Health education on diabetes and other non-communicable diseases imparted to teachers shows a cascading effect. A study from Southern India

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A B S T R A C T

Aims: The aims were to assess effect of a short training programme on non-communicable diseases (NCDs), particularly diabetes on school teachers and also on students who were in turn educated by them. Lifestyle changes made by both groups were assessed 6 months later.

Methods: Graduate teachers (n = 1017) from 2 districts in Tamilnadu, India were trained using audio visual aids in batches of 100, on healthy lifestyle practices, prevention and management of diabetes. Pre and post training knowledge scores were assessed using questionnaires. Each teacher was requested to impart similar education to 100 high school students within 3 months. Impact of the training on teachers and students was assessed using questionnaires 6 months later. Feedback from the students’ parents was also collected.

Results: A total of 1017 teachers (men: 33.8%, women: 66.2%, urban: 68.8%, rural: 31.1%) were trained. Among them, 651 (men: 31.3%, women: 68.7%) responded for impact evaluation. Changes in knowledge and attitude were reported by 93.7% of teachers. Improvement in lifestyle of the students was assessed by 587 teachers, 60.4% of the students avoided junk foods, 57.5% advised their family members on diabetes. Outdoor games were played by 50.8% of the students. Improvement in knowledge, changes in lifestyle and a positive attitude towards health care delivery were achieved among teachers and students through this training programme.

Conclusions: Significant improvement in health perception among the teachers and students occurred even with a short training. It has demonstrated that non-medical personnel like teachers are efficient in disseminating health information on lifestyle diseases especially diabetes.

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1. Introduction

Diabetes is a global epidemic of the 21st century and it is increasing rapidly. India has 69.2 million people with diabetes positioned second among the top 10 countries in the world with huge numbers of people with diabetes. The number is expected to increase to 123.5 million by 2040 [1]. Rapid urbanization and industrialization have triggered an enormous rise in the prevalence of the disease. Modernization and adoption of western culture particularly in the diet pattern is evident more markedly among the youth and the student population. Poor dietary patterns and sedentary lifestyle have contributed significantly to the epidemic of childhood overweight and obesity [2–6]. Intake of high calorie diet such as pizza, burger, cola, ice-cream has increased and sedentary behavior has caused decrease in physical activity [2]. Children spend more time on computers and watching television which has resulted in a reduction in exercise and development of overweight or obesity [3]. To overcome the adverse effects of unhealthy lifestyle, there is a need to increase the awareness about diabetes and other lifestyle diseases. Awareness about diabetes and its complications are also low even among persons with this condition [7]. In a population based survey conducted in Chennai, only 23% of the persons with diabetes, self reported to have known that diabetes could lead to foot problems, while only 5.8% knew that it could cause a heart attack [8].

Therefore there is an urgent need to improve awareness about diabetes and other non-communicable diseases (NCDs) among the public, including adolescents and children. Strategies to spread the knowledge need to be worked out to suit the social and cultural background of the population. To enhance the quality of health care services in current health system, the Ministry of Health & Family Welfare, Government of India had launched in 2008, the National Program for prevention & control of Cancer, Diabetes, Cardiovascular diseases & Stroke (NPCDCS) [9]. This programme has been implemented in 21 states of India. India Diabetes Research Foundation (IDRF) was one of the five nodal centers identified to implement the programme. School based health promotion activities are also carried out under NPCDCS programme. It is possible that teachers can impart knowledge among school children on healthy lifestyle practices, prevention of diabetes and obesity by educating them on behavioral/lifestyle changes related to diet and physical activity.

We conducted a short training programme on awareness of diabetes and other NCDs for school teachers and advised them to educate students on these aspects. We assessed its impact on them and among the students. School teachers were selected from two different locations; Chennai (urban) and Thiruvallur (peri-urban and rural) districts, in Tamil Nadu, Southern India. This programme is a step to improve the awareness and knowledge of school teachers and students on diabetes, hypertension and cardiovascular diseases in urban and rural parts of Tamil Nadu.

Considerable concern exists about the rising prevalence of type 2 diabetes among adolescents and children, particularly among the south Asian children [10].

This paper describes the training given to teachers to impart health education to school children and also its impact evaluation both among teachers and children.

The training programme was done with the following objectives:

1. To educate teachers of high schools in an urban and rural setting on diabetes and other associated NCDs by conducting seminars/workshops.
2. To inculcate healthy lifestyle habits in children by focused education imparted through trained teachers, whereby NCDs can be prevented or controlled in the population.
3. To evaluate the impact of training among the teachers and students by assessing improvement in knowledge and initiating and practicing behavioral changes.

