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Empowering communities to use healthy lifestyle centres: an implementation research from Sri Lanka

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ABSTRACT

Objective Healthy lifestyle centres (HLCs), a state service that screens for major non-communicable disease (NCD) risk factors and promotes lifestyle modifications in Sri Lanka, report underutilisation. The study aimed to assess the effectiveness of a participatory intervention to empower communities in improving HLC utilisation.

Design A quasi-experimental study based on the principles of community-based participatory research

Setting Six rural communities each as the intervention (IG) (Gampaha district) and comparison (CG) groups (Kalutara district) from the capital province of Sri Lanka.

Participants Study population was healthy individuals aged 35–65 years, the target group of HLCs in Sri Lanka. A random sample of 498 individuals was selected from each group for evaluation.

Interventions Community support groups (CSGs) were established and empowered using health promotion approach from August 2019 to February 2020. Group discussions and participatory mapping were conducted to identify determinants of underutilisation of HLCs, design activities to address prioritised determinants and develop indicators to monitor the progress of CSGs.

Primary and secondary outcome measures The primary outcome was improvement of HLC utilisation and the secondary outcome was initiation of lifestyle modifications.

Results Significant improvements were seen in the IG, compared with the CG in the seven determinants that contribute to HLC utilisation. The largest differences were seen in reducing negative perceptions of susceptibility for NCDs (pre=64.7%; post=33.3%; p<0.001) and usefulness of screening (pre=66.6%; post=17.3%; p<0.001). The HLC utilisation in IG increased by 29.5% (pre=5.85%; 95% CI 3.74 to 7.95, post=35.3%; 95% CI 30.9 to 39.8, p<0.001), while the utilisation of the CG showed no difference. Furthermore, there was an improvement in the proportion of users who initiated lifestyle modification (pre=64.3%; post=89.9%; p=0.039) in IG, which was not observed in CG.

Conclusion HLC utilisation and initiation of lifestyle modification can be improved by a community-based health promotion intervention through empowering CSGs.

Trial registration number SLCTR/2019/028.

INTRODUCTION

Healthy lifestyle centres (HLCs) in Sri Lanka is a population-based screening programme for major non-communicable disease (NCD) risk factors and lifestyle modification.[1] The HLC guideline stipulates screening of healthy males and females for hypertension, diabetes, blood cholesterol, oral and breast (female only) cancer at the nearest HLC.[1 2] The Ministry of Health recommends that implementers empower the target population for self-referrals, even though specific methodologies on how to do it are not documented.[1 3] However, according to the data of the prepandemic era (2018 and 2019), the reported utilisation rate of HLCs was only 10.0% and 6.9%, respectively across the country despite their high accessibility and affordability.[4] The annual utilisation has been reduced further to 3.7% in 2020 and 2.9% in 2021 with the COVID-19 pandemic.[5] Therefore, the major challenge for the impact of HLCs is their underutilisation.[3 6 7] The problem of poor participation of the target population in NCD risk factor screening is not unique to Sri Lanka but to many high-income and low- and middle-income countries implementing the services.[8–12]

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study used a quasi-experimental study based on community-based participatory research to investigate the outcomes of an intervention in improving screening utilisation.
⇒ Community support groups were empowered, particularly for this study using the health promotion approach.
⇒ A logical framework that developed based on our prior qualitative and quantitative studies on factors affecting healthy lifestyle centre utilisation was used as a guide to implement the intervention.
⇒ The pre-post design with a comparable non-equivalent intervention and a comparison group provided a more robust analysis.
⇒ Generally, the external validity of health promotional interventions is low because of contextual factors; therefore, generalising the findings to other settings needs to be done cautiously.

Global literature pointed out that underutilisation of the above screening services has a wide range of determinants operating on individual (eg, perceived lack of relevance to undergo screening, negative attitudes on screening concept, low readiness to face outcomes of health checks, lack of motivation, lack of awareness, understanding about health check services), family and community (eg, related physical and psychological barriers, lack of support from the social environment) and service provider (eg, ineffective invitation methods, low-quality communication skills of the healthcare providers, related negative image on general practice in primary care setup) levels.[13 14] These findings are consistent with our previous study on HLCs. (eg, perceived susceptibility to NCDs, perceived usefulness of screening, enthusiasm for screening and healthy lifestyle, perceived family support for screening and a healthy lifestyle, perceived community networking and perceived presence of peer support).[15]

Health promotion is '*the process of enabling people to increase control over their health and determinants*'.[16] In the context of health promotion, community empowerment is defined as the '*process by which people gain control over the factors and decisions that shape their lives*'.[17] Community empowerment for health was popularised with the origin of the health promotion concept, which was introduced by the Ottawa Charter in 1986.[18] WHO recommends empowering communities as a sustainable approach to NCD prevention, including seeking early detection and managing their conditions better.[19] Community empowerment is expected to build capacities of the community to gain access, build partnerships and networks to gain control over the determinants of the concerns of their lives.

When considering previous research on community empowerment, the majority of the previous studies that were conducted through consulting and involving paid or non-paid community volunteers often defined as community health workers (CHWs).[20–24] Even though an improvement in the screening coverage had been reported, generating collective community actions to improve screening service utilisation was rarely reported. Thus, there was an obvious discrepancy between the nature of the standard community empowerment process and the existing literature, which did not include comprehensive community empowerment processes.[25–27]

Community-based participatory research (CBPR) is an effective method for community empowerment and it has become increasingly popular in primary care research to improve health outcomes.[28] CBPR generates evidence on a social system while simultaneously changing that system via collaboration among researchers and community members.[28 29] The health promotion approach is one of the widely accepted approaches for implementing a CBPR to ensure better health outcomes following community empowerment.[30] Evidence on the effectiveness of CBPR, to increase screening utilisation is limited in low- and middle-income countries. Even in Sri Lanka,

to the best of our knowledge, there is a dearth of literature on interventions that use the health promotion approach in a CBPR model to empower communities in improving HLC utilisation. Therefore, this study may be one of the first to provide evidence for the mechanism of empowering communities to improve screening services.

