

The Heart-health Associated Research, Dissemination and Intervention in the Community (HARDIC) Trial for Nepalese Mothers regarding Diet and Physical Activity: A Process Evaluation

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ABSTRACT

Background

Mothers with young children in the peri-urban Jhaukhel-Duwakot Health Demographic Surveillance site of Bhaktapur district have misconceptions and poor behavioural practice regarding diet and physical activity. We developed the Heart-health Associated Research, Dissemination and Intervention in the Community trial - a health promotion intervention for mothers.

Objective

The objective of this study was to evaluate the intervention's feasibility, acceptability, potential for transferability and scaling up, and to determine its immediate outcome.

Method

Duwakot and Jhaukhel were randomly selected as the intervention and control communities, respectively. We trained 47 peer mothers from Duwakot, each of whom gave classes with 10 fellow mothers of their neighbourhood. The process evaluation was carried out on a continuous basis at different points of the intervention held from August to November 2016.

Result

In round one, the participation and completion rates were both > 90% for peer mothers; and 85% and 70%, respectively, for the fellow mothers. However, the participation rates fell in the round two of the intervention. On the whole, the mothers expressed satisfaction and acceptance of the course content and training modality. Immediate evaluation of the intervention showed improvement of knowledge, attitude and practice of diet and physical activity among both groups of mothers.

Conclusion

The successful implementation of the intervention targeting diet and physical activity clearly demonstrates the feasibility of health promotional activities in the Nepalese community for improvement of cardiovascular health.

KEY WORDS

Diet, health promotion, mothers, physical activity, process evaluation

INTRODUCTION

Unhealthy diet and physical inactivity are important behavioural risk factors worldwide of non-communicable disease (NCDs) in general and cardiovascular diseases (CVDs) in particular.¹ Nepal, a low-income South Asian country, is undergoing rapid epidemiological transition. Almost none of the Nepalese meet the WHO-recommended minimum daily level of fruits and vegetables, while the junk food culture has begun taking over traditional food habits.^{2,3} Only 15.2% of the school children are physically active and in this regard, community-based approaches are promising means to deliver health promotional strategies for diet and physical activity.^{4,5} As healthy habits are formed in early childhood, a life-course approach is required for their promotion.^{6,7} Further, mothers play a pivotal role in forming children's habits regarding diet and physical activity in Nepal.⁸

Our study among mothers with preschool children in the Jhaukhel-Duwakot Health Demographic Surveillance Site (JD-HDSS) revealed gaps in the mothers' perceptions and practices regarding their children's diet and physical activity.⁸ To address these gaps, we designed and implemented a community trial - The Heart-health Associated Research, Dissemination, and Intervention in the Community (HARDIC) Trial. Alongside the intervention, we conducted a process evaluation with the intention of documenting the experiences gained during the intervention. This paper presents the findings of the process evaluation of the HARDIC trial aiming to evaluate the intervention's feasibility, acceptability, potential for transferability and scaling up, and immediate outcomes.

METHODS

The HARDIC intervention is a community-based, non-blinded, randomized controlled trial conducted between August and November 2016 in the JD-HDSS which consists of Duwakot and Jhaukhel of Bhaktapur district. JD-HDSS constitutes of 3,505 households and 16,918 people. The intervention targeted young mothers with children aged 1-9 years because mothers in Nepal are primarily involved in their children's upbringing, and hence responsible for forming behaviours related to cardiovascular risk factors including diet and physical activity. The objectives of the intervention were: to increase knowledge of mothers on diet and physical activity through health promotion training; to improve self-efficacy of the mothers by addressing existing barriers for healthy diet and physical activity; to enhance the attitude of peer mothers towards diet and physical activity; and to motivate and empower mothers to educate fellow mothers in the community on healthy diet and physical activity.

Recruitment process of the mothers

The HARDIC intervention was set at two levels and was based on the peer-education concept. The research team

trained a group of mothers (denoted peer mothers) who in turn conducted health educational classes in their households to educate young mothers of their neighbourhood (denoted fellow mothers). Duwakot and Jhaukhel were randomly selected (by lottery method) as the intervention and control communities, respectively. Each village is composed of nine administrative clusters called wards. All nine wards of Jhaukhel were taken as control (figure 1).

