



How to promote a healthy lifestyle among schoolchildren: Development of an intervention module (i-PROMISE)

Tina Rawal, Research Scientist^{a,b,*}, Onno C.P. van Schayck^b, Maartje Willeboordse^b,
Monika Arora^a, Soumyadeep Bhaumik^a, Anjali Bhagra^c, Sumit Bhagra^c, Jean W.M. Muris^b,
Nikhil Tandon^d

^a Health Promotion Division, Public Health Foundation of India, Gurgaon, India

^b Department of Family Medicine, Care and Public Health Research Institute (CAPHRI), Maastricht University, Maastricht, the Netherlands

^c Mayo Clinic, Mayo Clinic, World India Diabetes Foundation, Rochester, United States

^d Department of Endocrinology and Metabolism, All India Institute of Medical Sciences, New Delhi, India

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ABSTRACT

Objective: Lifestyle preferences are inculcated in childhood and once established, persist into adulthood. The Project PROMoting Health Literacy in School (i-PROMISE) aims to promote a healthy lifestyle among students for the universal prevention of non-communicable diseases (NCDs) like diabetes.

Study design: Qualitative study using focus-group-discussions (FGDs) and In-Depth Interviews (IDI).

Method: Project was undertaken in two-phases in two private schools in New Delhi, India. In phase-one, FGDs with students (grades IV to VIII) and IDIs with teachers were conducted to ascertain their perceptions of diabetes prevention and management according to the Health Belief Model. The data was analyzed using a thematic framework method. In phase-two, the resources were pre-tested and participants' feedback was requested on the duration, quality, and understanding of the resources.

Results: In total, 89 students and 17 teachers participated in phase-one (n = 54 [in FGDs] and n = 5 [in IDIs]) and phase-two (n = 35 students and n = 12 teachers in FGDs). In phase-one, themes that emerged included: diabetes was considered a disease of the elderly; misconceptions about susceptibility to these diseases were common; children were largely aware of measures to prevent these diseases, but barriers to adopting a healthy lifestyle existed. Based on the findings, a comprehensive module was developed, which consisted of a teacher's manual with interactive activities and short films. The resources (teacher's manual and short films) were well received and contributed to a better understanding of diabetes and other NCDs; myths/misconceptions were clarified.

Conclusion: Development of resources using participatory approach can be effective in promoting and reinforcing healthy behaviours among school going children to prevent and control NCDs in schools.

1. Introduction

In India, an estimated 77 million adults live with diabetes and the country currently has the second highest number of people with diabetes in the world [1]. Rapid economic changes and consequent urbanization and lifestyle changes mean an epidemiological transition to an increased burden of NCDs such as diabetes [2,3]. By 2030, there are expected to be 101 million adults with diabetes in India [4].

Low awareness of healthy lifestyle choices that can prevent Type 2 diabetes is a major problem [4,5]. Lifestyle behaviors are established fairly early in life, in childhood and adolescence, and once established,

they persist into adulthood [5–7]. Therefore, interventions to influence healthier lifestyles may be more effective if implemented in childhood, before unhealthy choices become entrenched in an individual's lifestyle [8,9].

It is therefore important to find an answer for the education sector in the form of a comprehensive diabetes education module that not only promotes healthy lifestyle choices to prevent or delay type 2 diabetes but also educates school children about type 1 diabetes. In India, there is a lack of awareness about the management of type 1 diabetes even among parents of children with type 1 diabetes, healthcare professionals, school staff as well as the general public [10]. Children with

* Corresponding author. Health Promotion Division, Public Health Foundation of India (PHFI), Plot No. 47, Sector 44, Gurgaon (Haryana) 122002, India.

E-mail address: tina.rawal@phfi.org (T. Rawal).

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type 1 diabetes need a supportive environment around them, especially among their friends and teachers, free from stigma or negative attitudes [11]. It is crucial that teachers facilitate a supportive environment for children with type 1 diabetes.

