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Research Paper

Assessment of obesity in school going children of different schools

■ PUNAM AGARWAL AND VISHAKHA SINGH

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See end of the paper for authors' affiliations

PUNAM AGARWAL
Department of Foods and Nutrition, College of Home Science, Orissa University of Agriculture and Technology, BHUBANESWAR (ODISHA) INDIA
Email : punamagarwal2011@gmail.com

■ **ABSTRACT :** Unhealthy eating patterns and lack of physical activity develop obesity in school going children. If childhood obesity persists, it may bring the child at risk stage in his adolescent and adulthood. A study was undertaken on children from different schools in Bhubaneswar, Orissa to identify nutritional status based on anthropometric measurements and dietary intakes. Approximately 8.3 per cent boys (4-6 years age) in GEMS; 25 per cent boys in PNS and GEMS and 66.66 per cent girls of 7-9 years age in GEMS were stunted. About 50-75 per cent children in 7-9 years age group recorded normal to +1 (Z-score) BMI in PNS and GEMS whereas, 66.4 per cent boys and 91.63 per cent girls in SXHS (high parental income group) recorded BMI normal to +2 (Z-score). The data also indicated that around 8.33per cent girls and 25per cent boys of SXHS were obese with BMI of +3 . The income of the parents had profound influence on their calorie consumption and weight of school going children.

■ **KEY WORDS:** BMI, Parental income, Anthropometric, Energy consumption

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Anthropometric and energy intake of children is important for assessment of nutritional status of children and for reduction of malnutrition. India accounts for 40per cent of undernourished children in the world (James, 1998) and it is largely due to result of dietary inadequacy in relation to their needs (NIN, 2003). The state of Orissa still ranks second highest in the per cent of households reporting lack of food. During 1983, 35.1 per cent of households reported lack of food and it has been reduced to 5.9 per cent in 2004-05, whereas, the national average is 2.5 per cent.

Deficiencies in dietary intake below recommended averages affect the children in several ways both physically and mentally thus, becoming easy targets for infectious diseases and lessening of tolerance to paediatric ailments which would have long term effects during adolescence. India is going through a nutrition transition phase and is now facing the double burden of nutrition disorders. Poor and urban slum populations have a risk prevalence of under nutrition and on the problem of obesity. Unhealthy eating patterns and lack of physical activity develops obesity in school going children due to increased prevalence of paediatric obesity and its associated complications, the trends in child obesity should be closely monitored. In view of these vagaries in nutrition pattern of children in different income groups,

the present study is proposed with the following objectives:

- To assess the status of undernourished children.
- To understand the overweight and obesity patterns in children belong to different income groups of different schools in Bhubaneswar.
- To evaluate the energy intakes of children in different age groups of 4-6 and 7-9 years studying in different schools.

■ RESEARCH METHODS

Two age groups of school children (boys and girls) were selected, *i.e.* 4-6 years and 7-9 years. The 4-6 years group was consisted of children in Montessori II and III of nursery sections. The second group with age group of 7-9 years was consisted of children from standard 3 to 4. From each section/standard 10 boys and 10 girls were randomly selected for the study. Likewise, a total of 20 children from each standard were selected. A total of 40 children from each age group were selected in each school. Thus, the total number of children in both the groups in three schools was 240.

Three schools in different areas of Bhubaneswar were selected for the study were Prem Nursery School (PNS), Guidance English Medium School (GEMS) and St. Xavier's High School (SXHS).

Parental income has been considered for classifying the schools into different categories. Children from PNS are of low income (Rs. <1.0 lakh per annum); GEMS in medium income group (Rs. 1.0 to 4.0 lakh per annum) and St. Xavier's High School in the high income group (Rs. >4.00 lakh per annum).

Anthropometric measurement :

Measurements on weight (kg) and height (m) were recorded from every child and on the basis of these data, growth of the child was calculated comparing with standards. Body mass index (BMI) was calculated from standard formula weight (kg)/height $(m)^2$ and the values were compared with WHO standards (WHO, 2007; Chowdhury and Raug, 2014). The Z-scores under (0, +1, +2 and -1, -2) were calculated to identify overweight and obesity.

Dietary intake of children :

Information on dietary intake of each child was collected. Carbohydrate, protein, fat and total calorie contents of the diet were calculated and compared with the recommended dietary allowances for Indian children.

Statistical analysis :

The data on anthropometric measurements and dietary intake of children is first converted into uniform scale as per international procedures and standard deviation (σ) was calculated with Microsoft Excel® Windows 2014 with Vista operating system.

■ RESEARCH FINDINGS AND DISCUSSION

The results pertaining to anthropometric parameters of children (boys and girls) collected from two age groups and three schools were presented under sub-heading weight, height and body mass index. Table 1 shows the average anthropometric parameters of children in different schools.

