

Childhood Obesity: Impact on Physical Activity and Classroom Performance and Intervention through Nutrition Education Programme in Coimbatore and Nilgiris Districts

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SUMMARY AND CONCLUSION

Childhood overweight and obesity are global problems that are on the rise (Subramanya et. al., 2003). Obesity in children appears to increase the risk of subsequent morbidity, whether or not obesity persists into adulthood (Aggarwal et. al., 2008). Outcomes related to childhood obesity include hypertension, type 2 diabetes mellitus, dyslipidaemia, left ventricular hypertrophy, non-alcoholic steatohepatitis, obstructive sleep apnoea, and orthopaedic and psychosocial problems (National Nutrition Monitoring Bureau, 2002; Laxmaiah et. al., 2007; Ramachandran et. al., 2002). According to WHO, 22 million children (under 5 years of age) are overweight. Obesity is evolving as a major nutritional problem in developing countries, affecting a substantial number of adults and resulting in an increased burden of chronic disease. In national surveys conducted in the USA from the 1960s to the 1990s, the prevalence of overweight in children increased from 5% to 11% (Chatterjee, 2002). Studies on urban Indian schoolchildren from selected regions report a high prevalence of obese and overweight children (Kaur et. al., 2005; Khadilkar et. al., 2004; Kapil et. al., 2002; Mehta et. al., 2007; Kaneria et. al., 2006).

Obesity and overweight have become a worldwide epidemic, and there is an urgent need to examine childhood obesity and overweight across countries using a standardized international standard. In the present study, the prevalence of obesity and overweight and their association with socioeconomic status (SES) and the risk factors like diet, physical activity like exercise, sports, sleeping habits, eating habits like fast food, eating outside, and academic performance were studied.

Childhood obesity is an emerging problem in urban Indian children and increases in childhood overweight and obesity may be major contributors to the adult obesity epidemic. Thus, identifying potential risk factors for childhood

obesity and formulating early interventions is crucial in the management of the obesity epidemic. The present study was aimed at evaluating dietary and physical activity patterns as determinants of overweight in a sample of children. Duration of sleep, television viewing and consumption of fried foods may be significant factors that contribute to overweight.

Obesity is increasing rapidly in developing countries due to the change in the life-style. Reduced physical activity and confinement to one place or long sitting hours are a part of the routine. This is mainly due to the technological development – computers and internet, mobiles, video games and television, reducing the physical activities of the children. Physical activity helps to burn calories. It also helps to reduce body fat and control weight, in turn prevents the occurrence of obesity. Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health (WHO, 2000). The prevalence of overweight and obesity is a rapidly growing threat to public health due to the change in the life-style. Outcomes related to childhood obesity include hypertension, type 2 diabetes mellitus, dyslipidaemia, left ventricular hypertrophy, non-alcoholic steatohepatitis, obstructive Sleep apnoea, and orthopaedic and psychosocial problems (Barlow et. al., 1998; Nanda, 2004; Li et. al., 2004).

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. Body Mass Index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m^2). Obesity levels in some lower-income and transitional countries are also high and the levels are increasing rapidly (Popkin et. al., 1998).

WHO states that the fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended. Globally, there has been:

- An increased intake of energy-dense foods that are high in fat; and
- A decrease in physical inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanization. Changes in dietary and physical activity patterns are often the result of environmental and societal changes associated with development and lack of supportive policies in sectors such as health, agriculture, transport, urban planning, environment, food processing, distribution, marketing and education. Obesity and overweight among school going children are the common nutritional problems in developing countries including India. There is clear evidence of a demographic, epidemiological and nutrition transition in India that is fuelling the epidemic of chronic diseases and obesity, particularly in the urban areas. Childhood obesity affects more than 15 percent of children, making it one of the common chronic disease of childhood. More and more children are being diagnosed soon and other with co-morbid conditions associated with obesity and morbid obesity. Prevalence of overweight and obesity is more in school children in urban areas, and lack of physical activity is one of the main culprits. Regular physical activity is important for good health, and it is especially important to maintain a healthy weight and reduces the risk for many diseases (Kamath et. al., 2012).