METHODS
Study design and setting
We conducted a quasi-experimental study based on the principles of CBPR,[31] as described in the subsequent section.

Study settings were Gampaha and Kalutara districts, two adjacent districts to the capital district of Sri Lanka (Colombo). These were purposively selected as while the health services are implemented to a near-optimal level, the demographics of the potential clients are representative of the majority of other districts. In Sri Lanka, primary medical care units (PMCUs) is the grassroot-level primary healthcare (PHC) institution that is most accessible to the target population of HLCs. The intervention and comparison HLCs were randomly selected from the HLCs out of matched pairs based on the average monthly HLC attendance (February to July 2019) and key sociodemographic characteristics of the catchment populations. Six village administrative divisions (named the *Grama Niladari* (*GN*) divisions, they are the lowest administrative division in Sri Lanka) from each catchment area of the intervention and comparison HLCs (considering the need for consistency and feasibility, GN divisions within 5 km from the selected HLC were considered as the catchment areas for this study) were randomly selected to implement the study and were considered as the intervention group (IG) and comparison group (CG).

Study population and study sample
The study population was adults aged 35–65 years in the IG and CG. All the participants that matched the original definition of the study population were included in the intervention phase without employing any exclusion criteria based on ethical and moral grounds. However, for the pre-assessment and post-assessment, a random sample of 498 adults was selected. The sample size was calculated using the comparison of two sample proportions by the WinPepi sample size calculation software V.11.65. The sample size was calculated based on the primary outcome indicator which was the level of HLC utilisation. In 2017, the percentage of the target population who used HLCs was 10.2%.[32] This value was considered as the existing percentage of the HLC utilisation before the intervention (P_1). The expected percentage of HLC utilisation after the intervention was 25.2% (P_2). Sample size calculation was conducted after adjusting for a 10% non-response rate and a 5% loss through follow-up and dropout. The level of significance was 5% and power was 90%. When selecting this sample, adults in the targeted age category who are registered in the electoral

voter lists and lived in the *GN* divisions at least during the past 6 months from the date of the data collection were included. Individuals who were already diagnosed with chronic NCD conditions and all three risk conditions (diabetes, hypercholesterolaemia, hypertension) and pregnant and postpartum women (6 months) were excluded because those are not included in the target population of the HLCs.

Intervention

The health promotion approach was the main approach used in designing and implementing the intervention. The intervention mainly targeted to empower community support groups (CSGs) to design and implement community-based activities to promote NCD risk factor screening at the HLC and to improve lifestyle modifications to prevent NCD risk following the HLC visit among the healthy target population. Based on the principles of the health promotion approach, the intervention was delivered to the whole community in the IG. Thus, the behaviour change outcomes were aimed and intended at the community as a whole. But for the evaluation, a sample from the IG was selected. During the postevaluation, changes in the lifestyles in terms of dietary and physical activity changes following the HLC visit were only measured among those who used the HLC. The CG received only the standard promotion (distributing invitations, leaflets and health talks) currently conducted by any HLC in Sri Lanka.

The theoretical background of the intervention

The key principles of the health promotion approach; namely community-based, process, addressing contributing factors, generating community action via community empowerment and monitoring and redirecting the process[33] were used as the foundation for intervention development. Therefore, the overall mechanism consisted of the establishment of the CSGs and the empowerment of these CSGs in designing and implementing community actions to change modifiable determinants for the underutilisation of HLCs. CSGs were also empowered to monitor and evaluate the intervention process and outputs at individual and community levels. The process evaluation of the intervention will be published separately.

