

Impact of Awareness Program on Prevention of Childhood Obesity among School Children in a Metropolitan City – Chennai Slim and Fit Programme

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Abstract

Childhood obesity is an emerging public health issue in developing countries like India, yet combating against under nutrition. An evident and effective strategy is required to tackle childhood obesity. Moreover here it is necessary to consider the perception of obesity among general population. Most of the adults perceive obesity as a positive dimension of health. A school-based mass education programme for children improved their awareness levels about the hazards of being overweight and also the benefits of regular physical activity and right eating habits. However, the improvement was not significant in obese group as they had an increased awareness levels at the baseline compared to others. These higher baseline scores may be attributed to their knowledge acquirement after facing frequent difficulties in performing regular activities due to health disturbances. So a mass awareness program coupled with special motivation sessions tailored for obese children could prevent imminent obesity epidemic.

Keywords: childhood obesity, India, mass awareness programme, metropolitan city, overweight, school children.

1. Introduction

Childhood obesity is a major emerging public health issue in developing countries, whereas it has reached epidemic proportions in industrialized nations (Freedman et al., 2001). In Indian children, overweight and obesity are common among middle- and low-income groups; however, in the developed nations, a higher prevalence of childhood obesity can be seen in the low socioeconomic group (Fezeu et al., 2006; Goyal et al., 2010; WHO Report, 2003). Moreover, there is an increasing trend in the prevalence of obesity among both adults and children throughout India with certain urban and rural differences (Reddy et al., 2002). Studies conducted in Chennai, Tamil Nadu (South India), among school children aged below 15 years have shown the increasing prevalence of obesity, from 6.8% in 1998 (Subramanyam et al., 2003) to 12% in 2009 (Shabana & Vijay, 2009). These studies have also reported that the prevalence was higher in the schools catering to children from affluent families compared to those from poor economic status, and overweight was more common among girls than boys (Ramachandran et al., 2002). Such studies implicate that childhood obesity is an emerging health problem among the affluent urban Indian children (Subramanyam et al., 2003; Shabana & Vijay, 2009; Ramachandran et al., 2002).

Economic growth has made developing countries such as India more prone to lifestyle disorders (Asian Development Bank, 2010). This is due to physical inactivity and intake of calorie dense food associated with urbanization, rural-to-urban migration and mechanization, finally resulting in obesity (Allender et al., 2010; Ebrahim et al., 2010). This has resulted in nutrition transition, which in turn contributes to the prevailing increasing trend in childhood obesity. Obesity plays a vital link in the web of causation of most of the non-communicable diseases (Stevens et al., 2001). Further, the low birth weight and thrifty gene concept favour this situation and result in the early onset of metabolic syndrome and diabetes among children in India (Joffe & Zimmet, 1998). In this context, the role of food industries across the world is also of an important concern due to introduction of food products such as processed foods and canned foods that are rich in fat and sugar with an adoption to the local consumers. Though the consumers have the

freedom to choose the right food, nutrition awareness levels play an important role in selecting and consuming the right food. However, a major issue is that consumers in developing countries have not been informed about the pros and cons of these global foods adopted to the local market, compared to those in the developed countries (Redmond, 2005).

A study from India reported that awareness levels about childhood obesity among school children are generally poor (Shabana & Vijay, 2010). Increasing trends in obesity seen among urban Indian children combined with the poor awareness levels have led to initiation of many interventional strategies throughout the country. The World Health Organization has emphasized on promotion of healthy behaviors such as eating right and involving in regular physical activity as a strategy for the primary prevention of non-communicable diseases (WHO Technical Report Series, 2010). Hence, a concerted effort from policy makers and food industry will be an effective intervention; yet, educating the high risk group on this major public health issue can influence the attitude and physiologic and social behavior of people, particularly in India.

In view of these and obesity being a modifiable risk factor, an awareness programme is being conducted in all the Central Board of Secondary Education (CBSE), New Delhi, schools in Chennai for prevention of childhood obesity. The aim of this programme is to create awareness on the prevention of childhood obesity among school children and to sensitize the school administration, teachers and parents on this emerging issue. Herein, we report the effect of this ongoing awareness programme on the improvement of knowledge levels of school children by conducting a pre- and post-test before and after implementation of the programme using a questionnaire.