2. Materials and methods

The programme was conducted from August 2012 to November 2013. It was intended to train 1000 high school teachers; 500 teachers each from Chennai and Thiruvallur districts. Each teacher was instructed to educate 100 high school students thereby 100 thousand (1 Lakh) students could be trained. In turn, each student was expected to impart knowledge to at least two family members.

Permission from the department of school education and the school authorities were obtained to invite the teachers for the programme. Batches of 100 teachers were invited for each training session which lasted for a day from 9 AM to 5 PM. The contents of the training modules (2 in numbers) are shown in Tables 1 and 2. The faculty consisted of educators and each session lasted for 120 min with ample time for interaction by the participants. In the city, the teachers attended the training at the Department of School Education, state training centre whereas in the rural areas, the faculty conducted the sessions in the district headquarters training centre. During the training sessions, pre and post training knowledge levels of the teachers on various aspects of diabetes and healthy lifestyle were assessed using questionnaires. Each teacher was instructed to educate 100 high school students within a period of 3 months using the education materials provided by IDRF. The teachers were also requested to come back to the training center 3 months later, for an impact evaluation which was done using a questionnaire. The questionnaire included particulars on how the training helped them change their lifestyle by initiating and maintaining healthy behavior. They are also asked on how many students were given education, on the number of students who had made changes in their lifestyle practices including diet and physical activity, whether their knowledge on diabetes was shared with their family members and about their participation in the prevention and awareness of diabetes. These filled-in questionnaires were returned to the investigators when the teachers reported for their impact evaluation. The evaluating team from IDRF had an interaction with the trained teachers.
Table 1 – Contents included in the training module 1 (basic facts on diabetes).

- Introduction about diabetes
- Burden
- What is insulin, function of insulin in normal and persons with diabetes
- Insulin resistance
- Classification (Type 1, Type 2 and Gestational diabetes)
- Risk factors (modifiable and non-modifiable)
- Symptoms
- Diagnosis of diabetes [WHO diagnostic criteria (OGTT and HbA1c)]
- Complications (acute and chronic)
- Hypoglycaemia and Hyperglycaemia
- Management of hypo and hyperglycaemia
- Long term complications (micro and macro vascular complications)
- Treatment and management of complications
- Prevention

Figs. 1 and 2 show the details of the teachers’ training and the impact evaluation of teachers and students respectively.

2.1. Statistical analysis

Mean value and standard deviation of age and years of service of the participants were calculated. Details of gender, age, educational qualification, type of school (government or private) and geographical distribution of the schools were noted. For statistical analysis the groups were categorized as urban and rural (Peri-urban & Rural). Median and inter quartile range of the pre and post training knowledge scores were compared using Wilcoxon Signed Rank test. Comparison of the scores between the urban and rural participants were done using Mann–Whitney test.

3. Results

In this training programme, 1017 (male 344(33.8%): female 673(66.2%)] teachers participated. Among them 572(56.2%) were from government and 445(43.8%) were from private schools. The mean age of the participants was 39.5 ± 10.3 years and the mean duration of their teaching experience was 10.2 ± 8.0 years. All the participants were qualified with minimum of bachelor’s degree and 786(77.3%) teachers qualified with master’s degree. Majority of the participants [700(68.8%)] were from urban and rural [n = 222(21.8%)] areas and the remaining were from peri-urban areas (9.3%) (Table 3). Because the small numbers, peri-urban was combined with rural for analysis.

The teachers’ knowledge on diabetes was assessed using the same questionnaire before and after the training programme. Complete data was available only for 962 of the 1017 teachers trained, the remaining 55 questionnaires that were incomplete were not taken for the analysis. Knowledge levels on general awareness, treatment and complications improved significantly after the training (p < 0.0001) (Table 4). The median score (inter quartile range) improved on all aspects both among the urban and rural persons. Post training score on general aspects improved better among the rural persons (p < 0.0001). Pre training scores were lower on the treatment, among the rural group (p < 0.035).

Similarly, the knowledge levels of the students were assessed by the teacher using the same questionnaire before and after the education was imparted. Of the expected 100,000 students who received training, only 62,000 questionnaires were returned to the center by the teachers. Of this only 29,952 questionnaires had complete filled-in data of the pre and post education sessions and were suitable for the analysis.

The students knowledge levels on general awareness, risk factors and management of diabetes improved significantly after the training (p < 0.0001). The median score (inter quartile range) improved from 6(3–8) to 8(7–10) in general awareness, 2(2–4) to 5(3–8) regarding risk factors of diabetes and 3(2–4) to 8(5–11) on the management of diabetes (Table 5).