Intervention development

This study was the last component of a bigger project that aimed to improve the utilisation of the HLCs that was conducted as a part of the principal investigator (PI)'s (TH) PhD degree. The first two components were two separate qualitative and quantitative study designs that were used to identify modifiable and most influential determinants. The intervention was designed based on the results of those two components by the PI (TH). Sri Lankan literature on health promotion[33] was used as a reference to obtain a model for the logical framework (LFW) (figure 1) of the study. The applicability and validity of the logical and process frameworks developed explicitly for the current study were cross-checked with
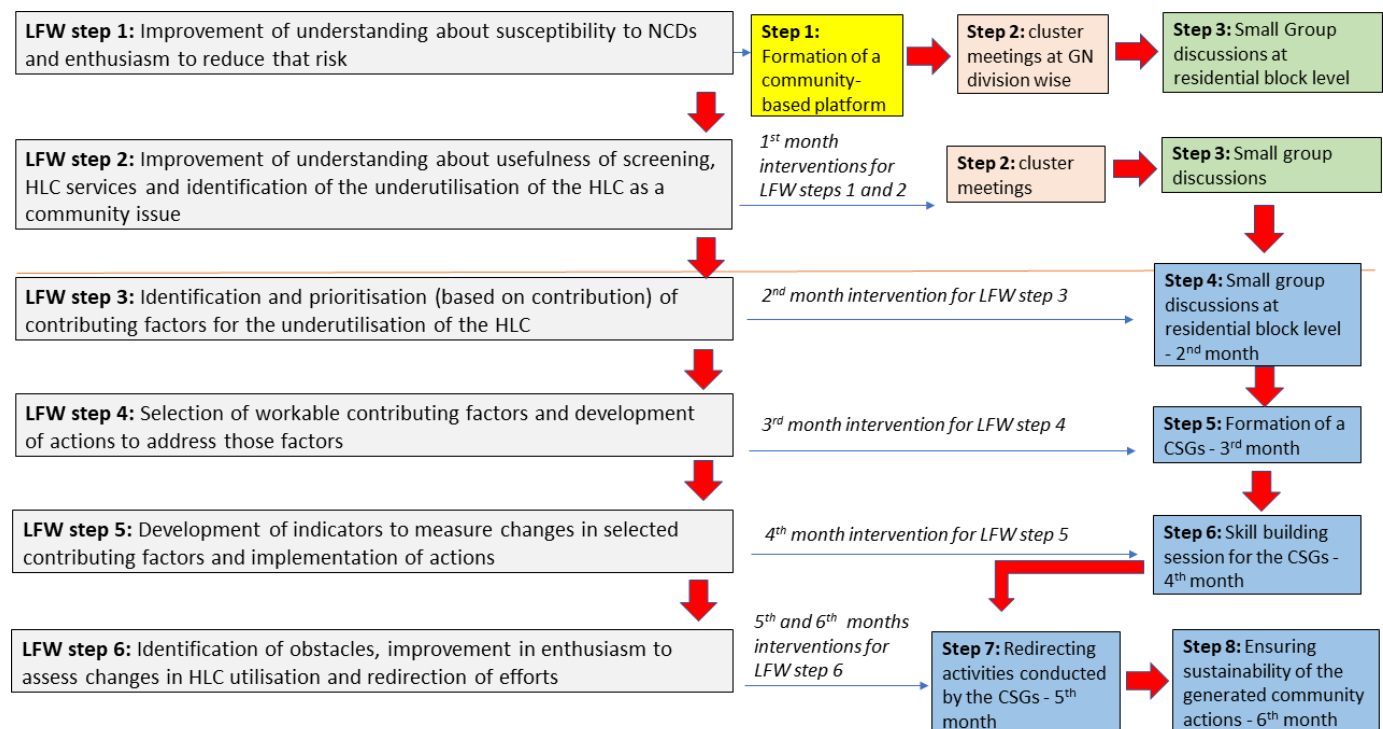

Figure 1 Logical Framework (LFW) and the intervention flow diagram CSGs- Community Support Groups; GN- *Grama Niladari*; HLC- Healthy Lifestyle Centre; NCD- Non-Communicable Diseases

Figure 1 LFW and the intervention flow diagram. CSG, community support group; GN, Grama Niladari; HLC, healthy lifestyle centre; LFW, logical framework; NCD, non-communicable disease.

the coauthor DG, a health promotion expert in the rank of a Professor in Health Promotion in a state university with PhD-level qualifications and more than two decades of experience in community empowerment. The intervention process was modified accordingly. The overall applicability of the intervention to the public health system and HLC setup was checked by other two coauthors AK, a public health expert in the rank of a Professor in Public Health and MP, a public health expert in the rank of a Senior Lecturer in Public Health in a state university with MD-level qualifications.

Intervention process and delivery

The intervention process was developed based on the LFW and consisted of eight steps (figure 1). Each step of the intervention was implemented to achieve LFW step/s. The duration of the intervention was 6 months, from August 2019 to January 2020.

LFW steps 1 and 2: the first step was aimed at improving community understanding of their susceptibility to NCDs by assessing their risk level. This improvement in understanding would generate an enthusiasm to take action to reduce their NCD risk. In the second step, the community would understand the usefulness of screening in reducing their identified susceptibility to NCD. Then, the community would understand that they can get screened at the HLC located in their community, and get support to modify their susceptibility to NCDs via HLC. Intervention steps 1–3 were conducted to achieve LFW steps 1 and 2.

Step 1: forming a steering committee engaging HLC staff and government field staff (health and non-health). The intervention objectives and the concept of health promotion were explained.

Step 2: identifying community volunteers who could serve as frontline messengers by the steering committee and holding cluster meetings at the village level (n=6). Their anthropometric measurements (body mass index, waist circumference) and food habits were assessed and discussed to improve knowledge of susceptibility to NCDs and the usefulness of screening. HLC was introduced as a resource in the community that supports reducing the risk for NCDs. A participatory assessment was done to assess the current HLC utilisation and sensitise them to the fact that their underutilisation is a community issue. Mutually agreed targets and an action plan to improve the utilisation of HLCs were developed.

Step 3: pocket meetings at the residential block level (n=30) were organised by the identified community volunteers in step 2. The structure of the meetings was similar to the cluster meeting conducted in step 2.

LFW step 3: community identified contributing factors that influence the utilisation of HLC with the interactive participatory sessions. Intervention step 4 was conducted to achieve LFW step 3

Step 4: a map of each of the residential blocks which was referred to as a community map was developed with the participants enabling them to gauge the problem of underutilisation of HLCs in their community.

Determinant charts were developed to identify and prioritise the contributing factors to the problem.

LFW step 4: community addressed the identified contributing factors that reduce utilisation of HLC through collective community actions followed by a broader understanding of the contributing factors operated beyond the individual level. Intervention step 5 was conducted to achieve LFW step 4.