The prevalence of overweight and obesity has increased substantially over the past three decades and is now considered as one of the most serious health challenges of the early 21st century. While the need for preventive action is increasingly recognized, policy implementation often occurs in a non-systematic, ad hoc manner (<http://www.who.int/dietphysicalactivity/childhood/tools/en/>).

Lifestyle modification/behavior-based treatment interventions in youth with severe obesity have demonstrated modest improvement in body mass index status. To begin to address these challenges, the purposes of this scientific statement are to (1) provide justification for and recommend a standardized definition of severe obesity in children and adolescents; (2) raise awareness of this serious and growing problem by summarizing the current literature, associated health risks (immediate and long-term), and challenges and shortcomings of currently available treatment options; and (3) highlight areas in need of future research (Kelly et. al., 2013). Changing physical activity and dietary habits are key to understanding obesity aetiology and are therefore important components in any obesity prevention and treatment strategies (WHO, 2000). Another major factor contributing to the childhood obesity epidemic is the increased sedentary lifestyle of children. School-aged children spend most of their day in school where their only activity comes during breaks or physical education classes (Kelly et. al., 2013). Numerous studies have shown that sedentary behaviors like watching television and playing computer games are associated with increased prevalence of obesity (Swinburn et. al., 2002; Tremblay et. al., 2003). Children in today's society show a decrease in overall physical activity. The growing use of computers, increased time watching television and decreased physical education in schools, all contribute to children and adolescents living a more sedentary lifestyle. "Screen time" activities such as watching television, gaming, texting, and playing on the computer require very little energy. They often take the place of healthy physical exercise. Also, children tend to crave unhealthy snack foods they see in TV ads (<http://www.nlm.nih.gov/medlineplus/ency/article/007508.htm>). The average child spends two hours a day watching television, but 26 percent of children watch at least four hours of television per day (<http://obesityfoundationindia.com/about.htm>). Physical activity was associated with numerous health benefits. The dose-

response relations observed in observational studies indicate that the more physical activity, the greater the health benefit. Results from experimental studies indicate that even modest amounts of physical activity can have health benefits in high-risk youngsters (e.g., obese). To achieve substantive health benefits, the physical activity should be of at least a moderate intensity. Vigorous intensity activities may provide even greater benefit. Aerobic-based activities had the greatest health benefit, other than for bone health, in which case high-impact weight bearing activities were required (Janssen et al., 2010).

Regular physical activity also appears to be critical specifically for the reduction of obesity related and other chronic diseases. Behavioral change is now recognized as an important component of any response to obesity and should be incorporated into treatment for weight loss and weight gain. Sedentary lifestyle and overweight are major public health, clinical, and economical problems in modern societies. The worldwide epidemic of excess weight is due to imbalance between physical activity and dietary energy intake. Sedentary lifestyle, unhealthy diet, and consequent overweight and obesity markedly increase the risk of cardiovascular diseases. Regular physical activity 45-60 min per day prevents unhealthy weight gain and obesity, whereas sedentary behaviors such as watching television promote them. Regular exercise can markedly reduce body weight and fat mass without dietary caloric restriction in overweight individuals. An increase in total energy expenditure appears to be the most important determinant of successful exercise-induced weight loss. Regular moderate intensity physical activity, a healthy diet, and avoiding unhealthy weight gain are effective and safe ways to prevent and treat cardiovascular diseases and to reduce premature mortality in all population groups. Although the efforts to promote cardiovascular health concern the whole population, particular attention should be paid to individuals who are physically inactive, have unhealthy diets or are prone to weight gain. They have the highest

risk for worsening of the cardiovascular risk factor profile and for cardiovascular disease. To combat the epidemic of overweight and to improve cardiovascular health at a population level, it is important to develop strategies to increase habitual physical activity and to prevent overweight and obesity in collaboration with communities, families, schools, health care professionals, media and policymakers (Lakka et. al., 2005). The Body Mass Index (BMI) is the accepted standard measure of overweight and obesity for children two years of age and older (Deurenberg et. al., 1991). As children approach adulthood, the 85th and 95th percentile BMI for age and sex are approximately 25 and 30 kg/m², the thresholds for overweight and obesity, respectively (Baker et. al., 2005).

