SUMMARY AND CONCLUSION
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Childhood obesity is one of the most serious public health challenges of the 21st century. The problem is global and is steadily affecting many low and middle income countries. The fundamental causes behind the increasing trend of childhood obesity include changing lifestyles of families, increased purchasing power, an increased intake of energy-dense foods that are high in fat and sugars but low in vitamins, minerals and other healthy micronutrients and a trend towards decreased levels of physical activity.

Overweight and obese children are likely to develop lifestyle diseases like diabetes mellitus and cardiovascular diseases at a younger age which are largely preventable. Prevention of childhood obesity therefore needs high priority. Lifestyles and behaviours are established at a young age. It is important for parents and children to focus on making long-term healthy lifestyle choices such as changing eating habits, increasing physical activity, engaging in a support group activity and setting realistic weight management goals.

Common strategies for reducing energy density include use of low-calorie products, more fruits and vegetables and reduction in portion size and number of energy-dense, nutrient-poor items such as desserts. There is also an urgent need to educate the urban community on the aspects of healthy food habits and desired lifestyles to prevent overweight/obesity and its associated ill effects. Weight loss program with any degree of success integrate food choice changes with exercise, frequently with behaviour modification, nutrition education and psychological support.
With this in view, the present study entitled, “Prevalence of Obesity among School Children in Coimbatore and Impact of Intervention Strategies” was aimed at estimating the prevalence of obesity and developed a framework of intervention strategies to manage childhood obesity with the following objectives to:

- Assess the prevalence of overweight and obesity among school children (7-12 years) in Coimbatore.
- Study the socio-economic background, dietary habits, food consumption and lifestyle pattern of overweight and obese children.
- Determine the physical activity pattern, energy balance, psychosocial and behavioural adjustment problems and biochemical profile of selected obese children.
- Develop and implement intervention strategies on selected obese children and
- Evaluate the impact of intervention strategies.

The study was conducted in five phases.

In Phase I, a total of 35 schools comprising of 10 government, 15 private and 10 aided schools were selected through purposive sampling for the conduct of the prevalence study. A total of 11,470 children which included 6121 children from private schools, 3270 children from aided schools and 2079 children from government schools of Coimbatore were screened for the prevalence of overweight and obesity. Out of the 11,470 children screened, 4,818 children had BMI between 5th and 85th percentile and were considered to be normal whereas 5136 children having BMI below the 5th percentile were considered as underweight. 871 children had BMI between 85th and 95th percentile and were classified as overweight and 645 children found to have BMI more than the 95th percentile and were categorized as obese. Anthropometric measurements such as height, weight and skinfold thickness were measured for all overweight and obese children.
Phase II comprised of collection of data using a formulated interview schedule on the age of the child, gender, birth order, birth weight, common illness, hours of television viewing, type and duration of games played and details on the type of family, education and occupational status of the head of the family, total monthly income, monthly food expenditure and family history of diseases. Along with this, details on food frequency and preference were obtained from all the overweight and obese children using a check list. The height and weight of the father and mother of all the overweight and obese children were also measured and their BMI was calculated.

In Phase III, the time utilization pattern of both obese boys and girls (n=64) and an equal number of normal boys and girls (n=64) was assessed. An indepth study on energy balance was also carried out on the 64 obese children. In addition, psychosocial and behavioural adjustment problems faced by obese children at school and home were studied for both the boys and girls. Biochemical parameters namely blood glucose, haemoglobin and lipid profile which included total cholesterol, serum triglycerides, HDL, LDL and VLDL cholesterol were determined in the laboratory for the obese children (n=64).

Phase IV comprised of categorisation of obese children as (20-40% overweight), obese (40-60% overweight) and severely obese children (>60% overweight). 240 obese children (120 boys and 120 girls) who were 40-60 per cent overweight were selected for the intervention study and they were further divided into three experimental groups having three intervention strategies and one control group as follows:
The initial height and weight of the selected obese children of all the groups were recorded. Body fat analyzer was used for measuring the body fat percentage of the children. Details regarding the food intake of 120 boys and 120 girls were collected using the three day recall method. The mean food intake per day was found out and the nutrient intake of the selected children was calculated. A pre-tested questionnaire consisting of 30 multiple choice questions each carrying one mark was formulated to assess the nutritional knowledge, attitude and practices of selected obese children.