2. Subjects and Methods

We conducted an awareness creation programme on childhood obesity as a part of the Chennai Slim and Fit programme (Prevention of childhood obesity). Thirteen CBSE schools in Chennai were included and 20,000 students in the age group of 9–13 years belonging to the high-income group participated in this programme from October 2010 to April 2011. Experts from various departments such as Nutrition, Epidemiology, Psychology and Exercise and Yoga discussed and prepared educational material, addressing the burden of childhood obesity in India, its implications on current and future health and the causes of childhood obesity, using PowerPoint presentations to create awareness among children. It also emphasized the benefits of consumption of a balanced diet and enhanced physical activity to maintain an ideal BMI in a simple language with pictorial representations. We also included the benefits of certain habits like nutritional label reading in this programme.

The epidemiology team randomly selected 20 students of fifth grade in each school and a subsample of 260 children in the age group of 9 to 10 years was included for pre- and post-test evaluation. Fifth grade children were selected for evaluation to maintain uniformity in the age group for knowledge assessment and also because it is the ideal age to inculcate awareness on issues such as healthy eating and lifestyle behavior. The expert committee developed a questionnaire in simple English and pre-tested among the 20 children of the same age group prior to the programme. The research team identified the difficulties, if any, in understanding the questions by the children and addressed them adequately and incorporated those changes into the questionnaire. The field team administered the questionnaire to the selected study subjects and provided a code number to each child to maintain the anonymity. They conducted pre-test among the children using this questionnaire before implementation of the programme. A representative from the expert committee educated the children on the causes of childhood obesity, prevalence of obesity, benefits of doing regular physical activity and about healthy eating habits, and a healthy interactive session lasting for 45 minutes was conducted after each educational session wherein the children had an opportunity to interact with the experts. The investigators requested the same set of students to complete the same questionnaire on the 6th day from the day of the awareness programme.

The questionnaire comprised of three domains viz., awareness on obesity, importance of physical activity and consumption of balanced diet. There were 11 questions in the questionnaire and an individual score was given to each question, and the maximum score for awareness on obesity was 30, the score for balanced diet was 50 and for enhanced physical activity it was 20, with a total score of 100.

The evaluation committee recorded the pre- and post-test scores for the subsample of 260 children before and after implementation of the awareness programme. The field team recorded the height, weight and gender details. They calculated BMI using the formula: weight in kilograms divided by squared height in meters. The researcher plotted

the BMI in age- and gender-specific WHO charts and categorized the children with BMI between 85th and 97th percentiles as overweight and more than 97th percentile as obese (WHO Growth Reference Chart, 2007). The Institutional Ethics Committee approved the study and informed consent was obtained from the parents of those children who participated in the pre- and post-test evaluation.

2.1 Statistical Analysis

SPSS 10.0 version software was used for statistical analyses. Continuous variables are reported as mean and standard deviation and categorical data are reported in proportions. A paired 't' test analysis was done using the pre- and post-test scores of the children. One-way ANOVA analysis was done as the test of significance for the pre-test score of different groups of nutritional status. P value of <0.05 was considered as statistically significant.

3. Results

Out of 260 selected children, 255 students responded to the pre-test questionnaire with a response rate of 98%. All the children participated in the pre-test took part in the post-test as well. There were no dropouts. There were 108 boys and 147 girls in the study.

Table 1 shows the general characteristics and mean pre- and post-test scores of boys and girls who participated in the study. There was no significant difference in the mean age of boys and girls. The mean BMI between boys and girls remained similar (17.6 ± 4.1 vs 17.5 ± 3.3 ; $p=0.812$). The overall prevalence rates of overweight and obesity in the study subjects were 14.9% and 17.2%, respectively. Although there was no significant difference in the prevalence of overweight and obesity between the genders, the obesity rate was higher among boys than that of overweight (Overweight vs. obesity; 13.9% vs. 22.2%). The mean pre-test scores for girls in the three domains remained higher than boys but the difference was not statistically significant. However, on considering the overall pre-test score, the awareness levels were higher among girls compared to boys and it was statistically significant ($p=0.029$).

The mean score of the post-test in each domain of the questionnaire was significantly higher than the pre-test scores secured by all the children ($p<0.001$). The results of the study emphasized that there was a significant increase in the knowledge levels of the children after attending the awareness programme on prevention of childhood obesity.

The pre- and post-test scores of the children in different nutritional grades are given in Fig. 1. The mean pre-test score was significantly higher in the obese group compared to other groups ($p=0.001$). There was a significant increase in the awareness levels among children in all nutritional grades except the obese group ($p=0.08$).

4. Discussion

The results of the present study have highlighted that knowledge regarding the hazards of obesity was generally low prior to the awareness programme. The higher pre-test score among the obese group showed that the children were probably aware of this issue only after developing the problem.