3.1. Impact evaluation of the teachers training

All the trained teachers (n = 1017) were invited to participate in an impact evaluation programme. Among them only 651 (64.0%) participants (432(66.4%) from government schools and 219(33.6%) from private schools) had responded and most of them were from the urban areas. There was a predominance of female teachers 447(68.7%). The distribution of mean age, qualification, years of service and the geographical area of those who responded were similar among the responders and non responders and therefore the numbers of teachers who responded for impact evaluation were representative of the trained group.

The impact of the training was demonstrated through the following actions. Maximum number of the respondents (97.1%) felt the training was useful and effective. It had significantly improved their knowledge on healthy lifestyle practices. The training had changed the health perception among 93.7% of the teachers, 76.3% started practicing healthy dietary habits, 60.7% had increased their physical activity levels and 44.2% started doing yoga and meditation (Fig. 3, Panel 1). Ninety-six percentage of teachers disseminated the knowledge gained in the training to their colleagues and students. Fig. 3, Panel 2 shows the aspects of healthy lifestyle practices shared with their colleagues. A large percentage of teachers (82.5%) emphasized on healthy food habits and on the benefits of improving physical activity (63.6%). Awareness
creation was done by 46.2% and 47.2% on complications of diabetes.

The teachers were then assigned the task of teaching 100 students each, on prevention and management of diabetes and also advised the students to share the knowledge with their parents and family members. Among them, 65.6% of the teachers emphasized more on reducing use of fats and fried foods, 59.6% stressed on taking healthy diet, 56.4% developed positive attitude towards the disease and 53.9% explained the need for reducing weight or maintaining ideal body weight and healthy diet principles. Principles of prevention of diabetes were also stressed by 37.4%. The need to have healthy diet by the students was stressed by 74.2% teachers, 70.8% participants wanted the students to increase physical activity and 52.8% felt the need to create awareness on healthy life among the students and their families.

Table 2 – Contents included in the training module 2 (Healthy lifestyle).

- The changing scenario in communicable and non-communicable diseases in the society
- Various lifestyle factors
- Determinants of healthy and unhealthy lifestyle
- Change in lifestyle (gains and losses)
  - Healthy and unhealthy diet
  - Physical activity and sedentary lifestyle
  - Stress free and stressful life
- Childhood obesity and its epidemic
- Lifestyle modification
- Factors to avoid and to adopt for a healthy lifestyle
- Dietary guidelines (foods to avoid, restrict and include)
- Demonstration of food guide pyramid
- Meal planning
- Obesity and diabetes and other non-communicable diseases
- Exercises (aerobic and anaerobic exercise) and benefits of regular exercise
- Exercise programme (type, intensity, frequency and duration)
- Walking tips
- Stress management
- Prevention of diabetes and other non-communicable diseases through healthy lifestyle

Fig. 1 – Flow diagram showing the details of the teachers’ training programme.
Each of the 1000 teachers trained by IDRF educates 100 students (n= 100000), using education materials provided by IDRF

Pre-Training assessment of the students’ knowledge on diabetes by the teacher using questionnaire

Interactive education session by each teacher for 120 minutes

Post- training knowledge assessment of the students by the teacher using the same questionnaire

Each student was instructed to impart their knowledge with their family members (i.e., 100 thousand families)

Impact of training- Students (n= 29952)
Impact evaluation of the students’ knowledge, attitude, and behavior were self-reported by the students on a questionnaire supplied through the teachers, 3 months following the educational session.

Impact of training- Teachers (n=651)
All the trained teachers were called back 3 months later to assess the impact of the training, of which only 651 responded. They returned the pre and post knowledge questionnaires of trained students and also submitted their assessments of the behavioral changes made by the students.

Fig. 2 – Flow diagram showing the impact evaluation of the students and teachers.