Nutrition education materials on aspects like general health and nutrition, importance of balanced diet, causes and consequences of obesity, hazards of consuming junk foods, consumption of foods during television viewing and importance of physical activity were developed and nutrition education was imparted to Groups A, B and C. Physical exercises were taught to children in Groups B and C with a package of outdoor games developed for this purpose.

A low calorie, low fat and high fibre snack was developed using varagu (a millet), horse gram (a legume), curry leaves and onion. One serving consisting of 50g of the developed low calorie, low fat and high fibre snack in the form of two kozhukattais(each weighing 25g) was given to 60 obese children (30 boys and 30 girls) in Group C as substitution for the evening snack.
In Phase V, the selected obese children were closely monitored and the intervention strategies were evaluated after a period of four months by recording the change in height, weight, BMI and body fat percentage of the children in Groups A, B, C and control group D. Apart from this, the change in nutritional knowledge, attitude and practice (KAP scores) after four months was also assessed for the children in Group A to whom nutrition education was intensely given.

The results of the study are summarized under the following headings

A. Prevalence of Overweight and Obesity among School Children
(7-12 Years) in Coimbatore

- The overall prevalence of overweight and obesity among school children from 35 schools of Coimbatore was found to be 7.6 per cent and 5.6 per cent respectively. The percentage of normal and underweight children was 42 and 44.8 per cent respectively.

- The percentage of overweight (13.7%) and obese (10.3%) children in private schools of Coimbatore was found to be the highest. The prevalence of overweight was 0.6 and 0.7 per cent and obesity was found to be 0.4 and 0.1 per cent among aided and Government schools respectively.

- The percentage of underweight children was found to be 54.9 per cent in aided schools and 59.1 per cent in Government schools in comparison with only 34.5 per cent in private schools.

- An equal percentage of normal children in private (41.5 %), in aided (44%) and in Government (44%) schools was seen.

- The prevalence of overweight and obesity among boys of 7-9 years was found to be 27.6 per cent and 25.1 per cent respectively whereas among girls of the same age group it was found to be lower with 21.2 and 18.1 per cent respectively.
Prevalence of overweight among boys of 10-12 years was 28 per cent and obesity was 31.9 per cent being the highest among all.

Percentage of overweight and obesity was 23.2 and 24.8 per cent respectively among girls of 10-12 years. The prevalence of overweight and obesity was higher among boys than among girls of 10-12 years. The percentage of overweight and obese girls in the age group of 7-12 years was less when compared with boys of similar age.

Mean weights of both obese and overweight children were above normal among all the age groups and among both sexes. The mean weight of overweight and obese children increased with age.

B. Factors Associated with Childhood Obesity

Majority of overweight (93.6%) and obese children (81.4%) were Hindus. The percentage of overweight and obese Muslim children was 4.6 and 12.4 per cent respectively and the percentage of overweight and obese Christian children was 1.8 and 6.2 per cent respectively.

Majority of overweight (81.6%) and obese children (81.9%) belonged to nuclear families and the remaining 18.4 per cent of overweight and 18.1 per cent obese children belonged to joint families.

The head of the families of 60.7 per cent of overweight and 66.8 per cent of obese children had college education which was followed by higher secondary education by 24.7 per cent and 20.9 per cent.

Majority of the head of the families of overweight and obese children were found to be professionals or in government services. Less percentage of head of the families was engaged in business or other categories of work. A significant association was found between occupation of head of families and obesity prevalence.
A majority of 77.4 and 75.3 per cent of the families of overweight and obese children respectively had a monthly income of more than Rs. 7,500 whereas 13.3 and 15.8 per cent families of overweight and obese children respectively had a monthly income between Rs.4500 and Rs.7500. The association was found to be significant (p<0.01).