Step 5: establishing CSGs after discussing the importance of a CSG and defining their target group to implement collective community actions targeting the community as a whole. CSGs identified modifiable determinants and designed interventions to address the selected determinants using the determinant charts developed in step 4. These interventions were expected to be implemented at different levels namely individual, family and community. CSGs were mainly facilitated to implement community-level interventions according to the health promotion approach. It was aimed to achieve community-wide changes that could subsequently impact family level and individual-level determinants. CSGs implemented community-level efforts such as commencing exercise/sports programmes and conducting monthly body weight, waist and hip measuring sessions that would make a supportive environment to improve physical activities, healthy dietary patterns and regular physical health screening in terms of body mass index and waist-to-hip ratio. They also conducted planned home visits according to the community maps mentioned in step 4 to measure the weight, height and waist of the target population. These home visits aimed to strengthen community actions and to improve personnel skills in measuring and identifying their own NCD risk. Community-level healthy public policies were enacted via attending community-based civil society meetings, where CSGs promoted voluntary enumeration to the HLC concerning the NCD risk and physical well-being. Identified modifiable determinants and actions undertaken by CSGs are listed in table 1. But during the postevaluation, only individual-level changes were measured quantitatively and those are presented as the secondary outcomes. Collective community actions and community-level changes will be described in our next manuscript on the process evaluation.

LFW step 5: CSGs implemented collective community actions and measured the process and progress via indicators developed by them followed by positive reinforcement and peer teaching and learning sessions. Intervention step 6 was conducted to achieve LFW step 5.

Step 6: a skill-building session was conducted to improve competence in implementing the proposed activities and monitoring the process using process, output and outcome indicators.

LFW step 6: CSGs identified obstacles, assessed changes and redirected efforts after giving the opportunity to share process and progress at a community forum. Intervention steps 7 and 8 were conducted to achieve LFW step 6.

Step 7: CSGs assessed the changes in HLC utilisation. Obstacles to progress were identified and solutions were discussed with the participants. Activities were designed

Table 1 The selected modifiable determinants and the activities proposed by the community groups with the support of the principal investigator under step 5

Modifiable determinant	Activities
Lack of knowledge on the HLC	1, 2, 3, 10, 13, 14
Enthusiasm on screening	4, 5, 6, 7, 8, 9, 11, 12, 15
Enthusiasm on a healthy lifestyle	4, 5, 6, 7, 8, 9, 11, 12, 15
Lack of perceived susceptibility to NCDs	4, 5, 6, 10, 13
Lack of perceived usefulness of screening	4, 5, 6, 10, 13
Lack of family support	5, 6, 7, 8
Lack of community networking and peer support	9, 10, 11, 12, 15
Ego and arrogance/Feeling of inferiority when using the HLC and generalised negative view that free health services are for poorer people and related stigmatisation	2, 3, 6, 9, 12, 13
Low value for the PHC/generalised negative view that PHC is an ineffective system	2, 3, 6, 12, 13

1=Delivering awareness via day-to-day conversations; 2=conducting awareness sessions in monthly meetings of community-based organisations; 3=displaying posters about HLC and its services in public places; 4=planned home visits according to the community maps to increase awareness. Some included measuring weight, height and waist through home visits; 5=distributing the *"shape of my body chart"* tool to do peer teaching and using *"which category am I-blood vessel chart"* tool; 6=glamorising the HLC record book and sharing obtained results; 7=using a measuring tape to measure the waist of the spouse and to commence family discussions; 8=arranging HLC visits within the family; 9=organising as pairs/teams to visit the HLC; 10=gathering the target group for minicluster meetings; 11=continuous encouragement, reminders and follow-up; 12=commencing an exercise/sport programme; 13=arranging a family get together to cover the community map. It was suggested to discuss about the individual and family activities and progress related to HLC; 14=circulating a letter on HLC among the villagers; 15=conducting a monthly body weight, waist and hip measuring session.
HLC, healthy lifestyle centre; NCD, non-communicable disease; PHC, primary healthcare.

to address the obstacles and the process was redirected if and when necessary.

Step 8: CSGs conducted experience-sharing programmes to share presituation and postsituation of HLC attendance, anthropometric and lifestyle changes. The way forward is discussed to ensure the sustainability of the generated community actions.

The coauthor, DG, conducted the step 2. Other steps in the intervention were implemented by the PI (a PhD candidate in Public Health, with a BSc degree in Health Promotion and a Master's degree in Public Health) and a field assistant recruited for the project (Diploma in Health Promotion with extensive health promotion field-work experience) in the local language (Sinhala). The time duration for each step was 2–2.5 hours and each step was completed within 1 month in all six GN divisions.

Output and outcome measures
As per step 6 of the intervention flow diagram, output measures were designed to measure the changes in the promotion of HLCs, invitations for awareness programmes on HLC, conducting community-based awareness on HLC, community-based enrolment of new clients, implementation of community actions and coverage of the agreed target group. The primary outcome measure was the proportion of participants who used the HLC, the mean number of users for a month at the HLC before and after 6 months of commencement of the intervention and median scores of each determinant except the last two determinants mentioned in table 1. Secondary outcomes

included the proportion of HLC clients who had done either a dietary change or a physical activity change after visiting the HLC, the proportion of HLC clients who had done at least one of the selected dietary changes after visiting the HLC and the proportion of HLC clients who had done at least one of the selected physical activity changes after visiting the HLC. During the postevaluation, secondary outcomes were specifically measured among those who had undergone the screening at the centre out of the total sample whereas primary outcome was measured among all the sample.

Patient and public involvement
Community participants, HLC staff and government field staff (health and non-health) were not involved in developing the research question. However, they were engaged in designing the study by clarifying the extent of HLC underutilisation in their communities, clarifying determinants of HLC underutilisation and designing activities to address selected determinants of HLC underutilisation in their communities, implementing the agreed interventions, monitoring and evaluation.