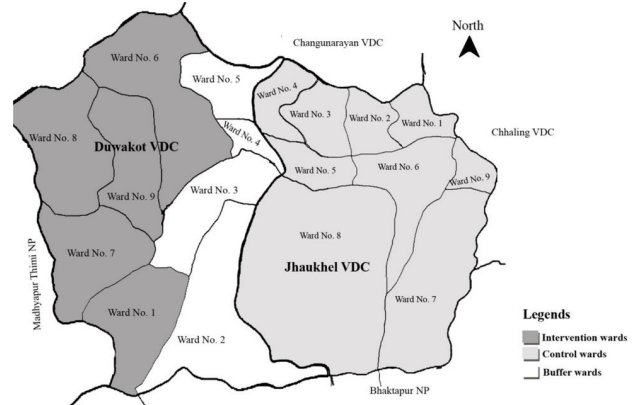


Figure 1. Location map of Jhaukhel-Duwakot Health Demographic Surveillance Site showing intervention wards (1, 6, 7, 8 and 9) of Duwakot, control wards of Jhaukhel and buffer wards (wards 2, 3, 4 and 5 of Duwakot)

Our sampling frame for the recruitment process was initially based on our follow up survey of JD-HDSS in 2012, according to which 440 mothers resided in the five intervention wards.⁹ We decided to recruit 40 mothers as peer mothers, so that they later could reach out to the fellow mothers (400) in the ratio of 1:10. However, we targeted 55 peer mothers for initial training in case there were drop-outs. Peer mothers were selected with active involvement of the local Female Community Health Volunteers (FCHVs). The peer mothers, in turn, interacted with mothers in their neighbourhood who had children aged 1-9 years and prepared lists of approximately 10 fellow mothers whom they would educate after they themselves had received training.

Development of the intervention

We developed intervention tools by exploring relevant international and national guidelines and manuals, with full consideration of the local context and findings from our previous studies and experience of our international collaborators.^{8,10-14} The content of the intervention covered the most relevant aspects of diet and physical activity in the following seven modules: food and cardiovascular health; fibres, fruits and vegetables; fats; salt; sugar and soft drinks; obesity; and physical activity. We developed training manuals, posters, and flipcharts first in English language and later translated them into plain simple Nepalese language. We demonstrated sugar and salt content of packed foods such as chips and beverages to the mothers by using a spoon and samples of salt and sugar. In

addition, we also taught mothers how to read and interpret nutritional labels of commonly consumed packed foods.

Implementation of the intervention

The intervention was done in two rounds for both peer mothers and fellow mothers, with one month gap between the rounds. Round one of peer mothers' training was held in two batches in August and September 2016, each of which was of six days duration, of approximately four hours each day. The training consisted of interactive lectures, practical and demonstration sessions, discussions, group activities, practice sessions and assignments. The peer mothers also learnt about communication skills and practiced use of learning materials such as flipcharts. They were also given home assignments to be undertaken during the one-month gap between the two rounds: to prepare a healthy diet for the family for one day and to send healthy snacks with their child/children to school (or at home in case of vacation); and, to begin gradual reduction of screen time of their child/children. We discussed with peer mothers the possible barriers and challenges they might face in accomplishing these assignments, and also possible solutions to overcoming such barriers. During round two, which was held in October-November 2016, we provided peer mothers with a recapitulation of the modules that they had learnt during round one. We also discussed the home assignments that peer mothers had been given during round one.

Peer mothers conducted health educational classes for fellow mothers of their neighbourhood within two weeks of their own training in round one. They each prepared a list of approximately ten potential fellow mothers which they finalized depending on dropouts and new additions. With the help of research supervisors, peer mothers made time plans to provide two health educational classes of 1-1.5 hours duration each week. Altogether, they provided four classes in round one. The health educational classes were based on the same modules that had been used in the peer mothers' training and the developed flipcharts, posters and manuals were used for teaching purposes. One main supervisor and three field supervisors, all public health graduates, assisted the intervention activities, monitored all the fellow mother classes, and recorded feedback from the mothers.

