Prevalence of Obesity among Primary school children and its Association with Parental obesity and Socio- economic status

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Abstract

Background: Childhood obesity adversely affects physiological and psychosocial well-being; the significant consequence is its persistence to adulthood with all its health risks. Data regarding childhood obesity in India is scarce. Effective prevention of adult obesity will require prevention and management of childhood obesity.

Aim: "To study the prevalence of overweight and obesity and its association with parental obesity and socio-economic status among primary school children of Mysore city."

Materials and Methods: A cross sectional design was adopted and 3 schools (2 private and 1 government schools) were selected by stratified cluster-sampling technique, using population proportional to size (PPS) method. A total of 1566 school children aged 6-12 yrs were measured for height and weight using standardised methods. Data on demographic details, diet and physical activity of child, their parent's education, income, height and weight were taken. Prevalence rates were calculated using World Health Organization-Body Mass Index (WHO-BMI) for age percentile chart 2007.

Results: Out of 1566 children, 132 (8.49%) were overweight and 65 (4.2%) were obese. Except for two overweight children in government school, all overweight and obese children were found in private schools, where children are from upper socio-economic class. Obesity in children was significantly associated with parental obesity.

Conclusion: Children from upper socio- economic class consume high fat and high energy food and snacks in between the meals. Health education should be given to parents, teachers and children regarding dietary habit and sedentary life style.

Keywords: overweight, obesity, BMI, school children, socio – economic status

Introduction

The 21st century epidemiological transition is manifesting in the form of shift towards increase in prevalence of Non Communicable Diseases (NCD's) and a decline in communicable diseases. NCD's are associated with various risk factors like obesity, tobacco use, alcohol, stress, high blood pressure and glucose levels that are measurable and largely modifiable. Obesity can be seen as the first wave of a defined cluster of NCD's, creating an enormous socioeconomic and public health burden in developing countries[1].

Childhood obesity adversely affects physiological and psychosocial well-being; the significant consequence is its persistence to adulthood with all its health risks. About one-half of obese children become obese adults [2]. Multiple factors like lack of physical activity, unhealthy eating patterns, or a combination of both with genetics and lifestyle play an important role in determining a child's weight. Television, computer and video games contribute to children's inactive lifestyles[3].

Excess body fat is associated with insulin resistance, impaired glucose tolerance, hypertension, atherosclerotic risk factors and type 2 diabetes among children and adolescents. In adults it leads to cardiovascular disease risk, type 2 diabetes, hyperlipidemia, hyperinsulinemia, arthritis, sleep apnoea and behavioral problems and cancer [3,4].

The increasing prevalence of overweight, obesity and its consequences prompted the World Health Organization to designate obesity as a global epidemic. The problem is global and is steadily affecting many low and middle-income countries, particularly in urban settings. Globally, an estimated 10 per cent of school-aged children between 5 and 17years of age are overweight or obese.[1] In India the

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growing affluence has come with a heavy price, the burden of obesity. Few earlier investigations in India have reported an increased prevalence of childhood obesity ranging from 5.5 % to 17%. Studies also indicate that the prevalence is higher in urban than in rural areas[5]. The paradigm shift in the quality of life in urban population is the reason for substantial increase in childhood as well as adult obesity in the urban population[6]. With these background in mind, the present study was undertaken in Mysore. The study was conducted with the objective to know the prevalence of obesity in primary school children and to identify the factors influencing childhood obesity.

Material and Methods

A cross sectional study was conducted during the period from May 2011 to November 2011, among the primary school children aged 6-12 years of Mysore city. Sample size was calculated using the formula $n = 4pq/l^2$, where p (prevalence) was taken as 0.06% and l (allowable error) as 20% of p, 1566 primary school children constituted the study population.

The list of schools along with its student's strength was obtained from BEO (north & south) of Mysore city. A total of 562 government and private schools were listed with a total strength of 57,931 children. Stratified cluster sampling method was used to select the schools. First the schools were divided into two strata, government schools and private schools. Each school was considered as a cluster and according to population probability to size (PPS) method, two private schools and one government school were selected. All the students aged between 6-12 yrs from each selected school, were included in the study.

Inclusion Criteria: All primary school children aged 6- 12 years in the selected three schools of Mysore city.

Exclusion Criteria

·Children whose parents did not provide consent

·Children less than 6 yrs or more than 12 yrs of age

Children whose exact birth date was not available

Approval for the study was obtained from the Ethical Committee, JSS Medical College, Mysore. A pilot study was done on 150 randomly selected private and government school children to check

the feasibility of the study performa. A prior consent for the study was taken from the school administration. At the time of initiating the study, parents of each participant were informed about the study protocol and written consent was obtained for their child's participation.

A semi-structured questionnaire was distributed to the study subjects in the classroom after explaining them about the study and taking their verbal consent. All the students were instructed to take the questionnaire home and get it filled by their parents/guardians, which were collected back the next day. Simultaneously height and weight of the children was measured using standardised instruments and techniques. Variables like age, sex, religion, dietary habits, physical activity of the child and education status, occupation, income, height and weight, h/o diabetes of their parents were included in the questionnaire.

Socio-Economic status of the family was assessed using Modified Kuppuswamy's method of socio-economic scale [7,8] which is based on the following three characteristics of the family.