There was a significant increase in the awareness levels of the children in all the 3 components of obesity after attending this education programme. Similarly, a recent study reported a 4% reduction in BMI in students of 6th to 8th grades due to national-level awareness creation on childhood obesity (Kaufman et al., 2011). In another study, a considerable reduction in modifiable risk factors was noticed among school children followed by a structured education programme against primary prevention of diabetes. It was also concluded that school-level educational interventions through teacher-parent-child teams will definitely reduce the prevalence of diabetes (Kameswararao & Bachu, 2009). Consistent with these findings, the present educational programme also had increased the awareness levels of children on the prevention of childhood obesity.

Nevertheless, providing with mere knowledge would not serve the purpose unless otherwise the knowledge is put into action thereby guaranteeing behavioral changes. In addition to this, in developing countries like India, which has not yet completed its struggle against infectious diseases and under-nourishment, obesity is perceived as a state of wealth and health even among the adult population (Ojofeitimi et al., 2007). Therefore, empowering the high-risk group with adequate knowledge and sustained motivation to adopt a healthy lifestyle is effective and can result in weight reduction (Nikousokhan & Rajab, 2003). Hence, creating mass awareness on prevention of obesity at the

community level could be possible through such programmes, which is one of the components of intervention strategies, the other component being involvement of stakeholders in implementing regulatory approaches in food industries, which could modify the prevailing obesogenic environment in India. These might include leverage of additional taxes on fats and sweets that may indirectly encourage children to consume more of fruits and vegetables and conventional foods. Modelled estimates have shown that a considerable reduction in the prevalence of childhood obesity could be achieved by restricting advertisements on high-calorie and unhealthy food (Veerman et al., 2009; Haby et al., 2006). Since children are the targeted group by the food-related advertisements, they must be sensitized and made aware of this issue through such mass educational programmes as the present one, especially in countries like India.

Behavioral change is a gradual process as shown in DiClemente model (DiClemente & Prochaska, 1982). But the present study has not assessed the change of behavior, which was a limitation of the study. A follow-up study has been planned to track the behavioral changes and its effect on the BMI of children. Another limitation of the study is that there is no control group for comparison.

A family-based therapeutic educational programme with a specialized pediatric guidance for a period of 3 years was effective in obese group of children (Tanas et al., 2007). In the current study, the educational programme had a significant positive impact on awareness levels of the underweight, normal and overweight children, but not in the obese children. Hence a special therapeutic programme comprising individual and intensive interventional strategies has to be implemented to target this high-risk group, similar to the above study.

In conclusion, the evaluation research of the ongoing school-based awareness programme on prevention of childhood obesity—Chennai Slim and Fit Programme—revealed that there was a significant increase in the level of knowledge among normal and overweight children followed by a mass education programme. However, the obese children had higher awareness levels in the pre-test, which showed a non-significant increase in post-test. This finding denotes that special intervention strategies are needed besides the educational programmes, such as promoting the production of nutrition-focused foods/snacks rather than calorie-dense food products, and regulatory actions for food-related advertisements are also required to address this issue. Further reinforcement by including the core concept of obesity and health in their educational curriculum and sustained motivation with the assistance of parents and school administration would have long-term benefits. In general, implementing mass awareness programmes to sensitise various high-risk groups would be a cost-effective measure in preventing the impending epidemic of non-communicable diseases such as cardiovascular disorders and diabetes in middle- and low-income countries.

References

- Allender, S., Lacey, B., Webster, P., Rayner, M., Deepa, M., Scarborough, P., et al. (2010). Level of urbanization and noncommunicable disease risk factors in Tamil Nadu, India. *Bull World Health Organ.*, 88, 297–304.
- Asian Development Bank. (2010) Key Indicators for Asia and the Pacific 2010. (41st ed.). The rise of Asia's middle class. Adverse consequences of rise of Asian middle class. (Chapter 6). Mandaluyong City, Philippines: Asian Development Bank. Available at: <http://www.adb.org/publications/key-indicators-asia-and-pacific-2010>. Accessed 25 October 2011.
- DiClemente, C.C., & Prochaska, J.O. (1982). Self change and therapy change of smoking behavior: A comparison of processes of change in cessation and maintenance. *Addict Behav.*, 7(2), 133–142.
- Ebrahim, S., Kinra, S., Bowen, L., Andersen, E., Ben-Shlomo, Y., Lyngdoh, T., et al. (2010). The effect of rural-to-urban migration on obesity and diabetes in India: A cross-sectional study. *PLoS Med.*, 7, e1000268.
- Fezeu, L., Minkoulou, E., Balkau, B., Kengne, A.P., Awah, P., Unwin, N., et al. (2006). Association between socioeconomic status and adiposity in urban Cameroon. *Int J Epidemiol.*, 35, 105–111.
- Freedman, D.S., Khan, L.K., Dietz, W.H., Srinivasan, S.R., & Berenson, G.S. (2001). Relationship of childhood obesity to coronary heart disease risk factors in adulthood. The Bogalusa Heart Study. *Pediatrics*, 100, 712–718.
- Goyal, R.K., Shah, V.N., Saboo, B.D., et al. (2010). Prevalence of overweight and obesity in Indian adolescent schoolgoing children; its relationship with socioeconomic status and associated lifestyle factors. *J Assoc Physicians India*, 58, 151–158.