Process evaluation data collection and analyses

The different components of the process evaluation and tools used for their data collection are summarized in Table 1. We calculated recruitment, participation and completion rates of the peer and fellow mothers from the recruitment and attendance sheets, and expressed in percentages. We elicited reasons for non-participation or non-completion of the training sessions/health educational classes by telephone calls. At the end of the training sessions/health educational classes, participants recorded their views about quality and methods of health education delivery, course content, acceptability and feasibility, etc in feedback forms through closed and open-ended questions. The research

Table 1. Process evaluation components used in the study and their brief descriptions

Context	Description
Fidelity	Larger physical, social, and political environment that either directly or indirectly affects an intervention program
Adherence	Extent to which the delivery of an intervention adheres to the protocol or program model as intended by the developers of the intervention Adherence indicators can include program content, methods, and activities
Reach	Proportion of the intended priority audience that participates in the intervention
Recruitment	Number of mothers actually recruited (of the total targeted)
Participation	Number of recruited mothers who participated in the trainings/education classes
Completion	Number of peer mothers who completed training/education classes Reasons for withdrawal
Course content	Difficulty; comprehensiveness; best liked/least liked content
Methods	Appropriateness; best liked/least liked method
Program exposure/dose delivered	Amount of program delivered in relation to the amount prescribed by the program model Number of rounds, Number of days per round, Number of sessions/classes per day, Duration of each session/class
Quality of delivery	Amount of program delivered in relation to the amount prescribed by the program model Number of rounds, Number of days per round, Number of sessions/classes per day, Duration of each session/class
Participant responsiveness	Manner in which participants react to or engage in a program. Examples include participants' level of interest; perceptions about the relevance and usefulness; and their level of engagement, enthusiasm, and willingness to engage in discussion or activities
Program differentiation	Degree to which the critical components of a program are distinguishable from each other and from other programs including community interventions
Acceptability, satisfaction, demand	Extent to which a new idea, program, process or measure judged as suitable, satisfying, or attractive, and likely to be used
Feasibility, sustainability and scaling up	Amount/type of resources; factors affecting (ease/difficulty); facilitators/ barriers; ability of participants to carry out interventions; carried out with intended participants using existing means, resources, and circumstances and without outside intervention; integrated within an existing system; expanded to provide a new program or service
Immediate Impact	Pre-training assessment, Post-training assessment, Change pre-post test, Positive/negative effects on target participants

assistants recorded participant responsiveness in their class observation notes and the findings were described in a narrative manner. We measured immediate impact of the trainings/health educational classes by doing pre- and post-test comparison of percentages of correctly answered responses.

We obtained ethical approval from the Nepal Health Research Council. We sought informed consent from each participant before they entered the study. Each participant had right to discontinue the study at any time. There was no harm or any medical procedures or drugs provided to the respondents. The intervention consisted of health educational classes aimed to improve practice regarding diet and physical activity among participating mothers.

RESULTS

Reach: recruitment, participation and completion

Ethnicity-wise, the two communities mostly consist of Newars (33.1%), Chhetri (31.6%) and Brahmin (21.8%) while disadvantaged Janajati (Tamang, Magar, and Rai) and lower caste (Dalit) are minorities (8.7 and 2.8%, respectively).⁹ There were more Chhetris (59.2%) than Newars (26.5%) and Brahmins (14.3%) among the peer mothers, and none from the minority ethnic groups. In terms of education, half (51%) of the peer mothers had studied beyond grade 10 while one peer mother was illiterate. Almost 60% of the peer mothers were housewives, 28.5% did agro-related works, and the remaining 12.3% owned personal business or a shop.

Among the fellow mothers, Chhetris, Newars and Brahmins constituted 46.0%, 25.6%, and 11.3%, respectively, while the remaining (17.1%) belonged to the ethnic minorities including Tamang, Magar and Rai. Twenty percent of the fellow mothers had studied beyond grade 10 whereas 13.4% of them were illiterate. Half (51.2%) of the fellow mothers were housewives, a quarter (27.7%) did agro-related works, 10.7% owned personal business, and the remaining ones were job-holders (10.4%).

Out of the targeted 55 peer mothers from the five selected wards, 54 gave final approval to participate (recruitment rate: 98.18%), and 49 of them came for round one of the training (participation rate: 90.74%) (Figure 2). The reasons given by the other five mothers for non-participation in the training were: family problems; some other work that needed to be prioritized; not allowed by the family members to attend training without monetary incentive; and migration to another village. Forty seven peer mothers completed round one of the training (completion rate: 95.91%).

Even though we initially targeted 400 fellow mothers based on our 2012 data,⁹ the number of mothers in these communities had increased over the four years. Each peer mother prepared a list of fellow mothers who would participate in the health educational classes that they would be giving. Altogether, we recruited 460 fellow mothers based on these lists (recruitment rate: 115%). However, only 391 eventually participated in the fellow mothers' educational classes conducted by the trained peer mothers (participation rate: 85%). Of the 391 fellow mothers, 276 completed all the classes (completion rate: 70.6%). The major reasons for the 30% drop-out included: harvest season, inability to give time for classes as many of them were working mothers; lack of monetary incentive for the classes; and fear of having to write in the class as many of the fellow mothers were illiterate (Figure 2).

