not assess the effect of each intervention individually in improving HSB. Due to limitations in sample size, data characteristics of HBM and follow-up period, multivariate regression analysis could not be performed and unadjusted comparisons are reported in the results. Therefore, observed improvements may not be totally linked to the myriads of performed interventions and interpretations linked with causality are to be made cautiously. It is recommended to have extended follow-up periods and increased sample sizes for future research. Additionally, the findings may not be generalizable to other settings, with different contextual parameters.

## CONCLUSIONS

The co-designed, evidence-based package of interventions implemented was found to have significantly increased utilization of HLCs, but only HSB practices related to physical activity. Risk factors for NCD, like smoking, excessive use of alcohol, beetle chewing, consuming of unhealthy foods and lack of physical exercise, remained high in both the intervention and control populations. The post-interventional changes of risk factors were not significant, except for an increase in physical exercise, as they may need more complex community-based and individualized interventions. These results indicate that in addition to promoting HLC utilization, it may be necessary to reduce NCD rates in Sri Lanka and other comparable settings through uplift of the quality of HLC programs, along with holistic planning that allows HLCs to complement other primary care and public health programs that are adapted to local socio-cultural and economic needs. The use of structured phases (pre-intervention analysis, co-design of an evidence-based package of community based, health promotion and health system-level interventions, and robust evaluation) may offer guidance for stakeholders in other resource-constrained settings who are aiming to increase NCD screening rates efficiently. Future research should evaluate the specific contribution of the individual interventions that were packaged together in this study and explicate which of those is most suitable for targeting specific demographic groups.

## AUTHORSHIP

ADUK was involved in initial conceptualization, and design of the research. ADUK, DD, MWMKW and AC collectively contributed to designing the methodology, analysis, and interpretation of results. DD contributed for reviewing the initial conceptualization and design and prepared the initial draft of the manuscript. SS supervised and refined the study design and methodology and co-reviewed the initial draft of the manuscript. HR reviewed the manuscript to ensure overall accuracy and integrity, and did the final revision and approval of the manuscript. All authors reviewed the manuscript before final submission.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## CONFLICT OF INTEREST

ADUK was the District Director of Health Services, and DD was the Deputy District Director of Health Services, who were responsible for supervising primary care services in the study and control settings. MWMKM is the present District Director of Health Services of Matara District.

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