Data collection
A participatory output and outcome evaluation was conducted. CSGs were enabled to monitor the progress in terms of the aforementioned mutually agreed measures. CSGs used enumeration books (books maintained by CSGs to keep records about new and potential clients), field log books (books maintained by CSGs to keep records

about their activities), community maps and community registries (registries maintained at community-based civil organisations to keep record about new clients and track lifestyle changes) to collect data. Data on the promotions of HLCs were obtained from the government field officers using interviews and data on invitations for awareness programmes on HLC were obtained from the HLC staff using a predefined data extraction sheet by the PI.

Non-participatory outcome evaluation was done by trained data collectors in both IG and CG using an interviewer-administered questionnaire. Data collectors were blinded to the type of setting (intervention or comparison) and they collected data from those who gave written informed consent to participate in the study. The participants were enrolled from August 2019 to February 2020. The baseline data collection techniques were interviews using an interviewer-administered questionnaire and secondary data from the HLCs (monthly attendance 6 months before the intervention). The endline data collection was done after the completion of the 6 months intervention. Houses were visited on weekends, afternoons on weekdays and public holidays to ensure all eligible participants' representation. If there was no one at the selected household, data collectors visited at least three times to that house before it was labelled a nonresponse or a loss to follow-up.

HLC utilisation before and after 6 months of the intervention was also extracted using the H1241-quarterly return document of the HLC by the PI. When extracting data, the number of users screened at working places (mentioned under the second category of the H1241-quarterly return document of the HLC) was excluded. This was because these screening programmes were not compatible with the objectives of the interventions.

Analysis

Output and outcome indicator data were analysed using SPSS V.23. During the participatory evaluation, CSGs were enabled to review all the aforementioned tools and analyse the data using descriptive statistics (frequencies and percentages). Precomparison and postcomparison of the IG were done using McNemar's χ^2 test and Wilcoxon t-test.

In the non-participatory outcome evaluation, self-reported attendance at HLCs was obtained using a binary variable indicating that HLC attendance as yes=1 and no=0. A conceptual framework developed based on the qualitative component of the present study, which was published separately,[34] was used to develop the interviewer-administered questionnaire. According to this framework, HLC utilisation is principally influenced by the client's cognitive and psychological attributes, family and community characteristics and services-related perceptions, along with medical and screening history. Determinants under each category and questionnaire items to measure determinants were selected, based on the findings of the aforementioned qualitative study. A score for each selected determinant was obtained using

predefined multiple choice or scale questions: (1) knowledge about HLCs (using two multiple choice questions on aim and target diseases and three best of five questions on target age, population and functioning date of the HLC), (2) enthusiasm on screening (using four items with a 3-point Likert scale), (3) enthusiasm to initiate and maintain a healthy lifestyle (using four items with a binary scale (yes and no), (4) perceived susceptibility to NCDs or risk conditions (cardiovascular disease, diabetes, hypertension or hyperlipidemia) (using five mutually exclusive responses), (5) perceived usefulness of screening (using five mutually exclusive responses), depending on the gradient of the responses in the factors of perceived susceptibility to NCDs or risk conditions and perceived usefulness of screening, each response was categorised into positive and negative perceptions, (6) perceived family support for screening and a healthy lifestyle (using six items with a 3-point Likert scale), (7) perceived community networking (using nine items binary scale) and (8) perceived presence of peer support (using four mutually exclusive responses to measure each perceived availability of supportive discussions and motivations) for NCD prevention, screening and healthy lifestyle. Three experienced public health academics with MD-level and PhD-level qualifications in community medicine in the rank of Professor in Community Medicine in state universities assessed the questionnaire for face and content validity.

Statistical tests were selected based on the normality of the data. HLC attendance that obtained through the questionnaire and the scores of the selected determinants were non-normally distributed. For categorical variables, the χ^2 test was used to compare independent groups, and McNemar's χ^2 statistic was used to compare the pre-intervention and post-intervention data of the two groups. For continuous variables, the Mann-Whitney U test was used to compare the predata and postdata of the intervention and control groups and predata and postdata comparisons of the same groups were made using the Wilcoxon signed-rank test. HLC attendance that was obtained through the HLC records was normally distributed. The between-group comparison regarding total HLC attendance was made using the independence sample t-test, and the within-group comparison was made using the paired t-test.

Results

Participatory evaluation

Table 2 presents the results of the participatory evaluation. There was a significant improvement in the number of government non-health officers that promoted screening at HLCs (p=0.008), the number of community-based civil organisations (CBCOs) that had the promotion of screening at HLCs in their agenda of routine activities (p=0.004), the median number of invitations received by the HLC per month to conduct awareness programmes (p=0.023), number of CBCOs that conducted at least one awareness session on HLC (p=0.004), number of CSGs

Table 2 Results of participatory evaluation

Indicator	Total	Pre-intervention		Post-intervention		P value*‡
		N	%	N	%	
Outputs						
Promotion of HLCs						
Number of government field health officers that promoted screening at HLCs[a]	05	02	40	04	80	0.500
Number of government non-health officers that promoted screening at HLCs[b]	18	00	00	08	44.4	0.008
Number of CBCOs that included promotion of HLCs in their agenda	12	1	8.3	10	83.3	0.004
Invitations for awareness programmes on HLC						
Median number of invitations received by the HLC per month to conduct awareness programmes	N/A	0.00§ (IQR=1.00)	N/A	2.00§ (IQR=1.00)	N/A	0.023†
Conducting awareness on HLC‡						
Number of CBCOs that conducted at least one awareness session on HLC	12	1	8.3	10	83.3	0.004
Enrolment of new clients‡						
Number of CBCOs that enrolled new clients to HLC sessions	12	0	0	05	41.7	0.063
Implementation of community actions‡						
Number of CBCOs that implemented at least one collective action to facilitate an HLC visit by its members	12	0	0	02	16.7	0.500
Number of CSGs who implemented at least one collective activity to attract new clients to the HLC	20	0	0	10	50.0	0.002
Coverage of the agreed target group‡						
Number of CSGs approached at least 20% of the target group	20	0	0	06	30.0	0.031
Outcomes						
HLC utilisation						
Median number of clients visited HLCs out of the target group	N/A	0.00§ (IQR=2)	N/A	10.00§ (IQR=7)	N/A	<0.005†