Anthropometric measurements of children :

Weight :

Children from St. Xavier's High School (SXHS-High income group) in both age groups recorded the recommended average weight at 0-Z score values compared to Guidance English Medium School (GEMS-Medium income group) and Prem Nursery School (PNS-Lower income group). The girls in both age groups have recorded lower weight than boys in all the schools and it was more pronounced in PNS and GEMS, where the average weight of boys and girls was between median and -2 of Z-score. However, the proportion of children categorised into different Z-scores revealed that, between 58.3 to 83.3 per cent (4-6 years age) children were in the Z score of -2 in PNS and GEMS, whereas, the proportion has been reduced to 25 per cent and 33.2 per cent in SXHS. Between 66.66 to 75 per cent children (both boys and girls) in SXHS were in the standard deviation '0' of Z score.

In the age of 7-9 years, the proportion of children under 0, +1, +2 in Z score '0 was more prevalent in SXHS than PNS or GEMS. The weight of children from both PNS and GEMS recorded below standard deviation and upto -1 of Z-score.

Height :

The average height of both girls and boys of 4-6 years age group in all the schools were below the median height of 1.10 meters (Z score '0') and it was more predominant in girls of GEMS and PNS. In 7-9 years

age group, only children from SXHS have recorded standard height of 1.26 m for girls and 1.27 m for boys.

The proportion of children in standard normal height of 4-6 years age group was between 8.33 to 41.65 per cent in all the school in both boys and girls. In 7-9 years age children it was only 8.33 to 33.32 per cent in PNS and GEMS; 41.65 to 50 per cent in SXHS were above standard median height. Approximately 8.3 per cent boys (4-6 years) in GEMS; 25 per cent boys in PNS and GEMS and 66.66 per cent girls of 7-9 years age in GEMS were stunted.

Body mass index (*BMI*) :

Boys in the age group of 4-6 years in all schools have recorded above standard average Z-score BMI (15.1 for girls and 15.2 for boys). Approximately 50 per cent of boys and girls in all the schools have BMI of >15.1 and 100 per cent girls of SXHS recorded higher BMI (0, +1, +2). In contrast to 4-6 years age group, the 7-9 years group girls in all the schools have recorded higher BMI over the boys, however, the girls of PNS have the BMI below average (15.7). About 50-75 per cent children in 7-9 years age group recorded normal to +1 (Z-score) BMI in PNS and GEMS. Whereas, 66.4 per cent boys and 91.63 per cent girls in SXHS (high parental income group) recorded BMI normal to +2 (Z-score). The data also indicated that around 8.33per cent girls and 25 per cent boys of SXHS were obese with BMI of +3.

Dietary intake of children :

The calorie intake was calculated on the basis of total intake of carbohydrates, proteins and fats by children of different schools. The energy intake by boys was found more than girls in age group of 4-6 yrs in all the schools whereas, it was found more in girls than boys in age group of 7-9 yrs in all the schools except the boys of SXHS. It is clearly shown in Fig. 1 and 2. The data further indicated that, among the three schools, the energy consumption was found highest in SXHS followed by GEMS and PNS. The highest intake of calorie was 1785 kcal by the boys of SXHS in age group of 4-6 yrs whereas, it was consumed lowest *i.e.*1590 kcal by girls of PNS in same age group. Same consumption pattern