Thirty two of the 47 peer mothers who had completed round one of the training participated also in round two of the training (participation rate: 68.08%). The major reasons for the peer mothers to discontinue training in round two were: not wanting to conduct second round of

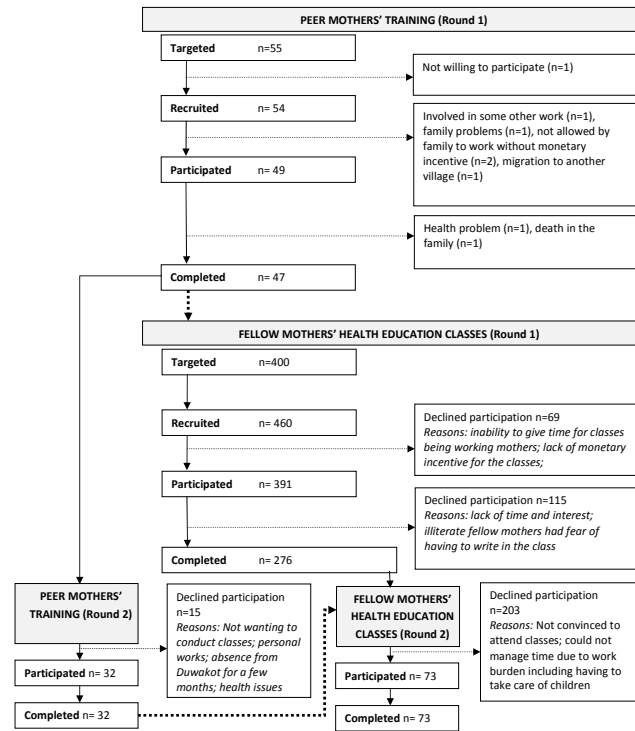


Figure 2. Flowchart showing recruitment and participation of peer and fellow mothers

fellow mothers' classes due to incompliance of the fellow mothers; personal work; not present in Duwakot for a few months; and health issues. All 32 peer mothers in round two of the training (completion rate: 100%). Only 73 out of the 276 (26.45%) fellow mothers attended the round two of health educational classes. Despite efforts of the peer mothers, most of them were either not convinced to attend the classes, or were too preoccupied with household work.

Course content: comprehensiveness and likability

Most peer mothers (70.2%) found the course content easy to follow while 10 mothers (21.3%) were neutral and two (4.3%) found some examples and use of technical English words difficult to follow. While most of the peer mothers either agreed (69.6%) or strongly agreed (19.6%) that the content of the course was comprehensive, 8.7% of them disagreed. Almost half of the mothers (44.7%) liked all the modules while a quarter (23.4%) specifically liked the heart disease module the most. Eighty five percent of the mothers did not have any least-liked module. One mother each did not like the obesity, salt and sugar modules, respectively.

A majority (75.3%) of the fellow mothers found the course content easy to follow whereas 8.6% of them thought it was difficult. Likewise, 85.9% opined that the content was comprehensive because it included all the important issues. A third of the mothers liked all the modules, the chapter on heart disease was liked by most (17%), followed almost equally (around 5%) by the modules on salt, sugar, fats and physical activity. Sixty five percent of the fellow mothers did not have any particular topic that they did not like. Some of them (6.3%) did not like the fats module.

Training sessions: methods and materials

All the peer mothers found the training methods such as lectures, practical sessions and group discussions to be either very appropriate (59.6%) or appropriate (40.4%) because the important issues were explained in a clear way. Most of them liked group activities, practical sessions, and discussions, while a majority of peer mothers (83%) did not have any particular teaching method that they disliked. Regarding the teaching-learning used during the training, all mothers thought that the training manual was either good (55.3%) or very good (44.7%) as the manual was written in simple language making it easy to understand. Likewise, almost all (97.8%) appreciated the flipcharts as they contained pictures and would be very useful in teaching fellow mothers.

Most of the peer mothers (68.1%) thought that the number of classes in the training was appropriate while 12.7% thought there were less than they would have liked. Remaining peer mothers (19.1%) thought there were too many classes. Likewise, about half of the peer mothers (56.5%) were happy with the duration of each class, whereas 23.9% and 19.6% of them thought the classes were too short or too long, respectively. Nine out of 10 peer mothers thought the teaching-learning methods were appropriate whereas a few opined that the training was more theoretical and less practical oriented than they had expected.