A maximum of 51.1 per cent and 59.8 per cent of families of overweight and obese children spent more than Rs.2000 monthly for their food expenses and was found to be significant (p<0.01),

A majority of 61.8 per cent of overweight and 71 per cent of obese children were single children in their family while the remaining 38.2 per cent of overweight and 29 per cent belonged to families having two children. No significant association was found.

A higher percentage of 67.4 overweight and 64.2 per cent of obese children were the first children in the family whereas 32.6 per cent of overweight and 25.8 per cent of obese children were the second children in the family.

Loss of immunity was found among 71 per cent overweight and 97 per cent obese children while 12 per cent each overweight and obese children had respiratory problems like asthma and wheezing and 37 per cent each of overweight and obese children had orthopaedic problems like leg pain and joint pain. About 5 per cent overweight and 7 per cent obese children had sleep disturbances whereas 9 per cent overweight and 7 per cent obese children did not have any illness.

Among the 871 overweight and 645 obese children studied, a family history of diabetes mellitus was found in 23 per cent overweight and 21 per cent obese children. Obesity was also present among the family members of 21 per cent overweight and 20 per cent obese children. Incidence of hypertension was found among the family members of 20 per cent overweight and 19 per cent obese children.
C. Dietary Pattern of Selected Children

- About 49.9 per cent of overweight and 51.6 per cent of obese were non-vegetarians followed by 38.6 per cent overweight and 34.4 per cent obese children being vegetarians and 11.3 per cent of overweight and 13.9 per cent of obese children ovovegetarians respectively.

- Majority of overweight (57.2%) and obese (52.8 %) children followed a three meal pattern.

- A higher percentage of boys had skipped their meals than girls and a strong association (p<0.01) was found between skipping of meals and obesity status.

- About 64.8 per cent of overweight and 55.3 per cent of obese children ate snacks once a day. A significant association (p<0.01) was found between snack consumption and obesity status.

- Majority of overweight (61%) and obese (64%) children consumed chocolates. 52 per cent of obese children took chat items compared to overweight children (37%). Bakery products, sweets, fried foods, ice cream and pizza were preferred by a majority of overweight and obese children. No significant association was observed between selection of snacks and occurrence of overweight and obesity.

- A majority of 33.4 per cent overweight and 20.9 per cent obese children selected the snacks and soft drinks because their parents bought them, while 27 per cent of overweight and 35.6 per cent of obese selected snacks and soft drinks influenced by television advertisements.

- About 4.3 per cent of overweight and 11.7 per cent of obese children obtained >Rs.100 as their pocket money from their parents towards snacks.
- It is seen that 13.5 per cent overweight and 19.3 per cent obese children viewed television for three hours whereas 7.1 per cent of overweight and 5.8 per cent of obese children viewed television for more than three hours.
- About 264 overweight and 199 obese children ate meals followed by 194 overweight and 201 obese children consuming snacks especially fried foods while watching television.
- Food preference scores of cereals and pulses were high in both overweight and obese children with scores ranging from 90.5 to 100. Preference scores of green leafy vegetables, other vegetables and roots and tubers were comparatively lower ranging from 71.4 for green leafy vegetables to 89.5 for other vegetables. Fruits, fish and milk preference scores ranged from 72.5 to 98.0.
- Meat and egg preference scores were much higher among obese children, preference score for fats, oil seeds and nuts, sugar, beverages and spices were found to be a maximum of 100. Preference scores for hotel / canteen foods, fast foods, sweets, snacks and desserts were found to be maximum among obese children (92 to 100) than overweight children (74.5 to 89.5).
- Food use frequency score of cereals was 100 indicating consumption of cereals regularly while the scores for pulses ranged from 62.9 to 69.9 in both overweight and obese children. Meat and egg preference scores were much higher among obese children. The scores for fats, oil seeds and nuts, sugar, beverages and spices were 100 for both overweight and obese children. Food use frequency scores for hotel / canteen foods were in the range of 66.4 to 69.3. Fast foods, sweets, snacks and desserts had a score ranging from 70.7 to a maximum of 89.2.
- Outdoor games like cricket, tennis and football were played by a less number of children when compared with indoor games indicating lack of physical activity among overweight and obese children.
- Correlation between the mean BMI values of overweight boys with the mean BMI values of their fathers was -0.064 and their mothers was -0.139 and found to be negative.