To our knowledge, there are few projects that focus on the management and prevention of diabetes in India. The Kids and Diabetes in School (KiDS) project [12] is one example. Following the evaluation of the KiDS project, comprehensive materials and tools were developed for students aged 9–13 years (grade IV–VIII) under the PROMoting Health Literacy in School (i-PROMiSe) project. The i-PROMiSe project aims to develop and pre-test a comprehensive intervention based on a theoretical model.

2. Methods

2.1. Theoretical framework

This study was designed taking into account feedback from an earlier study [13], conducted in schools of New Delhi, and then further developed in consultation with an expert group comprising clinicians, nutritionists, public health professionals, and health-communication experts. The need to base the module on a theoretical model of health promotion was a key input. The Health Belief Model (HBM) was considered appropriate because it matched our goal and focussed on the prevention of risk factors (Unhealthy diet and physical inactivity) related behavior initiation by taking into account both individual perceptions, external cues to action, and individual self-efficacy. The HBM focuses on four constructs: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. The success of the HBM has been well documented in childhood diabetes interventions and especially in lower-middle-income countries (LMICs), proving that it is an appropriate model for intervention development [14,15].

2.2. Participants

Earlier studies conducted in New Delhi reported a significantly higher prevalence of overweight and obesity among students of private schools in the focus age group compared to government (public) schools [16]. Therefore, we sent invitations to private schools in New Delhi and two schools agreed to participate in the study. Following the consent received from these two schools, students of grade IV - VIII (9–13 years) were recruited to participate in focus group discussions (FGDs) in consultation with the school authorities using convenience sampling and based on the received consent from their parents. Parental consent and informed consent were obtained from the students. Class teachers of grades IV - VIII, and teacher coordinators in the participating schools were nominated by schools for unstructured in-depth interviews (IDIs) and consent was also obtained.

2.3. Phase 1

FGDs with students and IDIs with teachers were held in the school on the topic guide, that was based on the HBM (Annexure I, II, and III). The duration of FGDs and IDIs was 35–40 min. The topic guide was developed based on the HBM constructs, and then an iterative approach was followed whereby, if additional issues were discovered, they were explored and probed for in subsequent IDIs and FGDs. FGDs with students were conducted in two groups (one with each grade): grade IV–V (n = 2; aged 9–11 years) and VI–VIII (n = 3; aged 11–13 years). In total, there were 54 participants (29 boys and 25 girls) in five FGDs and five IDIs. The FGDs and IDI were led by two authors (TR, female and SB, male), who are experienced in qualitative research and worked primarily in English (Hindi was occasionally used for the convenience of the participants). Data saturation was observed in the sense that answers for most themes were repeated during subsequent discussions. Therefore, no repeated interviews were conducted. All interviews were audio-

recorded. No one other than the participants was present during the FGDs and IDIs.

2.4. Phase 2

Based on the results of the first phase, two short audio-visuals (informative short films) and a manual of interactive classroom activities were developed and pre-tested in the same two private schools. Five separate FGDs were conducted with 35 students (16 boys and 19 girls) and 12 teachers. The duration of each FGD varied from 40 to 45 min. Separate FGD guidelines were developed to obtain feedback. Students were shown the draft of the film before the FGDs, and teachers were given the manual a day before and the informative short film before the FGDs.

2.5. Data analysis

The recorded FGDs and IDIs were transcribed verbatim. Each transcript was assigned a confidential identification code. In phase one, all transcripts were coded independently by two authors. These codes were then defined and grouped into categories to align with the HBM. In phase two, two authors independently coded all transcripts. A framework was then derived from this based on consensus and the transcripts were coded accordingly. Themes were then finalized in consultation with the principal investigator. Although the findings are presented under distinct thematic categories to facilitate interpretation, these are not very strict descriptions as participants often spoke about multiple themes at the same time. Atlas.ti 6.2 (release 2011, Atlas.ti, Berlin) was used for the thematic analysis.

3. Results

3.1. Phase 1 of the study

Responses obtained from FGDs and IDIs in phase one, are presented in Table 1.