Methodology of the Study

The study was conducted in four phases namely:

Phase I - Design of Interview Schedule and Conduct of Pilot Study

Phase II - Development of Software Kits

- 1. Nutritional Assessment Kit**
- 2. Nutrition Education kit**

Phase III - Conduct of Survey

Phase IV - Nutrition Education

Phase I: An interview schedule was designed to capture various details of the children with the aim to identify overweight and obesity and their impact on academic performance. A pilot study was carried-out to validate the interview schedule.

Phase II: Two software kits were designed and developed, one being to capture, relate and present the data captured using the interview schedule and the second for imparting nutrition education.

Phase III: Actual survey was conducted among 2538 children of both genders using the interview schedule.

Phase IV: Nutrition education was imparted to the children using the developed nutrition education software.

Findings of the Study

Pilot Study

The pilot study conducted among 75 children indicated the interview schedule designed was clear and easy to do the survey to assess the aim of the study.

However, the many children indicated that they found exam times uneasy and difficult. Hence, it was decided to include a question on stress during exams.

Development of Nutrition Software

The data captured in the Pilot Study was uploaded in the Nutrition Assessment Software designed. The Nutrition Assessment Software fit well to capture the details and to give the required reports presented as tables for easy understanding.

Nutrition Education Software

Nutrition Education Software designed was also used to impart the Nutrition Education among the students included in the pilot study. There was good response and learning among the children.

Survey Findings

• Socio-economic

The boys of all these three age (in years) were almost same in number ranging between 30 – 36 percent. A similar and an even closer percent level noticed among the girls with 33 and 34 percent.

It was clear that the number of children from nuclear family was higher (80 percent) as against the joint family (14 percent).

It could be observed that 66 percent of the families were of low income and 34 percent were from middle income. No one fell into the high income category. Among them, majority were Hindus (75 and 74 percent), followed by Christian (20 and 23 percent), India being a Hindu Country.

Both the fathers' and mothers' with school level education was higher (75 and 70 percent), followed by Graduates with 14 and 20 percent and least number noted with those with Post Graduation 11 and 10 percent respectively.

• Anthropometry

Majority of the children - 84 percent and 76 percent boys and girls respectively were underweight. However a sizable number of children falling to 11 and 18 percent (boys and girls respectively) were overweight which could lead to obesity in their adolescents period or in adulthood if not corrected.

The prevalence of overweight was seen to be more among the girls. Obesity prevalent percent levels was lesser than overweight percent showing 5 and 6 percent among boys and girls respectively.

• Dietary Pattern

92 and 88 percent were non-vegetarian, 5 and 8 percent were vegetarian and 3 and 4 percent were ova-vegetarian among girls and boys respectively. Among this non-vegetarian was the highest in both the gender.

Majority consumed non-vegetarian once a week 91 percent and 24 percent boys consumed once or rarely in a month and 7 percent of the girls consumed once a week and only 1 percent girls consumed once a month. There were none who consumed more than once a week regularly.

8 percent of boys and 10 percent of girls skipped breakfast. Lunch and dinner was rarely skipped and only by boys. All the girls mentioned that they never had the habit of skipping lunch and dinner.

Most of the children did not consume food outside. It could be depicted that only 6 percent of the boys and 14 percent of girls consumed fast foods outside. Eating outside as a major course of meal was 7 percent among boys and 11 percent among girls.

97 percent of the boys and 94 percent of the girls consumed snacks daily. A very meagre percent of 7 and 6 percent among boys and girls respectively consumed among boys and girls respectively consumed snacks weekly once or twice but not daily. All the selected children consumed deep fried snacks.