- Correlation between overweight girls with their fathers was 0.124 and with their mothers was 0.087 and found to be positive.

**D. Physical Activity Pattern, Energy Balance and Psychosocial and Behavior Adjustment Problems and Biochemical Profile of Obese Children**

- Duration of sleep hours per day for obese boys was 8.1 and for normal boys was 7.1 hours with no significant difference.

- Hours spent per day on sedentary activities among obese boys was found to be 13.3 compared to 8.3 for normal boys. The time spent by the obese boys on sedentary activities was found to be higher when compared to normal boys and was found to be statistically significant (p<0.01).

- Time spent per day for moderate activity by the obese boys (2.2 hrs.) was observed to be less than that of normal boys (5.3 hrs.). The findings were found to be significant (p<0.01).

- Negligible time of 0.4 hrs. was spent by the obese boys per day on heavy activities when compared with normal boys who spent 2.3 hrs. and the difference was statistically significant (p<0.05).

- Sleep hours of obese girls was 7.4 and normal girls was 7.1. Obese girls spent more time on sedentary activities (11.4 hrs.) when compared to normal girls (8.6 hrs.) and was found to be significant (p<0.01).

- Time spent on moderate activities by obese girls was 4.7 hrs. and by normal girls was 4.4 hours daily. Duration of time spent on heavy activities by obese girls was comparatively very less than the normal girls with a significant difference (p<0.01).
➢ Energy intake of obese boys was found to be more than obese girls and the difference was significant. (p<0.05). The energy expenditure was found to be more among obese girls when compared to obese boys which is also significant (p<0.05). A positive energy balance which was higher in obese boys than in obese girls was observed.

➢ Regarding psychosocial and behavioural adjustment problems, the difference in scores were found to be statistically not significant between obese boys and obese girls.

➢ Mean haemoglobin values for both obese boys (14.1 g/dl) and obese girls (12.8 g/dl) were above the normal value indicating that none of the selected children suffered from iron deficiency anaemia.

➢ Mean blood glucose level of both the obese boys and obese girls were within the normal range (80-120 mg/dl) indicating an absence of diabetes mellitus and impaired glucose tolerance among the selected obese children.

➢ Mean value of total cholesterol was within the normal range for obese boys but was found to be slightly higher than the normal values for obese girls. Mean values of triglycerides were less than the normal values among both groups.

➢ LDL cholesterol of obese boys was within the normal values but it was higher than the standard value for girls. The mean VLDL cholesterol values for both obese boys and girls were well within the normal values. HDL cholesterol was found to be lower than the standard value for obese boys and within the normal range for obese girls.

➢ Systolic and diastolic pressures of both the obese boys and girls were found to be within the normal range.
E. Impact of Intervention Strategies

- Out of the 645 obese children consisting of 368 obese boys and 277 obese girls, 34.8 per cent (128) of boys and 31.4 per cent (87) of girls were moderately obese. A total of 198 boys (53.8%) and 134 girls (48.4%) belonged to obese category.

- A deficit of 21 per cent in the consumption of cereals, 30.3 per cent in green leafy vegetables, 19.8 per cent in roots and tubers and 22 per cent in other vegetables was observed.

- Consumption of pulses and fruits was found to be more than suggested values by 2.7 and 8.6 per cent respectively.

- Intake of milk and milk products also was deficit by 31.4 per cent than the suggested allowances.