3.1.1. Perceived susceptibility to diabetes

Perceived susceptibility was discussed concerning the participant's notion about the risk of developing diabetes in relationship to age, gender, and socio-economic status (SES) of the individual. The majority of participants considered diabetes to be a disease that only affects older people and has serious consequences. Most children related diabetes to their own experiences with older relatives (mostly grandparents). Few students talked about the experiences of their friends and young relatives with diabetes. Very few teachers were aware of diabetes in younger populations.

“More aged people will be more affected” – Children-FGD

“It occurs mostly in the aged people” – Teacher-IDI

Table 1
Constructs of HBM and themes emerged in phase 1.

Health Belief Model Construct	Themes
1. Perceived threat	1.1 Perceived susceptibility to diabetes (Participant's defined causes, risk factors) 1.2 Perceived severity (Awareness about symptoms and consequences of diabetes)
3. Perceived benefits and barriers	2.1 Perception towards adopting a healthy lifestyle (including barriers; lack of motivation, complex lifestyle)
4. Self-efficacy	3.1 Self-efficacy to adopt healthy lifestyle
5. Cues to action	4.1 Experience/association with people with diabetes and source of information 4.2 Intervention perceived to be effective to promote a healthy lifestyle

“Young people are affected but between 35 and 50 years, this disease starts.” – Teacher-IDI

Some teachers linked the development of diabetes to an individual's SES and lack of physical activity in daily living. These teachers believed that people belonging to middle to high SES are at high risk of developing diabetes. Few participants were not even sure about the fact that diabetes can occur in anyone, regardless of gender.

“I feel people who are socially or economically low in criteria and those who are earning their livelihood through vigorous physical activity like rickshaw puller, domestic help have fewer chances of developing diabetes.” – Teacher-IDI

“Diabetes occurs as per age and gender of a person i.e., if the person is in the mid-40s and male they can have diabetes.” – Child-FGD

3.1.2. Perceived severity

Some of the participants perceived the consequences and complications of diabetes as very serious disease as they were aware of them. The vague knowledge of multi-morbidity, together with the need to take a large number of medicines as a result, was also identified as a cause of concern.

“My mother is now 65 and has developed diabetes which is affecting her kidneys so now she is having medicine for both.” Teacher-IDI

“I have heard somewhere it affects our eyes and causes harm to our body.” – Child-FGD

The majority of the participants were not aware of the relevance of the type of diabetes. Very few children mentioned it.

“I don't know much about the type of diabetes , for more details, I have to search as not much aware about it”. Teacher-IDI

Misbeliefs about diabetes susceptibility were common among the participants. Most children associated diabetes with eating sugar and were unsure about the risk factors of diabetes. However, some children and teachers appeared to be aware.

“Diabetes is caused by eating sweet things. A lot of sweet and sugars.” Child-FGD

Many students were curious about the pathology of diabetes and its connection to other lifestyle diseases.

3.1.3. Perceptions towards adopting a healthy lifestyle

Almost all participants highlighted the importance of adopting a healthy lifestyle and shared their personal experiences. Children were largely aware of measures to prevent diabetes but highlighted that barriers exist e.g. lack of motivation for children to perform physical activity and eat healthy food. A teacher during the IDI of phase one said: “*In the curriculum, we don't touch upon the details of these lifestyle diseases. Also, I have seen students get pizzas or burgers for lunch and a pack of juice.*”

Both teachers and children mentioned academic pressure as one of the barriers to being physically active and the unavailability of healthy food in the school canteen.

“In India in most of the schools, we give more importance to education rather than physical activities.” Teacher-IDI

“Study pressure should be decreased and due to pressure, we don't feel like playing.” Child-FGD

Few children thought that adults are not following healthy lifestyles because of their busy schedules and increasing dependence on technology. Some teachers also mentioned the increasing use of technology among children as a major barrier.

“Because everybody is busy in their life to earn more money and occupied with only phones.” Child-FGD

“Children are hooked on to video game. Young children might not be on Facebook, but they are there on WhatsApp. And the computer games.” Teacher-IDI

3.1.4. Self-efficacy

Participants have shown a sense of self-efficacy towards the importance of being physically active and following a healthy lifestyle. They also highlighted ways to overcome barriers, such as making High Fat, Sugar and Salt (HFSS) foods less available and choosing easier ways to be active, e.g., taking the stairs instead of the lift; using technology in a positive way instead of playing video games, home-made food instead of canteen food.