[a,b,c]Denominators of indicators were based on information available at, [a]MOH, [b]DS, [c]GN offices.
*McNemar's exact χ^2 test.
†Wilcoxon t-test.
‡Significance level: p<0.05, significant indicators are presented in italic font.
§Median.
CBCOs, community-based civil organisations; HLC, healthy lifestyle centre; N/A, not applicable.

Table 3 Distribution of study participants according to selected sociodemographic characteristics in the IG and CG

Characteristic	IG N (n=479)	%	CG N (n=462)	%	χ^2; df; p value*
Sex					χ^2=0.903; df=1; p=0.761
Male	213	44.5	210	45.5	
Female	266	55.5	252	54.5	
Age (years)					χ^2=16.295; df=2; p<0.001
35–44	224	46.8	162	35.1	
45–54	153	31.9	158	34.2	
55–65	102	21.3	142	30.7	
Religion					χ^2=20.776; df=2; p<0.001
Buddhism	475	99.2	433	93.7	
Roman Catholic	4	0.8	26	5.6	
Christian	0	0.0	3	0.6	
Educational level					χ^2=10.905; df=4; p=0.028
No formal education	1	0.2	2	0.4	
Primary education	12	2.5	8	1.7	
Lower secondary	319	66.6	274	59.3	
Upper secondary	130	27.1	168	36.4	
Tertiary	17	3.5	10	2.2	
Marital status					χ^2=6.178; df=3; p=0.103
Married	461	96.2	433	93.7	
Single	15	3.1	18	3.9	
Divorced	1	0.2	1	0.2	
Widow	2	0.4	10	2.2	
Type of family					χ^2=3.107; df=1; p=0.078
Nuclear	344	71.8	355	76.8	
Extended	135	28.2	107	23.2	
Number of children					χ^2=3.098; df=3; p=0.377
0	37	7.7	49	10.6	
0–1	324	67.6	300	64.9	
2–3	100	20.9	100	21.6	
>3	18	3.8	13	2.8	

*Significance level: p<0.05, significant differences are indicated in italic font.
CG, comparison group; IG, intervention group.

who implemented at least one collective activity to attract new clients to the HLC (p=0.002) and number of CSGs approached at least 20% of the target group (p=0.031) and number of HLC clients in CSG's target group (p<0.05) between prestatus and poststatus of the IG.

Non-participatory outcome evaluation
Four hundred seventy-nine respondents for the IG and 462 for the CG were recruited for the pre-assessment. The pre-assessment response rate for the IG was 96.2%, and the CG response rate was 92.8%. Twenty-nine from the IG and one from the CG were loss to follow-up. Thus, response rates for the post-assessment were 93.9% (IG)

and 99.8% (CG). Selected sociodemographic characteristics in the IG and CG are presented in table 3.

There was no significant difference between the IG and CG regarding sex, marital status, type of family (nuclear or extended), number of children, employment and distance from home to the HLC.

Primary outcomes
Primary outcomes are presented in table 4.