- Increased consumption of high fat and calorie rich foods namely fish and fleshy foods by 30.6 per cent, fats and oils by 20.8 per cent and sugar and jaggery by 10.2 per cent was observed.

- Mean food intake of all the food groups except fruits, fish and fleshy foods and fats and oils by the selected obese girls was deficit than the allowances.

- Consumption of green leafy vegetables was deficit by 21.8 per cent roots and tubers 17.8 per cent and other vegetables by 28 per cent.

- A high deficit (52%) in the intake of milk and milk products was observed among obese girls. Intake of fruits, fish and fleshy foods was in excess of 8.6 and 25.4 per cent respectively. Fats and oil intake was also found to be in excess by 12.8 per cent.

- Energy intake of obese boys was higher by 30.8 per cent whereas the intake of proteins was found to be deficit by 11.9 per cent.
Excess intake of fat by 45.5 per cent was observed among obese boys and may be associated with obesity.

Deficit intake of minerals such as iron by 30.8 per cent and calcium by 4 per cent was observed.

Intake of retinol and beta carotene was in excess by 9 per cent.

Deficit intake was observed in the intake of riboflavin (16.3%), nicotinic acid (10.7%), vitamin B$_{12}$ (7.8%) whereas a higher intake of thiamine (9.1%), ascorbic acid (43.4%) and folic acid (29.3%) was found among the selected obese boys.

Excess of 10.8 per cent of energy intake was seen among obese girls. The intake of protein was found to be deficit by 15.8 per cent. A higher intake of fat by 29.5 per cent was observed in the target group.

Iron intake of the obese girls was slightly more by 5.8 per cent than the recommended allowances. A negligible deficit of 0.9 per cent in calcium was observed.

Consumption of retinol (1.4%), β-carotene (1.4%), thiamine (3.2%) and nicotinic acid (6.2%) was found to be slightly above the ICMR allowances whereas the intake of ascorbic acid and folic acid was found to be 43 and 28 per cent more than the allowances. Among the obese girls, a deficit in the intake of riboflavin (1.7%) and vitamin B$_{12}$ (84%) was observed.

Energy and fat intake of obese boys was comparatively higher than obese girls. Regarding the protein intake only a slight difference was seen between boys and girls. An adequate intake of vitamins and minerals was found among girls than boys.

Nutrient analysis of 100g of the developed snack revealed that it had a moisture content of 25 per cent. The energy value of the snack was 252 kcal.
The snack contained 11g of protein and 50.1g of carbohydrate. The fat content of the developed snack was found to be only 0.8g in 100g. The content of calcium was 235mg and iron was 8.3mg per cent. The developed snack contained 9g of crude fibre and 12.8g of dietary fibre per 100g.

- Serving size of the snack was 50g and the nutrient content accordingly for this portion was 126 kcal of energy, 25.2g carbohydrate, 5.5g protein and a very high fibre content of 6.4g and a very low fat content of 0.4g. The developed snack also contained 117.5mg of calcium and 4.2mg of iron per 50g.

- Cost of the developed snack was Rs. 3.18 per 100g and per serving (50g) was Rs. 1.59.

- Nutrition education - Statistical analysis revealed a significant increase (p<0.01) between the initial and final values indicating that nutrition education given for a period of four months improved the nutritional knowledge of selected obese children. Positive impact on the nutritional attitude of selected obese children was found (p<0.01). No significant difference between the initial and final values was seen with regard to nutritional practice.

- Height - Mean height of the obese boys in experimental Groups A, B and C increased to 152.3, 153.4 and 152.1 cm from an initial value of 149.9, 150.8 and 149.7 cm after intervention. Mean height of the obese boys in control Group D was 148.2 cm which increased to 150.8 cm after four months. Increase in the mean height of the obese boys among all the groups were in the range of 2.4 to 2.6 cm and was found to be significant (p<0.01).