Most of the fellow mothers favoured flipcharts (22.9%), followed by the manual (4.4%) and lecture (3.0%). There was no particular method that they disliked. Regarding flipcharts, most of the fellow mothers thought that they were either very good (36.4%) or good (58.9%) because they described everything clearly and in a simplified way. When asked about their opinion about the manual, a majority of the mothers found that the manual was either very good (41.2%) or good (52.7%) because the explanations in the manual were well written. Nonetheless, some of the fellow mothers found the manual bad (1.9%) or very bad (1.9%). On the other hand, during feedback sessions, many of the fellow mothers opined that the manual itself is effective enough if read properly and that classes are not even needed.

Regarding the number of classes, about a third (36.4%) of the fellow mothers thought that classes were too many whereas a quarter (24.8%) of them thought they were too few. Similarly, 32.3% of the mothers thought the duration of classes was too long while 26.9% thought they were too short. Some fellow mothers opined that peer mothers should have consulted them regarding the length of class before conducting the classes.

Program exposure: dose received and its quality

The peer mothers received the intervention as planned with two rounds of training with a gap of one month between the rounds. There were no changes made to the number, duration and sequence of classes. However, due to a reduction in the number of interested fellow mothers,

Table 2. Perceived barriers for healthy diet and adequate physical activity by the peer mothers and solutions contemplated by them to overcome the barriers

Perceived barriers Diet	Contemplated solutions
Wide misconceptions	Awareness Increase awareness among children about junk food who insist parents to buy
Adverse children's behaviour including stubbornness	Bring children with you when visiting the market to buy vegetables and fruits
Resistance from other family members and guests over taste	Food should be cooked which is suitable to eat by every member of family from old to children Provide fruits, lemon juice and water instead of bottle juice to guest and request guest not to bring junk food while visiting them
Social pressure including tendency to show off and copying others	Do not copy others Do not follow advertisement
Cultural practices	Continue right practices and discourage wrong practices
Junk food provided as a token of love or handed as a prize for achievement	While showing love, promote giving food cooked at home rather than junk food of market Parents should not promote children using junk food by saying we will give something when you do assigned task or after following good work
Mother's laziness	Cook something healthy and do not serve junk food, even when there is feeling of laziness or tiredness
Lack of adequate time to cook, particularly in making different kinds of food	Cook breakfast by yourself no matter how busy you are.
Inconvenience in getting healthy food while going out or travelling	Carry fruits and cooked food from home while going outside for long time
Unaffordable food/poor socio-economic status	No immediate solution
Physical activity	
Lack of space to play	Roaming in different places
Lack of safe place to play	Parents should spend time with their children
Pressure of school homework	Let them experience outside environment
Lack of time	
Stubbornness of the children to play with gadgets	Make rules and regulations Make the children aware about physical activity and try to gradually involve them in physical activities
Lack of friends to play with	Try to set an example yourself Involve children in your work
Tendency to show off gadgets, etc. and copying others	Distinguish which is wrong and right Tell stories, jokes or scientific facts to children instead of making them watch television Slowly decrease wrong practices at home

Table 3. Percentage of mothers who responded correctly to the pre-test and post-test questions