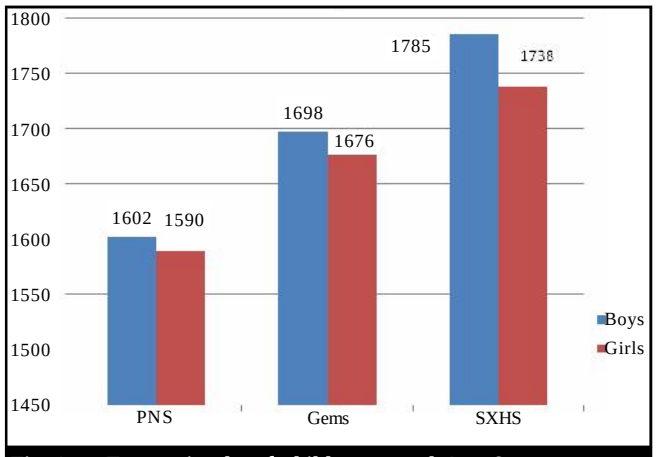

Fig. 1 : Energy intake of children - aged 4 to 6 years

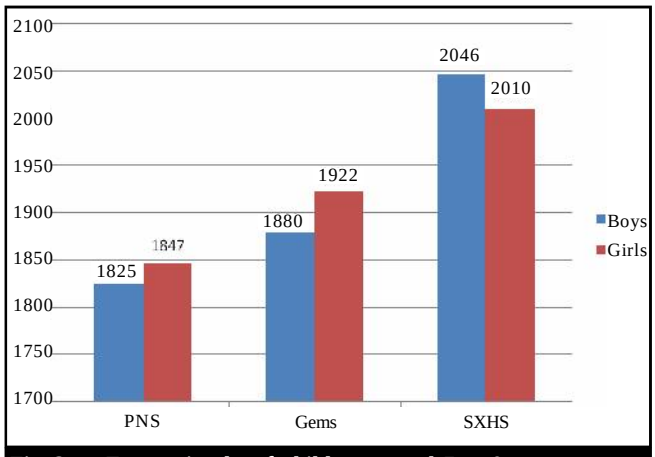

Fig. 2 : Energy intake of children - aged 7 to 9 years

Table 1: Anthropometric parameters of boys and girls of different ages in different schools in Bhubaneswar

School	4-6 years						7-9 years					
	Boys			Girls			Boys			Girls		
	Weight (kg)±SD	Height (m)±SD	BMI ± SD	Weight (kg)± SD	Height (m) ± SD	BMI ± SD	Weight (kg)±SD	Height (m)±SD	BMI ± SD	Weight (kg)± SD	Height (m) ± SD	BMI ± SD
Prem Nursery School (PEM)	16.89 ± 1.25	1.05 ± 0.03	15.23 ± 1.24	16.25 ± 1.108	1.04 ± 0.04	15.01 ± 1.71	23.66 ± 1.49	1.24 ± 0.03	15.46 ± 0.85	20.39 ± 1.58	1.15 ± 0.04	15.59 ± 1.43
Guidance Eng. Med. School (GEMS)	16.97 ± 1.41	1.04 ± 0.04	15.65 ±1.79	16.91 ± 1.32	1.04 ± 0.04	15.54 ± 1.05	23.75 ± 1.47	1.23 ± 0.03	15.65 ± 1.17	20.64 ± 1.35	1.14 ± 0.04	15.81 ± 1.41
St. Xavier's High School (SXHS)	18.58 ± 1.38	1.06 ± 0.03	16.55 ±1.41	18.53 ± 1.55	1.05 ± 0.03	16.93 ± 1.28	30.58 ± 2.89	1.27 ± 0.07	19.14 ± 2.63	29.25 ± 2.68	1.25 ± 0.05	18.98 ± 2.83

was observed in the age group of 7-9yrs in SXHS school. Discrimination against girls in feeding is reported to be one of the causes of poorer nutrition and higher mortality among girls than boys in many developing countries (Abeykoon, 1995; Pebley and Amin, 1991; Visaria, 1987; Elfindri, 1993 and Bairagi, 1986). Some studies based on anthropometric data do not find a higher prevalence of malnutrition among girls (Sommerfelt and Arnold, 1998; Sommerfelt and Steward, 1994; Basu, 1993; Schoenbaum *et al.*, 1995).

Further the results indicated a potential influence of parental income on calorie intake by the children and thus leads to higher BMI.

Studies have reported that the frequency of eating fast food is associated with BMI and body fatness in children (Thompson *et al.*, 2004). The higher the BMI is in childhood, the greater the probability of obesity is in adulthood. BMI has been used as suitable indicator to forecast the chances of obesity in future life of children (Freedman and Sherry, 2009; Krebs *et al.*, 2007). Overweight and obesity in childhood have been associated with adverse socio-economic outcomes, increased health risks (Must and Strauss, 1999; Reilly *et al.*, 2003; Whitlock *et al.*, 2005). High income of parents makes the child overweight and obese by allowing them to eat outside and brings them nearer to the health risk. Consumption of fast foods and junk foods has been on the rise in the recent days. Several studies indicated consumption of foods away from home increased fat content and further health risk. Consumption of foods away from home increased considerably in children (Nicklas *et al.*, 2001; St. Onge *et al.*, 2003) and adults (Lin *et al.*, 1999). The results indicated occurrence of obese children in schools with affluent parents.

Conclusion :

The study revealed variations in carbohydrate, protein and fat intake and thus leading the differential energy (calorie) consumption. The schools classified as per the income of the parents of children which also had a potential influence on anthropometric parameters *i.e.* height, weight and finally on BMI of the children. The present study also identified sections of the children from different income groups that are vulnerable to negative deviations and aberrations in anthropometric and dietetic imbalances and that too more so in girls than boys. It is also concluded that higher dietary fat and calorie consumption by children from high income groups may make them obese in future.

There is a direct relation among energy consumption, obesity and income. Intake of nutritious food, less oily foods, avoidance of junk food, changing of sedentary life style, reducing number of hours for watching television etc. would definitely reduce the risk of obesity and improve overall health of the child now and in future.

Authors' affiliations:
VISHAKHA SINGH, Department of Food and Nutrition, College of Home Science, Orissa University of Agriculture and Technology, BHUBANESWAR (ODISHA) INDIA

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