- Haby, M.M., Vos, T., Carter, R., Moodie, M., Markwick, A., Magnus, A., et al. (2006). A new approach to assessing the health benefit from obesity interventions in children and adolescents: The assessing cost-effectiveness in obesity project. *Int J Obes (Lond)*, 30, 1463–1475.
- Joffe, B., & Zimmet, P. (1998). The thrifty genotype in type 2 diabetes: an unfinished symphony moving to its finale? *Endocrine*, 9, 139–141.
- Kameswararao, A., & Bachu, A. (2009). Survey of childhood diabetes and impact of school level educational interventions in rural schools in Karimnagar district. *Int J Diabetes Dev Ctries.*, 29, 69–73.
- Kaufman, F., Hirst, K., Buse, J., Foster, G.D., Goldberg, L., Schneider, M., et al. (2011). Effects of secular trends on a primary prevention trial: The Healthy study experience. *Child Obes.*, 7, 291–297.
- Nikousokhan, A.K., & Rajab, A. (2003). Education and weight reduction control of type 2 diabetes. 18th International Diabetes Federation Congress.
- Ojofeitimi, E.O., Adeyeye, A.O., Fadiora, A.O., Kuteyi, A.O., Faborode, T.G., Adegbenro, C.A., et al. (2007). Awareness of obesity and its health hazards among women in university community. *Pak J Nutr.*, 6(5), 502–505.
- Ramachandran, A., Snehalatha, C., Vinitha, R., Thayyil, M., Kumar, C.K., Sheeba, L., et al. (2002). Prevalence of overweight in urban Indian adolescent school children. *Diabetes Res Clin Pract.*, 57, 185–190.
- Reddy, K.S., Prabhakaran, D., Shah, P., & Shah, B. (2002). Differences in body mass index and waist: hip ratios in North Indian rural and urban populations. *Obes Rev.*, 3, 197–202.
- Redmond, W.H. (2005). Misuse of marketing concepts: Marketing of seeming health package food. In P.M. Mark & R.P. Hill (Eds.). *Proceedings of 30th Macromarketing Seminar* (pp. 3–10). St. Petersburg: University of South Florida.
- Shabana, T., & Vijay, V. (2010). Chennai Slim and Fit Programme. Awareness and perceptions related to obesity among urban children and adolescents. *J Assoc Physicians India (Tamil Nadu State Chapter)*, 2, 19–23.
- Shabana, T., & Vijay, V. (2009). Impact of socio economic status on prevalence of overweight and obesity among children and adolescents in urban India. *Open Obes J.*, 1, 9–14.
- Stevens, J., Couper, D., & Pankow, J. (2001). Sensitivity and specificity of anthropometrics for the prediction of diabetes in a biracial cohort. *Obes Res.*, 9, 696–705.
- Subramanyam, V., Jayashree, R., & Raft, M. (2003). Prevalence of overweight and obesity in affluent adolescent girls in Chennai in 1981 and 1998. *Indian Paediatr.*, 40, 332–336.
- Tanas, R., Marcolongo, R., Pedretti, S., & Gilli, G. (2007). A family-based education program for obesity: A three-year study. *BMC Pediatr.*, 7, 33.
- Veerman, J.L., Van Beeck, E.F., Barendregt, J.J., & Mackenbach, J.P. (2009). By how much would limiting TV food advertising reduce childhood obesity? *Eur J Public Health*, 19, 365–369.
- WHO growth reference Chart, 5-19 years. (2007). Available: http://www.who.int/growthref/who2007_bmi_for_age/en/index.html. Accessed 24 July 2010.
- WHO Report. (2003). Diet, nutrition and prevention of chronic diseases. WHO Technical Report Series 916. Available: [Whqlibdoc.who.int/trs/WHO_TRS_916pdf](http://whqlibdoc.who.int/trs/WHO_TRS_916.pdf). Accessed 1 February 2012.
- World Health Organization Technical Report Series. (2010). Diet, nutrition and the prevention of chronic diseases. 916, i–viii, 1–149, back cover.

