ABSTRACT

The present study was conceptualized with the objective to first map the prevalence of malnutrition (overweight including obesity, underweight and anemia) among the adolescents in middle to high income schools, evaluate the nutrition health content of the International, National and state curriculum and then plan need based one and a half year nutrition and health promotion program by creating enabling environment in the school campus by offering healthy food choices to the students, capacity building of school administration, parents & teachers on nutrition and health issues of adolescents and foster their participation in the program.

For this purpose, two convent (coeducational) Gujarat Secondary & Higher Secondary Education Board (GSEB) schools with comparable fee structure were selected. Nutrition health promotion program (intervention) was planned and implemented in the experimental school while the control school was only used to compare nutritional status and dietary and lifestyle behaviors at baseline and after intervention. The consent forms, explaining the purpose and methodology of data collection, were distributed to all the children of classes V-VII, with adolescents aged 10-13 years. All those students whose parents and children themselves consented to participate in the study (273 in Experimental school and 92 in control school) were selected as subjects of the study. The text books of national (CBSE) and state board (GSEB), covered very few essential topics on healthy eating (NCERT: 13.6% vs GSEB: 9.1%) and physical activity (NCERT: 37.5% vs GSEB: 18.8%) when compared to international, CDC recommendations. The National Curriculum was slightly better than the state (Gujarat) Curriculum, though both need improvement.

Self assessment of school ethos and environment using school health index with four related modules, was done by newly formed NHT members (school administration, teachers, students and parents), Results showed that there were no written policies related to nutrition and health in both the schools. In the areas of physical education and physical activity programs, more weaknesses (experimental: 50% vs control: 70%) were observed than the strengths (experimental: 40% vs control: 30%) in both the schools. However, with respect to health education imparted) and nutrition services offered there were no policies related to the nutrition and health services were being practiced in both the schools. The canteen services were not nutrition

friendly, and the canteen service providers and the teachers had no knowledge about nutritional aspect.

Nutritional assessment of the study subjects revealed triple burden of malnutrition from MHSES (under weight: 53.7%, anemia: 49.3% and overweight and obesity: 25.2%). Central obesity as indicated by high WHtR and High WC was 37.0% and 9.0% of the study subjects respectively. The study subjects having high WC and high WHtR were six times at risk of developing sub optimal blood pressure.

Sub optimal high blood pressure among these study subjects was as high as 21.4%. Similarly,

46.5% and 28.2% of the overweight and obese subjects were identified as dyslipidemics according to ATP III and AHA classifications respectively, while 5.6% were identified as having Glucose intolerance. Among five dietary and lifestyle behaviors, low intake of fruits and vegetable (≤ 400 gm/day) was observed in more than half (56.7%) of the study subjects.

Central obesity was ($p \leq 0.01$) more in boys than in girls (42.6% vs 26.0%) as indicated by WHtR. Similarly, the unhealthy habit of consuming carbonated (sweetened) beverages was ($p \leq 0.01$) more in boys than in girls (19.0% vs 8.1%). Though, more percentage of girls ($p \leq 0.01$) consumed breakfast irregularly than boys.

For creating enabling environment, two sets of 6 days cyclic menus (providing $1/3^{rd}$ of the RDA and iron rich) were provided to parents. Tiffin auditing results showed that the percentage of study subjects bringing healthy tiffin increased from 49.9% at baseline to almost 100.0%. Parent's participation, was very poor (0.04%) during the first orientation meeting, which improved slightly to 22.0% in the first NHE session to 33.0% in the second NHE session. Also the knowledge of parents who attended the NHE sessions improved significantly after the NHE sessions. Canteen services providing healthy beverage options in a five day pilot trial, showed a consistent demand for butter milk and flavoured milk as compared to the sweetened beverages.

After 3 to 4 months of weekly IFA supplementation, a mild change in percent prevalence (49.3at baseline to 48.7% after supplementation) of anaemia (though non

significant) was observed. Significant reductions in prevalence o of anemia e of was seen in very good compliance group (56.6 Vs. 40.8) followed by average compliance group (50 Vs. 40) and good compliance group (59.3 to 52.5). In the poor compliance group however, a very highly significant ($p \leq 0.001$) increase in anaemia prevalence from baseline (18.7 Vs. 68.7) was observed. Significant improvement (from baseline) in academic scores of the study subjects in supplemented group (IFA) as compared to the non-supplemented group (191.2±45.20 Vs. 169.86±48.53). Similarly, when comparisons were made in the academic scores obtained between anaemic (174.38±45.46 Vs. 179.57±45.56) and non anaemic (187.87±82 Vs. 190.6±82) subjects the data clearly demonstrated a significant improvement after IFA supplementation in both the groups from their respective base line values. Nutrition health education (NHE) sessions and capacity building sessions for the students also showed marked improvement in knowledge of the study subjects.