Table 4 Primary outcomes of the intervention

Category	IG pre	IG post	CG pre	CG post	
(i) Score for the determinants	**Mean (SD) Median (IQR) OR Frequency (%)***	**Mean (SD) Median (IQR) OR Frequency (%)***	**Mean (SD) Median (IQR) OR Frequency (%)***	**Mean (SD) Median (IQR) OR Frequency (%)***	**Significance p values between groups†**
	Significance p value within IG*		**Significance p value within CG***		
Knowledge on HLC	3.76 (7.90) 0.00 (0)	10.10 (9.82) 10.00 (21.0)	1.49 (4.16) 0.00 (0.0)	1.81 (4.93) 0.00 (0.0)	Pre p=0.005 *Post p=0.000*
	P=0.000		P=0.305		
Enthusiasm on screening	23.7 (6.55) 25.0 (5.0)	32.1 (7.21) 35.0 (5.0)	29.9 (7.18) 30.0 (10.0)	29.9 (8.20) 30.0 (10.0)	Pre p<0.001 *Post p<0.001*
	P<0.001		P=0.952		
Perceived family support	25.0 (10.3) 20.0 (10.0)	34.6 (16.4) 35.0 (30.0)	26.7 (7.29) 30.0 (10.0)	27.4 (7.77) 30.0 (10.0)	Pre p<0.001 *Post p<0.001*
	P<0.001		P=0.201		
Perceived community networking	13.6 (5.70) 15.0 (5.0)	28.6 (12.9) 25.0 (25.0)	17.4 (8.69) 15.0 (15.0)	17.8 (8.20) 15.0 (15.0)	Pre p<0.001 *Post p<0.001*
	P<0.001		P=1.000		
Perceived presence of peer support	11.3 (9.09) 10.0 (15.0)	16.6 (8.93) 20.0 (10.0)	8.71 (8.07) 10.0 (15.0)	8.98 (7.95) 10.0 (15.0)	Pre p<0.001 *Post p<0.001*
	P<0.001		P=0.603		
Perceived susceptibility to NCDs					
Positive attitudes	169* (35.3)	300* (66.7)	177* (38.3)	181* (39.4)	Pre p=0.335§ *Post p<0.001§*
Negative attitudes	310* (64.7)	150* (33.3)	285* (61.7)	278* (60.6)	
	P<0.001‡		P=0.829‡		
Perceived usefulness in screening					
Positive attitudes	160* (33.4)	367* (76.6)	172* (37.2)	160* (34.9)	Pre p=0.219§ *Post p<0.001§*
Negative attitudes	319* (66.6)	83* (17.3)	290* (62.8)	299* (65.1)	
	P<0.001‡		P=0.448‡		
(ii) Utilisation of the HLC					
(a) Proportion of participants used the HLC—according to questionnaire data	**Frequency (%) (95% CI) (n=479)**	**Frequency (%) (95% CI) (n=450)**	**Frequency (%) (95% CI) (n=462)**	**Frequency (%) (95% CI) (n=459)**	**Significance p values between groups§**
	Significance p value within IG‡		**Significance p value within CG‡**		
Users	28 (5.85) (3.74–7.95)	159 (35.3) (30.9–39.8)	15 (3.27) (1.64–4.90)	16 (3.49) (1.80–5.17)	Pre p=0.056 *Post p<0.001*
Non-users	451 (94.2) (92.1–96.3)	291 (64.7) (60.2–69.1)	447 (96.7) (95.1–98.4)	443 (96.5) (94.8–98.2)	
	P<0.001		P=1.000		
(b) Utilisation of the HLC—according to HLC records	**Mean (95% CI) (SD)**	**Mean (95% CI) (SD)**	**Mean (95% CI) (SD)**	**Mean (95% CI) (SD)**	**Significance p values between groups****
	Significance p value within IG¶		**Significance p value within IG¶**		
Number of users per month	39.0 (23.9–54.1) (14.4)	133.3 (63.5–203.3) (66.5)	33.0 (21.4–44.6) (11.0)	31.3 (15.6–47.1) (14.9)	Pre p=0.437 *Post p=0.012*
	P=0.002		P=0.864		

Significance level: p<0.05, significant differences are indicated in italics font.
*Wilcoxon t-test.
†Mann-Whitney U test.
‡McNemar's exact χ^2 test.
§χ^2 test.
¶Paired t-test.
**Independent sample t-test.
CG, comparison group; HLC, healthy lifestyle centre; IG, intervention group.

Scores for the modifiable determinants

IG had a significantly higher knowledge of HLC (p=0.000), enthusiasm on screening (p<0.001), perceived family support (p<0.001), perceived community networks (p<0.001), perceived presence of peer support (p<0.001) in post-assessment compared with the pre-assessment. But, there was no significant difference among CG pre-assessment and post-assessment of the CG. IG reported significantly higher respondents with positive perceptions of perceived susceptibility to NCDs and perception of the usefulness of screening after the IG compared with the CG (p<0.001).

Utilisation of HLCs

a. The proportion of participants who used the HLC: IG reported an increase of users to 35.3% (n_{IG}=159, 95% CI 30.9 to 39.8) in its post-assessment compared with the 3.5% (n_{CG}=16, 95% CI 1.8 to 5.17) of users in CG (p<0.001).
b. The mean number of users for a month at the HLC before and after 6 months of commencement of the intervention: in the post-assessment, IG reported a significantly higher (t=3.66, p=0.012) mean number of users per month (M_{IG}=133.3 (SD=66.5); 95% CI 63.5 to 203.3) compared with the CG (M_{CG}=31.3 (SD=14.9); 95% CI 15.6 to 47.1) in their post-assessment.

Secondary outcomes

During the post-assessment, IG reported a significant improvement (p=0.002) in the proportion of users who initiated or maintained lifestyle modification advice after the HLC visit (89.9%, n_2=143) compared with the post-assessment of the CG (62.5%, n_1=10) (table 5).

Discussion

The present study indicates that there was no significant difference in HLC utilisation among IG and CG in the pre-assessment. Following the intervention, there was a marked increase in the proportion of users in the IG (pre=5.85%, 95% CI 3.74 to 7.95; post=35.3%, 95% CI 30.9 to 39.8). The user proportion did not improve significantly in the CG. The intervention also produced secondary outcomes such as an improvement in the proportion of users who initiated or maintained lifestyle modification advice after the HLC visit (and maintaining at least one selected physical activity method. CG did not report a statistically significant difference in any of these.

Global literature reported that utilisation of screening can be improved via community interventions irrespective of the type of community intervention whether conducted by CHWs or used community mobilisation with or without empowerment.[20–24] These studies primarily found that CHWs or trained community

Table 5 Comparison of dietary and physical activity changes among HLC clients in the IG and CG in the pre-assessment and post-assessment

Criteria	IG Frequency %		CG Frequency %		P values between groups¶**
	Pre	Post	Pre	Post	
Initiation or maintenance of lifestyle modification advice (either dietary or physical activity method) after the HLC visit*					
Yes	18 (64.3)	143 (89.9)	12 (80.0)	10 (62.5)	Pre p=0.285
No	10 (35.7)	16 (10.1)	3 (20.0)	06 (37.5)	*Post p=0.002*
P values within groups§**	*P=0.039*		P=0.250		
Initiation or maintenance of at least one selected dietary modification advise†					
Yes	18 (100.0)	141 (98.6)	9 (75.0)	9 (90.0)	*Pre p=0.025*
No	0 (0.0)	2.0 (1.4)	3 (25.0)	1 (10.0)	Post p=0.058
P values within groups§**	P=1.000		P=1.000		
Initiation or maintenance of at least one selected physical activity method‡					
Yes	3 (16.7)	112 (78.3)	7 (58.3)	8 (80.0)	*Pre p=0.018*
No	15 (83.3)	31 (21.7)	5 (41.7)	2 (20.0)	Post p=0.901
P values within groups§**	*P=0.002*		P=0.500		