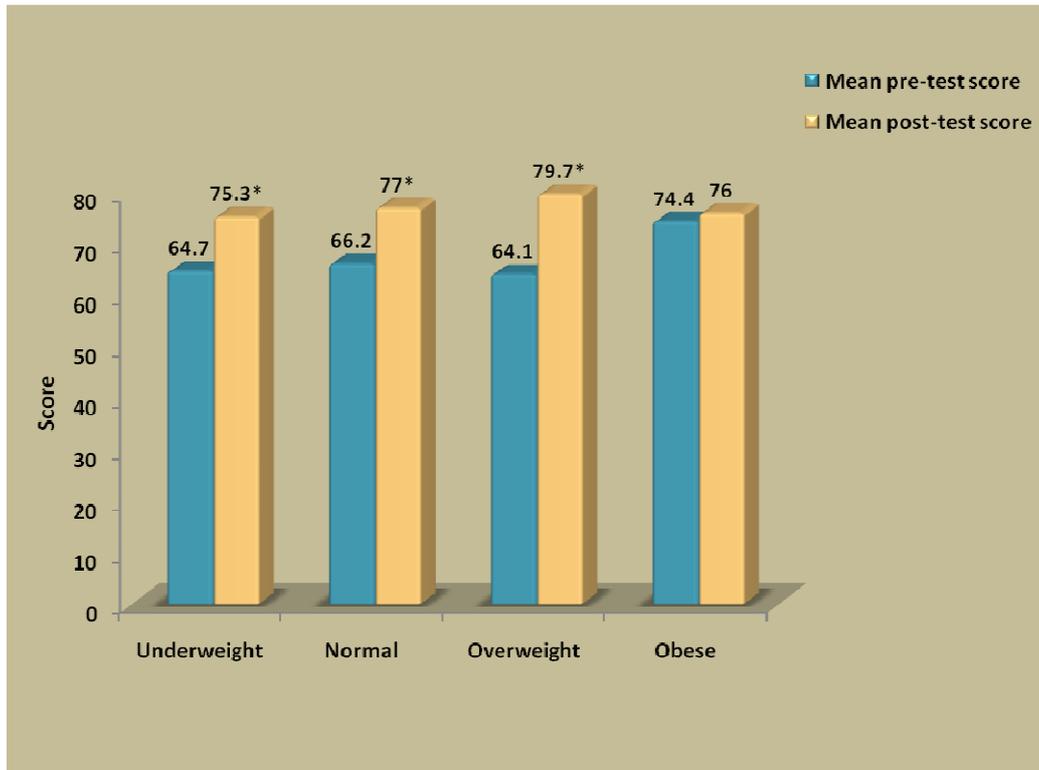


Figure 1. Pre- and post-test scores of the study subjects in different nutritional grades
*P<0.001 (pre-test score vs post-test score)

Table 1. General characteristics and awareness levels of study subjects gender wise

		Boys N=108	Girls N=147	P value Boys vs Girls
Age (years)		9.85±0.38	9.84±0.41	0.842
BMI (kg/m ²)		17.6±4.1	17.5±3.3	0.812
BMI†				
Overweight (85 th -97 th percentile)		15 (13.9)	23 (15.6)	0.198
Obese (>97 th percentile)		24 (22.2)	20 (13.6)	
Overall awareness score (maximum 100)	TOTAL			
Pre-test	66.9±16.4	64.4±16.2	68.7±16.3	0.029
Post-test	76.8±13.9*	73.6±11.8*	79.2±14.9*	0.001
Awareness on childhood obesity score (maximum 30)				
Pre-test	16.3±8.7	15.3±9.3	17±8.1	0.121
Post-test	21.8±7.2*	20±7.4*	23.1±6.8*	<0.001
Balanced diet score (maximum 50)				
Pre-test	37.1±8.9	36.5±9.6	37.5±8.3	0.375
Post-test	39.5±7.3*	38.6±6.9*	40.2±7.5*	0.083
Enhanced physical activity score (maximum 20)				
Pre-test	13.7±6.0	13.1±5.7	14.2±6.2	0.149
Post-test	15.4±5.6*	14.8±5*	15.9±6*	0.122

Values are mean ± SD

*p<0.001; pre-test vs post-test score

†values are n(%)

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