“.. because they might live in a hostel or go out for higher studies. They will eat whatever is available there. But yes, a conscious effort has to be made to eat healthy food.” Teacher-IDI

“Children should eat a balanced healthy diet.” Child-FGD

“Children are sitting in front of the TV. They are in the trap of technology. They are not using technology for good or benefit but disadvantageous for them.” Child-FGD

3.1.5. Experience/association with people with diabetes and source of information

The source of information on diabetes varied: teachers cited the internet as the primary source of information, while children tended to see adults as the primary source of information. A teacher shared the experience of a child with diabetes at school and expressed concern about the child's poor attendance due to physical weakness.

“She is a very nice and well-behaved kid but her attendance is very low. I feel she is physically very weak also and that's why her attendance is very poor.” Teacher-IDI

3.1.6. Intervention perceived to be effective in promoting a healthy lifestyle

Most teachers suggested that resources are needed to educate in school about unhealthy lifestyles and related diseases. Their suggestions included organizing a workshop for teachers and children; developing short films, cooking sessions with parents.

“Whatever is required to know about diabetes is not talked about. Why can't we give students the required information once a week? If we make it a habit the students go on to adopt it for life.” Teacher-IDI

“I think we can make short movies and can be shown in the schools through smart boards. I always think that visual aid is more effective.” Teacher-IDI

Some children suggested the use of animated videos (cartoon) to attract more attention, while others mentioned the need for workshops, community-engagement, and the inclusion of activities.

3.8. Phase 2: Development and pre-testing of intervention

Following the results of phase one, informative and teaching-learning material were developed, which were reviewed by a technical expert group including nutritionists, public health, and communication specialists.

A short animation film was developed for screening in class. It focused on reinforcing healthy lifestyle practices through a character named Super Kid Aryan (see Fig. 1).

An informative short film was developed for teachers on NCDs including diabetes, its prevention, and management. A renowned



Fig. 1. Glimpses from video developed for students.

endocrinologist was used as a resource (see Fig. 2).

A teacher’s manual (see Fig. 3) was developed with interactive theme-based activities, comic strips, information on the type, risk factors, consequences, management and prevention of diabetes, region-specific food preparation options to promote healthy eating, and guidelines for schools to promote regular physical activity/exercise and healthy eating.

The developed videos (supplementary file) contain sections on debunking diabetes myths.

The intervention was then pre-tested in the same two private schools in New Delhi. The developed intervention components were shown to the students and teachers and their feedback was sought through FGDs on the length, quality, understanding, and interpretation. The feedback could be grouped into three themes: satisfaction, awareness, and suggestions.

3.9. Satisfaction with the intervention

Intervention components were appreciated and well-received by participants. They found it much needed and important to fill gaps in knowledge. According to the children, the inclusion of information on healthy eating habits and recipes provides them the opportunity to discuss these topics with their parents and reinforce the concept at home. The teachers found the content of the video and manual simple, clear, and easy to understand. They found that the information is presented in an attractive, informative, and child-friendly way.

“It is quite informative, and it will encourage children to adopt a healthier lifestyle and they will become more conscious about their health.” Teacher-FGD

“Manual is quite informative. Activities are good and merges well with the curriculum.” Teacher-FGD

“People could relate to film. It was easily understandable. The video is useful for person who could not read also.” Child-FGD

3.10. Raised awareness/Reinforcement of information

After watching the video, teachers reported that their knowledge of NCDs, especially diabetes, had improved. Teachers were made aware of their role in dealing with children with diabetes. Teachers stressed that including cartoons in the manual is a good approach to capture student’s attention.



Fig. 3. Teacher’s manual.

“Awareness was created among the teachers also. It was shown that this disease not only occurs among adults, but even children are also affected by this disease. Therefore, it is important to sensitize children and their parents also.” Teacher-FGD

The students stressed that the intervention emphasised the need for lifestyle changes to escape the threat of diabetes.