• **Clinical Assessment**

The clinical assessment was carried out for all the selected subjects, **Hair:** Lack of lustre, thinness of hair and being brittle easily pluckable was noted among a high percent among the girls and was very meagre among the boys.

Skin: Dry and wrinkled skin and pigmentation was not noticeable seen indicated by 1 to 4 percent.

Eye: Bitot spots was noted among the eye problem among 12 and 13 percent boys and girls respectively. However, there were several children who were wearing glasses to correct their vision.

Lips: Angular stomatitis was not among 1 percent of the boys only.

Tongue: Pale and bloated tongue and red ulcerated tongue was noticed among few children.

Teeth and Gums: The major problem noted among the children was discovered/chalked/molting enamel (22 percent boys and 15 percent girls) and spongy (20 percent boys and 9 percent girls) and bleeding gums (19 percent boys and 8 percent girls).

- **After School Activity**

Watching Television: A high percent of watching television was noted among the girls than the boys ranging from 15 to 27 percent as against the boys ranging from 11 to 52 percent. A higher percent of 52 percent of the boys watched television against 27 percent girls for more than 1 hour per day.

Mobile Games/Video Games: It was surprising to note that all the girls did not use mobile phones to play games for more than one hour. However, it was very obvious among the boys with 44 percent playing video games for more an hour per day.

Home work and Tuition: Data reveals that more than 50 percent of the children – 26 percent of both boys and girls and 69 percent and 37 percent of girls did home work at home or had tuition for one hour or more. This time is also getting the children to be idle without physical activity.

Leisure Time with Friends: A maximum time of upto 30 minutes was spent by most of the boys and girls (81 and 54 percent respectively) with a lesser percent shown in more than one hour. This could be due to homework, tuition, watching television and playing mobile games. All these occupied the time of the children after school.

Outdoor Games: It was astonishing to note that the girls spent a maximum of 30 minutes if at all they played but said that it was not on regular basis. However, the boys still despite the time spent on non-motile activities, did engage in playing outdoor games.

The same could be noted that the time spent by girls in non-motile activities were higher than the boys and the time boys returned home was late evening which gave them sufficient time to play outdoor games also.

- **Sports and Yoga**

Sports was a part of the school timetable and being mandatory to participate in sports activities, it was noted that all the selected children were involved in sports.

Yoga also was practiced among few schools. The yoga practice was also during school time which was 33 percent among boys and 24 percent among girls. It is a positive factor to note that all are involved in sports activities and many in yoga through the school system.

- **Sleep and Wake Hours**

8 hours of sleep was maximum noticed among 68 percent boys and 89 percent girls followed by 9 hour and least was those who slept for 10 hours (11 percent boys and 3 percent girls). A minimum of eight hours of sleep is necessary and a positive note can be taken to see that all the children in the study had a minimum of eight hours of sleep.

- **Academic Performance**

Results of marks scored in two monthly tests, quarterly and half yearly exam was consolidated. It could be noted that 80 percent of the boys and 83 percent of girls scored above 50 percent marks.

From the data through the survey, it can be noted that around 50 percent of the students 44 to 47 percent of both boys and girls found both preparing and writing the exam stressful.

- **Impact Evaluation on Overweight and Obesity**

Age and Sex

The socio economic factors evaluated to assess their impact on the overweight and obesity as a whole. Totally 224 and 97 overweight and 87 and 31 boys and girls respectively with the total of 439 put together both the genders accounting for and 17 percent of the total subjects being overweight and obese. In both the cases girls had a higher percent of being overweight and obese compared to the boys.

Family Type

It was noted that the joint family had a higher percent of being overweight and obese (34 percent compared to the nuclear family (15 percent).

Income Level

22 percent of the middle income group children were overweight and obese compared to the low income group with the 12 percent.

Religion

Among the religions, the Muslims had a higher percent level of being overweight or obesity with 41percent.