Questions	Correct answer	Peer mothers (n=47)			Fellow mothers (n=391)		
		Pre-test	Post-test	p-value	Pre-test	Post-test	p-value
What is deposited in the wall of blood vessels to cause heart disease?	Fat	81.8	100.0	0.008*	85.9	94.1	<0.001*
What is an important cause for increased prevalence of heart diseases?	Increase in weight	61.4	72.3	0.508	58.5	72.7	0.002*
What among the following helps to reduce risk of heart disease?	Less intake of sweets	28.9	72.3	<0.001*	32.1	46.7	0.018*
Which among the following increases risk of heart disease?	High blood pressure	62.2	74.5	0.454	56.4	68.3	0.015*
How many types of nutrients are there?	5-6	48.8	82.6	0.007*	60.9	74.2	0.001*
Which of the following food contains mainly carbohydrate?	Starchy food	48.9	86.7	0.001*	40.7	59.8	0.071
Lack of which of these causes high blood pressure, diabetes, CVD, obesity and cancer?	Fiber	26.7	66.0	0.002*	29.0	60.7	<0.001*
Which food is made from whole grain?	Brown rice	75.6	93.6	0.039*	56.0	83.8	<0.001*
How much fruits and vegetables should we have in a day?	400gm	15.6	27.7	0.146	13.6	27.7	<0.001*
Which food among the following does not count as fruit?	Tetra-packed juice	68.9	80.9	0.227	68.1	83.4	<0.001*
Which food among the following does not count as vegetable?	Potato	73.3	80.9	0.508	71.3	89.0	<0.001*
Which of these food items do not have a high amount of fat?	Beaten Rice	91.1	93.6	1.00	86.6	92.3	0.054
Which of the following fat is bad fat?	Plant Ghee	50.0	74.5	0.027*	50.1	77.1	<0.001*
Which among these is the healthiest drink for children?	Milk	91.1	95.7	0.688	85.9	93.7	0.010*
How many times should children of age 9-18 years take dairy products?	5 times	13.3	42.6	0.004*	19.5	32.5	0.001*
At the most, how much salt should we take in a day?	One teaspoon	35.6	70.2	0.002*	48.8	61.7	0.007*
Which among these is correct regarding salt?	Every type of salt has same effect on the heart	14.0	87.2	<0.001*	24.0	45.5	<0.001*
How much salt does one packet of waiwai noodles contain?	900 mg	6.7	29.8	0.007*	12.9	44.6	<0.001*
How much amount of sugar should a child of 4-9 years have in a day?	3 teaspoon at most	46.7	91.5	<0.001*	61.8	87.8	<0.001*
Which among these can occur due to obesity?	Breast Cancer	6.8	21.3	0.453	11.3	22.6	0.003*
Which among these is the best way to measure obesity?	Take weight and evaluate if it is appropriate as per the height	11.1	51.1	<0.001*	19.1	43.7	<0.001*
What is a major cause of less energy, lack of concentration, headache and irritation in the children?	Excess intake of junk food	64.4	78.7	0.057	46.8	66.8	<0.001*
How large portion of vegetable should we take in a plate?	Half of the plate	52.3	53.2	0.815	29.4	47.2	<0.001*
Which among these is not counted as physical activity?	Working while sitting in a chair	86.7	91.5	0.688	79.0	86.0	0.013*
For how long should we do vigorous activity in a week (minimal)?	75 min	13.3	21.3	0.454	12.8	30.3	<0.001*

McNemar test applied *statistically significant at p<0.05
Note: the other three incorrect options in each question are not shown in the table.

several changes were made in their health educational classes: two sessions were combined into one long session so that the fellow mothers did not need to come twice; two trained peer mothers jointly gave classes instead of each of them giving separate classes; class schedules were moved to adjust for the participants' availability. Despite these adjustments, the peer mothers delivered all the components of the course.

We obtained feedback from the peer mothers on the trainers' capability, enthusiasm, friendliness,

supportiveness, etc. All peer mothers found the trainers to be very competent (66%) or somewhat competent (34%) because the trainers were experienced, and taught them in a simplified manner. The trainers were eager to teach and were able to clearly deliver their message to the mothers (absolutely: 59.6%, somewhat: 36.2%), particularly through demonstrations and a participatory approach. The peer mothers felt motivated (absolutely: 65.2%, somewhat: 34.8%) by the trainers to give classes for fellow mothers; because of which even the shy

mothers were able to speak up during class by the end of the training. The peer mothers felt that the trainers were friendly (absolutely: 80.9%, somewhat: 19.1%), supportive as well as clear and unbiased, and treated everyone in a non-discriminatory manner. The trainers repeated without hesitation any part that the participants found difficult to understand. Likewise, we obtained feedback of the fellow mothers on the quality of the educational classes that the peer mothers conducted. Approximately 90% of the fellow mothers thought that the peer mothers were: competent and able to clearly deliver their message, able to motivate them, made them participate in the class, and friendly and supportive.

Participant responsiveness: relevance and usefulness

Most mothers found the training relevant (97.9%) because this was the first training in heart-health and they were able to learn many new things. They also thought that the training was either absolutely useful (59.6%) or useful (38.3%) because they learnt about diseases that they did not know earlier as well as about healthy dietary habits. A majority of the fellow mothers thought that the educational classes were relevant (81.1%) and useful (91.7%) because they could learn new things which could prevent their children from getting non-communicable diseases.