3.11. Suggestions of the participants

Both groups suggested adding an important myth that diabetes is caused by eating too much sugar, with the accompanying facts. Children suggested including information about how insulin works in the children’s video. Few felt that for better understanding the intervention should be adapted in Hindi for the rural population. One teacher

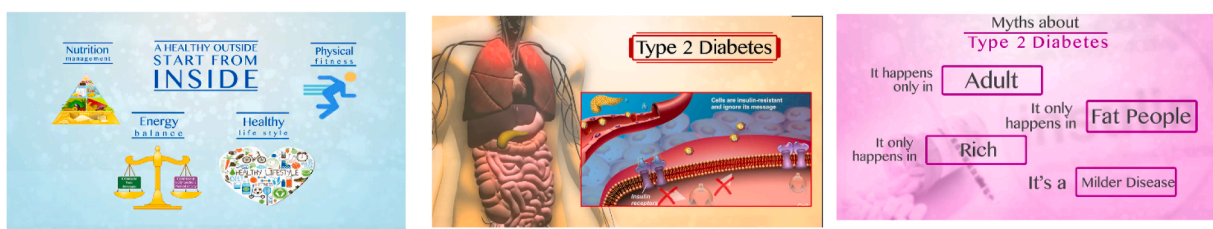


Fig. 2. Glimpses from video developed for Teachers.

suggested including a case study of a person living with diabetes.

“It should be shown to all kinds of school, rural and urban Delhi, in private and government schools and can be modified accordingly.”
Child-FGD

Most of these suggestions were incorporated into the intervention. A separate video was developed for VII–VIII grade children, with additional information on the pathology of diabetes. Some suggestions, such as the adapting the intervention in Hindi and including a case study will be considered in the next phase.

4. Discussion

The results of the first phase highlighted the easy availability and accessibility of unhealthy food items and technological resources, including mobile and computer-based games, as risk factors for adopting an unhealthy lifestyle. Lack of knowledge and motivation were also seen as serious concerns and barriers. Regular reinforcement of messages focusing on the importance of physical activity and healthy eating habits was considered important for preventing or delaying NCDs in later life. Findings of phase two showed that the intervention was effective in conveying the importance of healthy lifestyles and are consistent with the literature that HBM is an effective framework for developing health interventions [17,18]. Components such as the organisation of sessions and the development of interactive resources were considered effective media for sensitization, when participants perceived NCDs, especially diabetes, as a disease that occurs only in the elderly and has serious consequences.

The findings indicate that the methodology of the present study was useful in obtaining input from students and teachers and gauging their perceptions to guide the development of resources/tools, which were ultimately based on the recommendations of the earlier study [13]. Perceived severity and susceptibility have been reported previously as the most influential constructs among the younger age group [19].

Regarding perceived susceptibility in relation to age, gender and SES, participants recounted their own experiences of dealing with such lifestyle diseases, especially in relation to elderly family members. Most participants associated diabetes with people with higher SES and the elderly. The views were similar to a finding from a study in Indonesia, conducted to explore the community's general perceptions of diabetes and its risk factors, which have shown that diabetes affects wealthy people and is considered a familial disease [20].

Adopting recommended health behaviors was discussed and participants demonstrated self-efficacy by sharing ways to improve practices to lead a healthy lifestyle. Thus, there was a reinforcement of the messages that were considered important to be confident in adopting a healthy lifestyle that would result in an improvement in overall health [21]. Most participants indicated the importance of being physically active and eating healthy as key to overall health. However, other risk factors discussed, including attractive advertising and the promotion of unhealthy foods, were considered the barriers, especially for children in grades VI–VIII. Similar findings were reported in other studies of adolescents [22,23].

The participants suggested that the message was considered more relevant and effective when it came from experts or through teachers. Results from a previous study have shown that teacher engagement can be more effective than information-only messaging in improving healthy living habits [24]. Attractive and captivating messaging is an essential component of health communication and promotion [25]. The study found that teacher-led messaging can increase the relevance and credibility of the message relevance, although for some participants the use of experts to attract attention along with organizing workshops and developing audio-visual aids are important.

