

## ABSTRACT

Adolescence refers to the long transitional, developmental period between childhood and adulthood, and to a maturational process involving major physical, psychological, cognitive and social transformation. During adolescence, nutritional problems from childhood can potentially be corrected in addition to addressing new ones. Therefore, it is a period to shape and consolidate healthy eating and lifestyle behaviours, thus preventing or postponing nutrition related disorders and diseases later in life.

Thus the present study was planned with the broad objective of developing a Healthy Eating Index and Food Behavior Checklist for adolescents in Indian context and to implement a Nutrition Communication Programme to improve their dietary practices from three schools of urban Vadodara.

The study was conducted in three purposively selected schools of urban Vadodara. All the children from Std. V to std. XI were enrolled for the study. Anthropometric data was obtained on 1041 subjects. Data on socio economic status, food frequency, Dietary and physical activity practices was collected on 631 subjects. Knowledge, attitudes and practices (KAP); dietary intakes using 3- day recall, morbidity profile and cognitive development was obtained from 478 subjects from two schools. Hemoglobin estimation was done on a subsample of 61 subjects.

Two schools were allotted to the Experimental (EG) and Control group (CG) for the Nutrition Communication Programme (NCP), known as Creating Healthy and Active Learning Kids (CHALK) Programme. EG consisted of 212 subjects and CG had 266 subjects. Due to dropouts impact data was collected on 191 subjects in EG and 245 subjects in CG who completed the study.

Mean age of the study subjects was  $12.45 \pm 0.07$  years. Peak height velocity was observed in boys at 12 years and in girls at 11 years of age with a mean increment of 7 cm and 5.9 cm in boys and girls respectively. Peak weight velocity was observed in boys at 15 years and in girls at 11 years of age with a mean increment of 8 kg and 5 kg in boys and girls respectively.

One-fourth of the subjects were found to be underweight, with moderate ( $WAZ < -2SD$ ) and severe ( $WAZ < -3 SD$ ) forms being 4.8% and 0.9% respectively. Stunting was prevalent in 14% of the subjects, moderate ( $HAZ < -2SD$ ) and severe ( $HAZ < -3 SD$ ) stunting was observed in 2% and 0.3% of the subjects. Prevalence of thinness was 33%, with moderate ( $BAZ < -2SD$ ) and

severe ( $BAZ < -3SD$ ) thinness being 8% and 2% respectively. Overweight and obesity were found in 13% and 4% of the subjects respectively.

Mean intakes for all the food groups except edible oil was below 75% of the recommended dietary allowances. Consumption of all the nutrients except protein and fat was below 84% of the RDA. Mean nutrient intakes of boys were significantly higher than girls. Age and sex significantly affected mean nutrient intakes except fat (ANOVA  $p < 0.01$ ). Amongst unhealthy foods the most frequent consumption was observed for baked foods (42.5%) followed by accessories (42.3%) with meals on a daily basis.

Mean hemoglobin level of the subjects was 11.9 g/dl. Prevalence of anemia was 42.6% with mild and moderate forms being 66% and 31% respectively. More than half of the anemic subjects showed normocytic red blood cells. Two-thirds of the subjects reported to have experienced some or the other form of morbidity (ies) in the past fortnight. Most common morbidities were cold, headache, stomachache and cough. Two-third of the subjects slept for  $< 8.5$  hours in a day. As age increased study time increased while duration of physical activity, playtime, sleep time and leisure time decreased.

Mean cognitive scores were positively correlated with age. Undernourished subjects had lowest overall scores in the cognitive tests. KAP revealed lack of knowledge amongst subjects regarding, growth and development, healthy foods, functions of foods, food groups, healthy eating practices etc. Incorrect self perception was observed amongst 64% of the subjects. Lack of awareness regarding adolescence, health, foods to be given under various conditions etc. was observed amongst the teachers.

Healthy Eating Index for Adolescents (HEIA) was developed in the present study to assess the dietary quality of the subjects. HEIA consisted of 10 dietary components namely, Total Grains; Total Pulses/ Meat/ Fish and Poultry; Total Vegetables; Total green, yellow and orange vegetables; Total Fruits; Total Milk; Total Oil; Total Sugar; Variety and SOFAAS. Mean overall HEIA score was  $63.3 \pm 5.2$  and was higher in boys as compared to girls. Almost all the subjects needed improvement in their diets according to their HEIA scores. Individual HEIA components scores revealed low intake of fruits and green, yellow, orange vegetables. Parents' education, family size and family type affected the individual component scores for certain foods.

A short Food Behaviour and Activity Checklist for Adolescents (FBACA) was developed to assess the quality of 20 dietary and physical activity practices. Mean total FBACA score was  $70.20 \pm 8.35$  and was higher in girls as compared to boys. Most of the subjects needed improvements in the quality of dietary and physical activity practices being followed. More females than males had 'good' dietary and physical activity practices (13% v/s 8%). The highest mean FBACA score was observed for vegetables (4.9), which indicates almost all the subjects consumed vegetables regularly. The lowest scores were for evening snack item (0.97) indicating higher intakes of unhealthy foods as evening snacks. Content, Construct and criterion validity were established for both HEIA and FBACA. Analysis revealed that both the tools were reliable to be used time and again.

Based on the assessment of knowledge, attitudes and practices of the subjects, key messages were selected and a nutrition communication strategy was developed. Intervention was carried on for a period of 3-4 months followed by reinforcement sessions. Various communication methods like PowerPoint presentations, posters, puzzles and video clips were used.

Impact evaluation showed that NCP was successful in significantly increasing the knowledge levels, of the EG subjects as compared to CG, with respect to most of the messages covered in the *CHALK* programme. Significant improvement in the dietary practices, like regular breakfast and mid morning food consumption and vegetable consumption was observed in EG post intervention. EG showed a significant improvement in self-perception after the intervention. A significant increase in the mean food group intakes of grains, vegetables and edible oil was seen in EG after intervention. Mean nutrient intakes were significantly higher for all the nutrients in EG after the intervention. Mean increments in the nutrient intakes were significantly higher in the experimental group as compared to the control group post intervention.

The present study revealed dual burden of malnutrition, among school children of urban Vadodara. HEIA and FBACA were developed in the present study and were found to be valid and reliable tools in measuring the diet quality and the quality of dietary and physical activity practices. The need of the hour in India is for a targeted approach to assess, evaluate and improve the dietary behaviours. The approach should focus on the improvement in dietary behaviours of both undernourished and over nourished children together, as these problems coexist in the society. Thus, dietary tools like HEIA and FBACA should be used along with simple behavioural change communication messages to bring positive changes amongst populations.