Program differentiation

Each component of the intervention package was distinguishable from one another as the content had been clearly demarcated into various modules due to that there was no overlap or ambiguity regarding the different components and activities. Furthermore, the HARDIC intervention differed from other community-based interventions that had earlier targeted mothers and children. To date, almost all public health interventions that target women are directed towards reproductive health issues. The ones that promote child health are usually about under-nutrition rather than over-nutrition. Rheumatic heart disease is usually targeted when it comes to cardiovascular health in children. HARDIC is distinctly the first intervention that incorporates a life-course approach for overall cardiovascular health of the family, particularly of the children, through improvement of diet and physical activity.

Acceptability, satisfaction and demand

We assessed acceptability of the intervention by the peer mothers through a feedback questionnaire supplemented with class observation notes taken by the research assistants. Most of them were either satisfied (61.7%) or very satisfied (27.7%) with the training. Regarding the training environment, almost all of them found it to be enjoyable (53.2%) or absolutely enjoyable (44.7%). They attributed this to the friendly and fun environment, confidence gained to speak without hesitation, and freedom and encouragement provided during the training to share their thoughts.

Regarding timing of the training (10:30- 14:30 hours local

time), the peer mothers found it to be convenient (63.0%) or very convenient (32.6%) because they could well utilize the spare time in the afternoon. The venue of the training at Kathmandu Medical College, Duwakot was termed convenient (57.4%) or very convenient (38.3%) by the mothers because it was close to their houses.

About one-tenth of the fellow mothers were not satisfied with the educational classes. A majority of them (90.1%), on the other hand, were satisfied and thought that they learnt many new things that were important to them. The timing of the classes was convenient for the majority (83.1%) of the fellow mothers. However, timing was one of the important reasons for non-attendance by many of those who had initially shown interest but did not participate. As the fellow mothers' classes were conducted in the community after consultation with everyone, most of the mothers (91.8%) found the venue to be convenient.

Feasibility, sustainability and scaling up

Almost half (56.5%) of the trained mothers stated that they absolutely intend to use the knowledge and skills learnt in the training for applying themselves or teaching others. The rest (43.5%) were not very sure if they will use their knowledge and skills in practice. Sixty percent of the mothers mentioned that they would absolutely recommend the training to others while 37% were not sure. About half (56.5%) of the mothers were absolutely confident and another one-third (34.0%) were somewhat confident about giving classes for the fellow mothers. During round one, the peer mothers discussed potential barriers that they were likely to face while implementing the knowledge, and also came up with solutions for those barriers (Table 2). In addition, after both rounds of health educational classes were over, many of the peer mothers wanted to carry on with the classes for those who were interested. A quarter of the fellow mothers stated that they would absolutely use the new knowledge in practice, while two-thirds (69.5%) said they would probably use it. Half of them (50.2%) would absolutely and another 41.3% would probably recommend such classes to others.

Immediate impact of the intervention

Comparison of pre-test and post-test assessment of the peer mothers revealed improvement in their knowledge (Table 3). The training facilitated identification of problems and solutions by the mothers regarding implementation of the acquired knowledge in their families. The mothers felt empowered to implement the knowledge into real practice because their self-esteem had been enhanced by the training. During feedback sessions, many of the peer mothers stated that compared to the past, their children had begun to show less interest in junk food and had started to eat green vegetables; had become conscious of the amount of salt and had started to use less salt and sugar; and had taken up the habit of eating fruits on a daily basis.

A pre- and post-intervention comparison of knowledge elicited through 25 single-answer multiple choice questions

showed improved level of knowledge among the fellow mothers (Table 3). When the fellow mothers resumed for round two, which was held one month after round one with two major Nepalese festivals also falling in between, many of them shared that during the festivals, use of spicy and oily foods along with junk foods had decreased. Different varieties of vegetables were now cooked. Fruits, milk and milk products were used instead of meat products. However, it was still difficult to bring about such changes while living in a joint family whereas it was easier in a nuclear family.

In fact, many children were upset as they did not get junk food even during the festivals like they used to have every year. In many households, children were no longer provided with regular chocolates and ice cream. For example, some children no longer got sweets daily but rather once a week. Many mothers replaced energy drinks with milk. Also, for some, junk food at school was replaced by homemade healthy food which also led to substantial savings for the family. By and large, it was easier to convince older people of healthy food choices but challenging to make children understand such changes. Many mothers even started to play with their children in order to improve their children's physical activity and reduce their screen time.