- Weight - Mean weight of the obese boys in experimental Groups A, B and C was found to be 56.1, 55.3 and 53.4 kg at the start of the intervention which got reduced to 55.1, 54.1 and 52.1 kg respectively after the intervention strategies. Maximum reduction of 1.4 kg was observed in Group C which was given a combination of nutrition education, physical activity and snack substitution.
BMI - Mean BMI value among the obese boys in Group A was 23.8 initially, which reduced to 22.8 after intervention with a mean difference of 1.0. Mean BMI values of groups B and C were found to be 24.4 and 25.2 which decreased to a level of 23.0 and 23.6 after intervention with a maximum reduction of 1.6 found in Group C. All the experimental groups showed a statistically significant reduction in BMI.

Body fat percentage - Mean body fat percentage of experimental groups A, B and C ranged from 30.9 to 31.9 which reduced to 29.2 to 29.9 after intervention and found to be statistically significant (p<0.01). The reduction was found to be maximum with a value of 2.1 in Group C where all three types of intervention strategies were adopted.

Except height which increased in all the groups after intervention, the weight, BMI and body fat percentage seemed to decrease after intervention strategies with a maximum reduction found among Group C which received an integrated approach of nutrition education, physical activity and a low calorie, low fat, high fibre snack substitution.

Height - Among groups A, B and C the height of obese girls was found to range from 138.7 to 143.1 cm before intervention, which increased to 140.3 to 146.7 cm after intervention. Control group D also showed an increase of 1.2 cm.

Weight - Mean weight of the obese girls in Groups A, B and C ranged from 47.9kg to 50.6kg among experimental groups before intervention and had reduced to 47.2 to 50.0kg after intervention. Statistically significant difference was found among groups A and B and not among Group C. The findings clearly indicated that nutrition education cum physical activity had a better impact in group B than substitution of snack on the weights of obese girls in Group C.

BMI - Mean Body Mass Index (BMI) of obese girls in Groups A, B and C was found to be 23.5, 24.9 and 25.6 before intervention respectively and the
mean values reduced to 22.8, 24.0 and 24.1 after intervention. Maximum reduction of 1.5 in the mean BMI of Group C before observed. The reduction in BMI was found to be statistically significant (p<0.01) in Groups A and B and (p< 0.05) among group C. An increase in BMI by 1.3 was seen in control group.

- **Body fat percentage** - Mean body fat percentage of obese girls in Groups A, B and C was found to be 33.6, 34 and 34.3 respectively which reduced to 33.4, 33.2 and 33.7 respectively. Reduction in body fat percentage was found to be statistically significant (p<0.01) with a maximum reduction in group B.

- **ANOVA test** - Mean difference in height among obese boys of Group A and C was found to be equal (2.4cm). The mean difference of Group B was 2.6cm and a similar difference was also observed in control Group D. The ANOVA results also revealed that the heights of the obese boys was found to be significant (p<0.01). Mean difference of height among obese girls in Groups B and C were similar (1.6cm). The mean difference observed in Group A was 1.4 cm whereas among the girls in control group it was 1.2 cm.

- Mean difference in weight of obese boys among groups A, B and C decreased after intervention. Group C which received nutrition education cum physical activity and substitution with a low calorie, low fat and high fibre snack showed a maximum weight reduction of 1.4 kg.

- Obese boys of Group B (nutrition education cum physical activity) had a weight reduction of 1.2kg followed by Group A (1kg). An increase of 1.3kg in weight was observed among the boys in the control group.

- Among girls maximum reduction of 0.7 kg in weight was seen among Group B followed by 0.6 kg among Group C indicating that substitution with a low fat snack had less impact on weight reduction. A negligible reduction
of 0.3 kg was observed in Group A. Among girls in the control group D a maximum increase in weight of 1.9 kg was seen.

- Mean difference in weights of obese boys and girls among groups A, B and C decreased after intervention indicating a uniform reduction in weights of the obese children after four months, irrespective of the different intervention strategies.

- Mean difference in weights of obese boys and girls of control group D revealed that there was an increase in weight after four months. ANOVA tests revealed a statistically significant difference (p<0.01) between all the groups of obese boys and girls respectively.