Table 3 – Demographic characteristics of the trained teachers and those who responded for the impact evaluation.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Training n = 1017</th>
<th>Impact evaluation n = 651</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>344</td>
<td>33.8</td>
</tr>
<tr>
<td>Female</td>
<td>673</td>
<td>66.2</td>
</tr>
<tr>
<td>Qualification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree-1 (UG/PG)</td>
<td>117</td>
<td>11.5</td>
</tr>
<tr>
<td>Degree-2 (1 + B.Ed., M.Ed)</td>
<td>786</td>
<td>77.3</td>
</tr>
<tr>
<td>Degree-3 (2 + M.Phil, PhD)</td>
<td>114</td>
<td>11.2</td>
</tr>
<tr>
<td>School</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>572</td>
<td>56.2</td>
</tr>
<tr>
<td>Private</td>
<td>445</td>
<td>43.8</td>
</tr>
<tr>
<td>Geographical area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>700</td>
<td>68.8</td>
</tr>
<tr>
<td>Peri-urban</td>
<td>95</td>
<td>9.3</td>
</tr>
<tr>
<td>Rural</td>
<td>222</td>
<td>21.8</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>39.5 ± 10.3</td>
<td>41.6 ± 8.5</td>
</tr>
<tr>
<td>Years of service</td>
<td>10.2 ± 8.0</td>
<td>10.7 ± 7.7</td>
</tr>
</tbody>
</table>
This paper describes a newer strategy of imparting health interest to disseminate knowledge with their colleagues, had beneficial impact on improving knowledge and in creating training programme was conducted for a short duration, it and healthy lifestyle lasted for 120 min each. Although, the benefits of healthy diet and increased physical activity. and physical education teachers who were able to clearly applications of diabetes and other NCDs. Improvement in knowledge was significant and was observed among both genders and in urban and rural participants. This could be due to the fact that all those trained were science graduates and physical education teachers who were able to clearly understand the metabolic changes involved in diabetes and the benefits of healthy diet and increased physical activity.

The session on diabetes, its prevention and management and healthy lifestyle lasted for 120 min each. Although, the training programme was conducted for a short duration, it had beneficial impact on improving knowledge and in creating interest to disseminate knowledge with their colleagues, students and family members. This was also evident in an earlier short term training programme conducted by IDRF for the primary care physicians in improving knowledge and in creating enthusiasm to improve diabetes care and awareness [11]. Another programme had also demonstrated the benefits of short training programme in training primary care physicians in a community eye screening programme [12].

Majority of the participants considered the training as a useful programme, which had changed their overall health perception. Initially the teachers did not consider health care as an important component in their profession, but after completion of the training they realized their role in health care education and also the importance of self-management and care with regards to NCDs. Many participants felt the programme was short and preferred to have a detailed training on NCDs. They also felt, that the programme should be extended to non-teaching school staff as well. Majority of teachers started practicing healthy eating habits and increased their physical activity levels. Some of them had started practicing yoga and meditation. All the teachers shared their knowledge with their colleagues and students. To disseminate the knowledge gained at the training, the participants requested to provide a compact disc containing the training materials. Interest was evinced by 46.2% in creating awareness on diabetes. Primary care physicians trained by IDRF in an earlier training programme also showed keen interest in enhancing awareness about diabetes among their teammates, professional associates and the general public [11]. Teachers stressed the need on reducing fats and fried foods, and maintaining ideal weight and healthy diet principles. Maintaining a positive attitude and prevention of diabetes were also stressed.

Only 64.0% teachers responded for impact evaluation. Majority of the participants who responded were from government schools in the urban areas. Few private school teachers had quit their jobs and few government school teachers were transferred to other areas, and the IDRF team was not able to communicate with the teachers regarding the impact evaluation programme. Hence, those teachers were unable to attend the impact evaluation programme. The mean age, qualification, years of service and the geographical area of the teachers who responded were similar among the responders and non responders and therefore the numbers of teachers who responded for impact evaluation were representative of the trained group.

### Table 4 – Distribution of knowledge scores of the teachers before and after the training programme.

<table>
<thead>
<tr>
<th>Module</th>
<th>General (n = 962)</th>
<th>Male (n = 327)</th>
<th>Female (n = 635)</th>
<th>Urban (n = 645)</th>
<th>Rural (n = 317)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-training</td>
<td>Post-training</td>
<td>Pre-training</td>
<td>Post-training</td>
<td>Pre-training</td>
</tr>
<tr>
<td>Total</td>
<td>16 (13–18)</td>
<td>18 (16–20)</td>
<td>15 (12–17)</td>
<td>18 (15–19)</td>
<td>16 (14–19)</td>
</tr>
<tr>
<td>Male</td>
<td>15 (12–17)</td>
<td>18 (15–19)</td>
<td>16 (14–19)</td>
<td>19 (16–20)</td>
<td>16 (13–18)</td>
</tr>
<tr>
<td>Female</td>
<td>16 (13–18)</td>
<td>18 (16–20)</td>
<td>16 (13–18)</td>
<td>18 (15–20)</td>
<td>16 (13–18)</td>
</tr>
<tr>
<td>Urban</td>
<td>16 (13–18)</td>
<td>18 (16–20)</td>
<td>16 (13–18)</td>
<td>18 (15–20)</td>
<td>16 (13–18)</td>
</tr>
<tr>
<td>Rural</td>
<td>16 (13–18)</td>
<td>18 (16–20)</td>
<td>16 (13–18)</td>
<td>18 (15–20)</td>
<td>16 (13–18)</td>
</tr>
</tbody>
</table>

Scores – Median values (Inter-quartile range).  
* Pre-test vs post-test p < 0.0001 (Wilcoxon Signed Rank test).  
** Urban vs rural p < 0.035 (Mann–Whitney test).