DISCUSSION

To our knowledge, this is the first health promotion program conducted in Nepal on diet and physical activity to prevent CVD that targets mothers with young children. We applied the concept of peer education that has been shown to improve nutrition knowledge and dietary behaviour.¹⁵ In fact, peer education has been successfully used in rural Nepal to promote maternal and neonatal care practices.¹⁶

For our intervention, we had a good representation of different ethnic groups among the fellow mothers including the minorities who are usually less educated. On the other hand, our peer mothers were exclusively from the three main castes Brahmin, Chhetri, and Newars. On the whole, our intervention was able to reach women from different ethnic groups and education level. As in other studies, it was challenging for us to engage mothers with low income to participate in our research.¹⁷ Indeed, it was important for us to involve them into our intervention, as people from low socio economic status generally exhibit worse cardiovascular health behaviour and are likely to have poorer diet quality.^{18,19}

Our observation of strong motivation in most of our peer mothers to participate in the training with good completion rate (65% overall) is comparable to similar trials from other settings.²⁰ Only some of them with genuine problems such as health issues in the family could not complete the training. However, during education classes for fellow mothers, we noted that the fellow mothers had less motivation than the peer mothers which hampered the intervention completion rate of the fellow mothers. Even though we provided the training manual to each of

the fellow mothers along with snacks and tea during the class, the fellow mothers expected incentives for attending classes. This was the main reason for their unwillingness to attend and continue with the classes.

We meticulously developed our own education materials that included a manual, a poster, as well as three sets of flip charts. The good acceptability of such health education media as a flip chart is supported by other studies targeting behaviour changes in the rural communities of Nepal and Vietnam.^{16,21}

Furthermore, to decrease the gap between knowledge and practical application, it is important to focus on perceived barriers. We believe that our group education approach that discussed perceived barriers and possible solutions among the mothers helped create a sense of belonging to the program. Such an approach also helped the mothers to realize that their peers are also having similar problems and challenges, and that it is possible to achieve a healthy lifestyle.²² Apart from the perceived barrier for practical knowledge implementation, it is indeed important to consider the logistic barriers that can hinder attendance and participation of the mothers in the training sessions. Therefore, while planning the intervention, we gave adequate attention to common logistic barriers such as inconvenient times, need to manage childcare, and transport which is necessary to improve fidelity of the program.²³

Our training for the peer mothers went as planned without any changes. For the fellow mothers, we had initially planned to conduct the intervention in two rounds with four classes in each round. But our preliminary discussion with mothers revealed that it would be difficult for the peer mothers to gather fellow mothers for eight sessions. Hence, we reduced the number of classes to four during round one and had only one class in round two to reduce participant burden and optimize adherence to the intervention. It was more important to keep mothers motivated rather than making them exhausted by conducting too many sessions as other studies demonstrate that very intensive programs can lead to low adherence, feasibility and effectiveness.^{22,24}

We assessed immediate impact of the intervention by applying pre- and post-test of the mothers through 25 single-answers multiple choice questions. We found significant improvement in knowledge for both peer and fellow mothers. Other studies also show effectiveness of an intervention when assessed soon after implementation.²⁵ These findings also support that peer education can be applied in suburban communities to increase awareness regarding CVD. However, it is important to assess long term impact of the intervention as it is well known that the impact of an intervention decreases with time unless there are repeated interventions going on in the community.²⁶

One major strength of our study is that we have covered most of the important features of a process evaluation study.^{27,28} However, there are certain limitations as well. Most importantly, the process evaluation was conducted by

the research team who was simultaneously deeply involved in the intervention program, rather than by independent evaluators, and this may have affected the findings.

CONCLUSION

In spite of existing challenges in conducting health promotion programs in the community, the HARDIC trial, the first intervention in Nepal that incorporates a life-course approach for overall cardiovascular health of the family through improvement of diet and physical activity, exhibited an overall acceptability and good adherence by the participants. Good participation and completion rate of the training, motivation of mothers towards lifestyle changes along with significant improvement of their knowledge on diet and physical activity clearly demonstrates a positive immediate impact of the program

on the mothers. Nonetheless, medium to long-term impact evaluation of the intervention should be conducted to evaluate sustainability of these impacts. Based on the outcome of the evaluation of the intervention, health educational training as applied in HARDIC can be incorporated into the national programs targeting NCDs to address behavioural changes on diet and physical activity as a primordial prevention of CVDs.

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