*IG pre n=28; IG post n=159; CG pre n=15; CG post n=16.
†IG pre n=18; IG post n=143; CG pre n=12; CG post n=10.
‡IG pre n=18; IG post n=143; CG pre n=12; CG post n=10,
§McNemar's exact χ^2 test
¶χ^2 test.
**Significance level: p<0.05, significant differences are indicated in italic font.
CG, comparison group; HLC, healthy lifestyle centre; IG, intervention group.

members can improve screening coverage by delivering screening service at various venues namely at the client's home,[22 23] at a mobile service,[21] at workplaces[24] or community settings[20 24] rather than motivating the clients to visit the nearby PHC centre. There were only a few studies that had also assessed the role of CHWs in referring at least the high-risk individuals to the PHC screening centre.[12 23 35] An Indian study[12] reported that despite CHW's recommendations and follow-up, there was low participation in the centre (6%). Many respondents (52%) stated their non-usage was due to the absence of symptoms. Thus, this study recommended that CHWs should address the risk perception of the clients using individual or community interventions if the aim is to improve the utilisation of the PHC centre after the home-based screening. Previous studies also mentioned[36] that the evidence was limited to demonstrating the sustainability of screening uptake by the general public who merely received advice about their risk status. Furthermore, findings showed the importance of enabling a community to decide on better well-being options compared with appointing an outsider to fulfil their health needs. This is highlighted by the Ottawa Charter for Health Promotion as well.[37] There were also few studies that used the CBPR design.[20–22] They found that participants can be motivated to use screening services by conducting various communication strategies (weekly announcements, notices, local newsletters, radio, television personnel communication and repeated flyers)[20] and by sharing health information and support.[20 21]

The present study indicates how CBPR principles[31] are used to engage with the community and to generate social action to achieve community empowerment, obtain continuous community participation and partnership for its implementation, improve community capacity to address the problem, distribute equal power among the community, establish a sense of ownership about the project among the community and facilitate collective community actions which previous studies did not provide comprehensive evidence. According to the questionnaire-based survey, there was a nearly 30% improvement in the utilisation of the HLCs in the IG, which was beyond the expected change. Therefore, our study showed that community ownership goes beyond community involvement, participation or engagement.[31] There was a gradual growth of community power towards community mobilisation where all community members are united to demand better health options, resources and services in terms of HLC utilisation.[37]

According to the literature, public participation is the key measure of a successful community-based screening programme.[38] Since the proposed intervention is effective in improving HLC utilisation, it has important implications namely accelerating the number of new cases diagnosed with NCD risk factors and increasing participation of the hard-to-reach population groups in HLCs. The presence of a health promotion facilitator who can empower communities to address determinants

of underutilisation of the HLCs was found to be effective in this study. This can be considered in future cadre revisions at the community-level health services sector in Sri Lanka. As an implication, existing HLC staff can be trained on principles and strategies of health promotion approach for community empowerment. However, the literature highlighted that the implementation of such measures will be challenged by the availability of human resources and health financing issues in low- and middle-income countries.[39] Therefore, there should be proper readiness in the HLC service delivery system to face the increased demand from the community followed by the intervention to cater to the health needs of the target population.

Strengths and limitations

Our study has several strengths. First, this is the first study to our knowledge that used a quasi-experimental study based on CBPR to investigate the outcomes of a health promotion intervention in improving screening utilisation. By using a quasi-experimental design, we were able to investigate the outcomes of a real-world intervention where randomisation is not possible. The pre-post design with a comparable non-equivalent IG and a CG provide a more robust analysis than a simple before and after comparison or a descriptive study. The design improved the internal and external validity of the study. Second, using a proper sample size calculation and a sampling method improves the internal validity of the study. Third, by using a comparative analysis we were able to investigate the effectiveness of the quasi-intervention both within and between groups. Fourth, we were able to develop and empower CSGs, particularly for this study even within the short period of the intervention, because the community was directed along with the principles of the health promotion approach, which is an effective approach for community empowerment as evident by the number of local projects.[40–43] An LFW that developed based on our prior qualitative and quantitative studies on factors affecting HLC utilisation was used as a guide to implement the intervention. Therefore, the present study provides evidence for a potential mechanism that can be used to achieve sustainable outcomes in relation to screening utilisation, particularly important for low- and middle-income countries.

A number of limitations however remain. Generally, the external validity of health promotional interventions is low because of contextual factors. Therefore, generalising the findings to other settings needs to be done cautiously. The majority of the population in Sri Lanka resides in the rural sector and the study settings were also located in the rural sector. Replicating the intervention in other urban and semi-urban settings may need methodological adjustments. Respecting the autonomy of the target population is an ethical approach to screening promotion interventions. Thus, people may not be captured in the intervention, if they choose to bypass the PHC because of its

inherent structural barriers such as fixed schedule, and long waiting hours.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, HLC utilisation can be improved by a community-based health promotion intervention through establishing and empowering CSGs. Context-specific multifactorial interventions can be designed to improve HLC utilisation at community levels. Community empowerment interventions should target to improve perceived family support, perceived community networking and perceived presence of peer support apart from the factors suggested related to the design of the promotion strategies. The developed community intervention model can be used as an example model to improve HLC utilisation. However, the potential contextual factors should be considered in project planning to ensure the effectiveness and efficiency of the outcomes.

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