Vegetarian girls were more obese than vegetarian boys. Obesity was more pronounced among vegetarian boys compared to vegetarian girls. Totally 37 percent of the vegetarian children are overweight and obese. This was more than those who are non-vegetarians. This could be contributed by other factors (physical activity). More of ova-vegetarians (54 percent) overweight and obese. Among the non-vegetarians, 16 percent were overweight and obese when they consumed once a week and 12 percent among those who consume once a month.

Watching TV

Watching TV was directly proportional to the incidence of overweight and obesity with maximum of 86percent and 68percent overweight and 59 and

32percent be obese among those who watch TV for more than one hour - boys and girls respectively. A total of 27 percent was seen for both overweight and obesity for those watching TV more than one hour per day.

Mobile Games

A similar scenario was also notice among those who used mobile for more than one hour with maximum of 22percent and 60percent of overweight and obese boys. Overall analysis reflected that 29percent where overweight and obese compared to those who used mobiles for 30 minutes (6%) and less than 30 minutes (4percent).

Homework and Tuition

Doing homework in tuition also in a way leads to idleness showing similar results of 51 and 74 percent overweight and 49 and 48 percent obesity for those who spent one hour or more for homework and tuition among boys and girls respectively. Overall percent level syndicated 22 percent of children with one or more hours doing homework and tuition being overweight and obese.

Leisure Time with friends talking

Talking with friends for one hour more added to the time of idleness causing overweight and obesity - 75 and 64 percent and what is 6 and 10 percent among boys and girls respectively.

The overall result show that those pending less than 30 minutes overweight and obese open (17 percent). This could be e because they were also spending time watching TV, playing mobile games and into homework, tuition and not into outdoor games.

Outdoor Games

Children showing a decrease in the number of children being overweight and obese for who participated in outdoor games for more than one hour. However

there were no girls who participated in outdoor activities for more than one hour after school hour.

Sleep Hours, Overweight and Obesity

An increase in sleep hours decreased the percent of overweight among the boys and was reverse among the girls. The reverse was also noted both the genders for obesity. Both put together, it was depicted the decrease in sleep hours increase the percent level of overweight and obesity. This could be because of longer rest and sleep duration which could have put the children to being more active during their wake hours.

Yoga

The table also clearly depicts that only 2 and 6 percent of boys and girls were overweight however there were no obese children. This overweight could due to irregular practice of yoga or unhealthy eating practices.

- **Academic Performance**

Among those who scored the (consolidated) percent less than 50 were - 29 and 13percent being boys and 22 and 17 percent girls being were overweight and obese respectively and totally 42 percent of those who scored less than 50 percent overweight and obese.

Analysis on the percent level of overweight and obese children scoring less than 50 percent in academics showed that they were 54 and 21percent of overweight with boys and girls and 62 and 52 percent of obese boys and girls.

Majority that is more than 50 percent of the boys and girls (except overweight girls 21percent scored lower scores. Hence, it could be concluded that there is a need to intervene and correct the food habits and activities of children for better academic performance.

- **Exam Stress**

Exam stress during preparation and writing the exams was noted among children. It could be also noted that almost all boys (96 percent) and all (100 percent) of the boys stressed were overweight. Similar case was not among girls with high percent levels of 82 and 87 percent.

The same was noted among both the genders for both stress during preparation and writing the exams with percent levels ranging from 94 to 98 consolidated percent level (93 and 97) proved almost all the children who were overweight and obese were stressed during preparation of exams and while writing the exams.

- **Nutrition Education**

Nutrition education imparted was interactive and useful for the children for learning on nutrition, healthy food choices and following hygiene practices.

Conclusion

It could be concluded that the after school activities of the children were mainly sedentary in nature. Very little time by very few children was spent on outdoor games. This trend will lead to overweight and obese children in the society, further this will lead to various health disorders. Hence, an emergency call is required to assess prevalence of overweight and obesity among children and create an awareness on food habits and after school activities among children, school authorities and parents to curb the occurrence of overweight and obese children in our nation.