### Table 5 – Knowledge scores at the pre-training and post-training assessments of the students.

<table>
<thead>
<tr>
<th>Modules (Maximum score)</th>
<th>Students (n = 29,952)</th>
<th>Pre-training</th>
<th>Post-training</th>
</tr>
</thead>
<tbody>
<tr>
<td>General (10)</td>
<td>6 (3–8)</td>
<td>8 (7–10)</td>
<td></td>
</tr>
<tr>
<td>Risk factors (9)</td>
<td>2 (2–4)</td>
<td>5 (3–8)</td>
<td></td>
</tr>
<tr>
<td>Management (12)</td>
<td>3 (2–4)</td>
<td>8 (5–11)</td>
<td></td>
</tr>
</tbody>
</table>

* Pre-test vs post-test p < 0.0001, Wilcoxon signed Rank test.
We were able to motivate the teachers to train their students, create diabetes awareness among other teachers and students. Few physical education teachers had included yoga practice for their students as part of the physical education classes. Few teachers who felt the importance, need and usefulness of the training programme approached IDRF to conduct a diabetes awareness education programme to teachers who had not attended the training.

The trained teachers had conducted educational sessions for high school students using the training materials provided to them. They emphasized on the ill effects of unhealthy dietary patterns, inadequate physical activity and its association with metabolic diseases such as diabetes, obesity, and cardiovascular diseases. Students were also informed to make healthy food choices using food pyramid demonstration. Teachers also provided information on the need and benefits of increased physical activity especially on aerobic exercises and hazards of sedentary lifestyle. The students were encouraged to translate the knowledge gained to improve their daily lifestyle.

The feedback from the teachers and the students was encouraging. They had used the knowledge gained to improve their lifestyle practices. They also disseminated the knowledge on NCDs to their family members, colleagues and friends.

A similar study in another part of the country demonstrated that intervention using social cognitive theory significantly improved the knowledge about diabetes and change in behavior among school children [13]. The study showed that teacher led classroom discussions with active youth engagement and peer led health activism lead to sustained health benefits [13].

Shah et al. conducted a school-based nutritional education programme on knowledge and behavior in Northern India. Benchmark assessment of teachers and parents also was done. The baseline scores of urban Asian children, parents
and teachers were poor. Following intervention, significant improvement in the scores improved in children, parents and teachers [14].

School based interventions have shown some success in improving energy balance patterns in large group of children through co-ordinated programmes integrating food service training and nutrition education, staff training and family involvement [5]. Such a training venture through the help of specially educated teachers to create awareness and motivate young students on healthy lifestyle practices suggested the feasibility of such an approach.

The outcome of our project indicated that teachers can also be used as health educators to impart knowledge on healthy lifestyle to the student community.

The Department of School Education authorities appreciated the need and importance of the programme and extended their support to facilitate the conduct of this programme. Major challenges faced in conducting the training programme were organizing a large number of participants from different locations of the state, particularly from the rural areas. The dropout rate of the follow-up assessment was large. This was particularly due to the unexpected job transfers. However, the total number being large, the analyzable data gave useful information on the outcome of the training.

A limitation of the study was that we had no baseline data on the habits among the teachers or students. The changes reported are self-reported by the respective groups.

It is generally believed that health care professionals only are suitable for disseminating knowledge related to health, but this training programme has demonstrated that non-medical personnel such as teachers are efficient in disseminating health information on lifestyle related diseases especially diabetes. Teachers are one of the most respected and influential people in the society, especially by the adolescent age group. Therefore, teachers can be used to educate, motivate and influence students to follow healthy lifestyle. Such training programme should be conducted in other parts of the country and also in other developing countries. This will have a cascading effect and will penetrate even in the remote areas where there are limited opportunities to gain information on healthy habits and practices. This programme has demonstrated the benefits of health education among teachers and students.

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Conflict of interest

None to declare.

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REFERENCES