- Among boys the highest difference of 1.6 in BMI was seen in Group C which was given nutrition education cum physical activity and snack substitution showed a maximum difference among the intervention groups. Group B showed a mean difference of 1.4 followed by Group A with a lowest mean difference of 1.0. An increase of 1.1 was observed in control Group D.

- Mean difference in BMI of obese girls was found to be lesser when compared with the mean differences in BMI of obese boys. A maximum difference of 1.5 in BMI was seen among the obese girls of Group C followed by a mean difference of 0.9 among the girls in Group B. The mean difference in Group A was 0.7 which was less than other groups. An increase in BMI by 1.3 among the girls in control Group D was seen.

- Uniform decrease in BMI was seen among both obese boys and girls in Groups A, B and C. An increase in BMI was found among obese boys and girls in control group D. This observation resulted in a significant difference (p<0.01) among the groups.

- Mean difference in body fat percentage of obese boys in Groups A, B and C had decreased after the intervention ranging from 1.2 to 2.1 per cent.
In control group D, an increase of 0.5 per cent of body fat was observed. No significant difference between the intervention groups and control group was seen.

Mean body fat percentage of obese girls in the intervention groups A, B and C had reduced ranging from 0.2 to 0.8 per cent when compared to obese boys but the mean body fat percentage of control group D had increased by 1.3 per cent. The mean difference between intervention groups and the control group was not significant.

Obesity is the most common chronic disorder and its impact on individual as well as on health economics has to be recognized widely. One should aim to increase public awareness of the ever increasing health burden and economic dimension of the childhood obesity epidemic. Strategies aimed at reducing caloric intake and increasing caloric expenditure through regular exercise are necessary to meet the challenges. Based on the findings of the present study it can be concluded that school based and family based intervention which includes nutrition education, increased physical activity and substitution of high calorie foods with low calorie, low fat and high fibre foods can be recommended and encouraged which would be effective in the management of childhood obesity.

STRATEGIES FOR MANAGEMENT OF CHILDHOOD OBESITY

Prevention of obesity in children is easier than in adults. It is recommended that the following strategies can be considered in the management of childhood obesity.

- Our traditional understanding of concepts of ‘catch up growth’ in childhood, and ‘healthy’ weight gain during adolescence may need redefining.
- Main focus of preventive programmes should be directed towards prevention of obesity throughout childhood and adolescence.
✓ Public health campaign should be directed towards life style changes in the family / society as a whole.

✓ Benefits of healthy eating, increased physical activity and reduction in sedentary activities have to be inculcated from early age.

✓ School based programmes will be likely be successful, if health authorities and media play an important role.

✓ Dietary interventions must usually rely on indirect measures, such as reducing the energy density of foods.

✓ Training modules on prevention of obesity for school teachers, parents and community can be developed.

✓ Health professionals and policy-makers should focus on primary prevention of childhood obesity and the metabolic syndrome, especially in low- and middle-income countries, facing an epidemic of chronic diseases in the near future.

✓ Establishment of a uniform and universally accepted set of criteria for defining overweight, obesity, and the metabolic syndrome in children and adolescents would be the foundation for addressing this emerging public health concern.

LIMITATIONS OF THE STUDY

❖ In the present study there were constraints for reducing energy intake as a means to reduce body weight, even among overweight children.

❖ Estimation of blood parameters could be done only for a small group of children since collection of blood sample was difficult in this age group and parents and school authorities did not cooperate for this aspect.
• Authorities of few schools in Coimbatore city did not give permission to conduct the study quoting reasons of parent's opinion and discrimination or teasing of obese children by other children.

• Intervention strategies could not be implemented for a longer period as school children had term holidays and cannot be monitored.

Childhood obesity trends are disturbing and needs concerted efforts targeted at improving lifestyles of children and adolescents. Effective interventions and preventive strategies should be instituted at the national level with a population based, multi sectoral, multi disciplinary and culturally relevant approach to tackle this societal problem.