After one and a half years nutrition health promotion program (intervention), the overall prevalence of malnutrition (overweight including obesity, under nutrition and anemia) between the two schools showed trends (non significant) towards reduction in malnutrition from baseline in the Experimental school (78.8% vs 77.9%}, while the control school showed increase in malnutrition rates (79.3% vs 82.6%).

Nutrition health and promotion program had a very highly significant impact (($p \leq 0.001$) in reducing sub optimal blood pressures of the study subjects in the Experimental school from its baseline values (23.8% vs 4.1%), while they increased significantly in the control school (14.1% vs 35.9%). Similarly very highly significant lower levels of sub optimal blood pressure were recorded in Experimental school as compared to control group (35.9% vs 4.1%) at the end of nutrition health promotion program, though at baseline no significant differences existed between both the groups at baseline. Within the schools also, decreasing trend was observed (very highly significant) in experimental school than in the control school, where the prevalence increased (very highly significantly) after the intervention period

Similarly, the impact of one and a half years nutrition health promotion program (intervention) was also observed in overweight and obese subjects with respect to their fasting lipid and glucose levels. The results showed that after the intervention, significant ($p \leq 0.05$) and highly significant ($p \leq 0.01$) lower prevalence of

dyslipidimea between the two schools were observed, according to ATP III (experimental: 19.5% vs control: 46.4%) and AHA (experimental: 9.8% vs control: 42.9%) classifications respectively. Within the schools, significant ($p \leq 0.05$) reduction in dyslipidemia was observed in the experimental school from its baseline values, according to ATP III (37.2% vs 19.5%) and AHA (20.9% vs 9.8%) classifications. However, in the control school, according to ATP III, non significant decrease (60.7% vs 46.4%) and according to AHA non significant increase (39.3% vs 42.9%) was observed from the respective baseline values.

The practice of unhealthy behaviors by the study subjects in the experimental school, very highly significantly ($p \leq 0.001$) decreased from their baseline values for (carbonated/ sweetened beverage intake: 17.6% vs 7.1%, fast food intake: 42.9% vs 17.2%, Low fruits and vegetable intake: 59.0% vs 15.4%, physical inactivity: 34.8% vs 6.0%), while highly significantantly ($p \leq 0.01$) decreased in TV watching/ computer playing (41.8% vs 32.2%). On the contrary, in the control school, very highly significant ($p \leq 0.001$) increase was observed in percent prevalence of study subjects who consumed carbonated (sweetened) beverages (8.7% vs 13.0%), became physically inactive (22.8% vs 88.0%). While significant increase ($p \leq 0.05$) was observed in the l who consumed fruits and vegetable less than 400 gm/day (50.0% vs 67.4%). Similarly, with respect to fast food intake (18.5% vs 22.8%) and TV watching / computer playing (40.2% vs 58.75), also significant increase was observed in the control school from their respective baseline values. After the nutrition health promotion program (intervention), the percent prevalence of more than or equal to 3 cumulative unhealthy behaviors was very highly significantly ($p \leq 0.001$) lower in the experimental school subjects as compared to those in control school subjects (4.1% vs 52.2%). Within the schools also, a very highly significant ($p \leq 0.001$) decrease, in the percentage of subjects, having cumulative unhealthy behaviors was seen in the experimental school (30.0% vs 4.1%), while the reverse trend was seen in the subjects of the control school (9.8% vs 52.2%).

Thus the results of the present study clearly demonstrate that the need based nutrition health promotion program works in school settings and holds an immense potential to help children and adolescents modify their dietary and lifestyle behaviors, prevent occurrence of any NCD risk factors at young age. This in turn helps the nation to have

healthy productive population. Hence, school nutrition health policies should be framed and implemented in all the schools (government or non government). Also the school health policies should include age specific key aspects of health and nutrition should have technical experts in nutrition who have the knowledge and skills to implement the entire program effectively in the school. The effectiveness of nutrition health promotion program in a school setting depends highly on the participation of school administration, teachers and parents. Hence, school administration and teachers need to be made aware about their roles and responsibilities in improving the immediate and future health of their students which will greatly help in reducing the disability adjusted years of life (DALY) and improve productivity.

Therefore, a multi component nutrition health promotion program should be an integral part of all schools irrespective of their type and governments can make it either mandatory or give incentives to schools who implement the program like giving accreditation as a nutrition friendly school or providing subsidized land for kitchen and ground area etc.