The majority of participants cited as sources of information on NCDs: teachers, media channels, parents, and grandparents. At the same time,

the findings pointed to the need to develop innovative resources to emphasize the importance of practicing healthy behaviours, which are in line with other studies and highlight the need to raise awareness among adolescents at an early age to prevent or delay NCDs [26].

Understanding messages is a prerequisite for processing messages and acceptance to perform a behaviour. Individuals also need to understand what that behaviour is. Feedback obtained in phase two of the study indicated that the tools developed can regularly reinforce the adoption of healthy practices. Therefore, messages were designed to communicate and reinforce strategies for dealing with the barriers listed. Results from another study also showed the value of approaches to reducing exposure to risk factors associated with NCDs and promoting healthy living practices through tailored interventions [22].

Pre-testing showed that participants were satisfied with the developed interventions in terms of content and presentation. Teachers were informed of their role in delivering the intervention and contributed enthusiastically to provide input.

This study used the HBM to develop an appropriate intervention to promote the importance of adopting healthy lifestyles through short informative films for students and teachers including interactive activities and an animated component (cartoon) for the student. The latter is novel in the promotion of preventive messages.

4.1. Strength and Limitations

Participants reported an increase in knowledge about NCDs; however, future studies should focus on assessing the impact of this intervention. Using qualitative methods such as FGDs and IDIs to explore the type of intervention to promote healthy lifestyles may elicit socially desirable responses. Therefore, FGD and IDI guides were designed and conducted to obtain detailed information, and the analysis was conducted independently by two trained researchers. The sample group was small and recruited using convenience sampling therefore, findings may not be generalizable to other parts of India. The findings of this study provide valuable insights i.e. prevention-oriented interventions and strategies that are based on behavioural theory can be used to promote preventive messages. In the study, lack of knowledge and motivation is reported as a serious concern and barrier to adapting healthy living practices. Thus, regular reinforcement of messages using such innovative strategies is an important factor in preventing NCDs.

4.2. Implications

The school environment has the potential to impact NCD-related behavioural change in children and adolescents. Educational resources to advance health literacy in school-going students can encourage healthy eating and have long-term implications later in adulthood. Positive feedback from the participant of this study suggests that interactive modules including short films and follow-up interactive activities can be effective in promoting a healthy lifestyle among children and adolescents in schools. Such programs may be further strengthened by involving parents to reinforce the health messages at the home and community level. Further evaluation (e.g. RCT) of the intervention using a representative sample can be useful to assess its effectiveness and up-scaling it further at the regional and national levels. Along with such interventions, there is a need to strengthen policies for fostering an enabling food environment in and around the school for the student of this age group to be motivated for being physically active and eat healthy food.

5. Conclusion

Evidence-based interventions are seen as best practices to promote the adoption of healthy lifestyles. However, there are few published prevention-oriented interventions and strategies that are based on behavioural theory and scientific evaluation. This study fills an

important gap in the literature. The findings provide valuable insight into possible messages and strategies that can be used to promote preventive messages among children and adolescents in schools. These include the use and reinforcement of simple messages through intervention including informative short films and interactive activities as strategies to address the problem. Positive feedback from the target audience including school-going students suggests that interactive modules to promote healthy behaviours fill an unmet need and can be effective in improving the perception of NCDs in schools.

Ethics statement

The study was approved and supervised by the institutional ethics committee of the Public Health Foundation of India (TRC-IEC-355/17). Permission was also sought from the school principal of the schools. Written informed consent obtained from all teachers and parents of the children. Written informed assent was obtained from the participating children, giving them the right to refuse participation even if their parents had given consent.

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Data availability statement

The data presented in this study are available on request from the corresponding author.

Authors' contributions

MA, SOV, MW, AB, SB, and TR conceptualized the study design. MA, SOV, and TR led the implementation of the study. TR and SB collected and organized the data and wrote the manuscript. SOV, MW, MA, JM, and NT critically revised the manuscript for intellectual content. All authors approved the final manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

None to declare.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.puhip.2022.100262>.

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