1.Educational status of the head of the household

2.Type of occupation of the head of the household

3.Monthly income of the family BMI of each parent was calculated and they were categorized into normal, overweight and obese based on WHO classification of adults according to BMI [7].

Normal	18.5 - 24.9
Overweight	25 – 29.9
Obese	> 30

Anthropometric measurements

Height was measured by asking the child to stand upright without footwear with gaze horizontal, the heels, the buttocks and the shoulders touching the wall on which the scale was marked with the measuring tape. It was recorded in centrimeters to the nearest 0.5 kg by using the standard weighing machine. The students were asked to stand upright, bare footed on the weighing machine looking straight while the measurement was read. The scale was zeroed before each session. BMI was calculated using the formula [9,10].

$$BMI = \text{Weight (kg)} / \text{height (m)}^2$$

According to WHO-2007 sex specific BMI percentile chart, which is considered to provide an appropriate reference curves for the world population aged 5 – 19 years, children were categorized into four groups: $\geq 95^{th}$ percentile as Obese, $> 85^{th}$ percentile as Overweight, $5^{th} – 85^{th}$ percentile as Normal and $< 5^{th}$

percentile as Underweight.

Data was compiled using Microsoft Excel software and analyzed using Epi- Info software. Proportion & Chi-square tests are done in this study. For all statistical tests applied, $p < 0.05$ was taken as the significant level.

Results

Among 1566 children, aged 6-12 years, 760 (48.5%) were boys and 806 (51.5%) were girls. Majority of children 625 (41.6%) were in the age group of 11-12 years. Maximum number of children 1063 (67.8%) were Hindus. Most of the children 979 (62.5%) consumed mixed diet. In the present study, 364 (23.2%), 335 (21.3%) and 338 (21.5%) belonged to class I, class II and class III socio- economic group respectively.

Table 1 Prevalence of Overweight and Obesity among study subjects

BMI status	Number of subjects	Prevalence rate (%)
Obesity	65	4.1
Overweight	132	8.4
Underweight	532	33.9
Normal weight	937	59.8
Total	1566	100.0

According to the WHO-BMI for age percentile chart 2007, prevalence of Overweight and Obesity among study subjects was 8.4% (132) and 4.1% (65) respectively (Table 1). The prevalence of underweight in our study was 33.9% (532). No obese child was found in government school and the prevalence of underweight was more in government school children 57% (399) when compared to private school children 34% (296), but the reverse was true for overweight prevalence which was more in private school children 14.9% (130) than government school 0.2% (2).

An increasing trend of prevalence of obesity was seen with the age of children; except for a slight decline at the age of 12 yrs (Figure 1). High prevalence of about 14.5% was observed in the age group of 10-11yrs. Least prevalence was seen in the age group of 6-7 years (8.2%). No much difference was seen in the prevalence of obesity between girls (12.9%) and boys (12.2%). The prevalence of obesity was high among Hindu children. The prevalence of

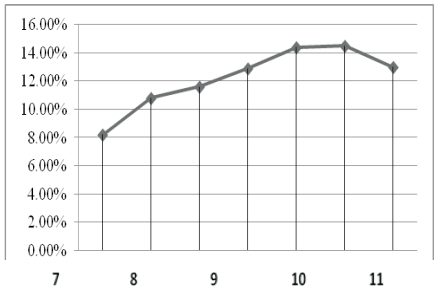

Figure 1. Age wise prevalence of obesity among study subjects

obesity was almost same between nuclear (12.6%) and three generation families (12.5%), but was less among joint families (7%).But these differences were not statistically significant (p >0.05).

Table 2. Prevalence of obesity among study subjects in relation to their parents education status

Education status	Parent	Obesity among study subjects		Total
		Present	Absent	
<10th std	Father	05 (1.7%)	282 (98.3%)	287
	Mother	06 (1.5%)	384 (98.5%)	390
>10th std	Father	**192 (15%)**	1087 (85%)	1279
	Mother	**191 (16.2%)**	985 (83.8%)	1176

Table 3. Prevalence of obesity among study subjects in relation to occupation status of their mothers

	Obesity among study subjects		Total
	Present	Absent	
Working mothers	**110 (15.8%)**	587 (84.2%)	697(100.0%)
Non- working mothers	87 (10%)	782 (90%)	869(100.0%)
Total	197	1369	1566

$x^2 = 11.7, p = 0.001$

Table 3. Prevalence of obesity among study subjects in relation to occupation status of their ted $\geq 10^{th}$ std

when compared to children of illiterate parents or parents educated less than 10th std (Table 2). Statistically significant association was observed between working mothers and raised prevalence of obesity among children (Table 3). Children with diabetic father had less prevalence of obesity (10.9%) when compared to children with non-diabetic father (12.8%). But this was reverse among mothers; raised prevalence (16.4%) was seen among children with diabetic mothers than with non-diabetic mothers (12.4%). However both the differences in prevalence were not statistically significant ($p > 0.05$). Out of 38 children whose both the parents were obese, 20 (52.6%) children were obese, statistically significant association was seen between childhood obesity and parental obesity (Table 4).

Table 4. Prevalence of Obesity among study subjects in relation to their Parental Obesity

Parental Obesity	Obesity among Study Subjects		Total
	Present	Absent	
Present	**20 (52.6%)**	18 (47.4%)	38 (100.0%)
Absent	177 (11.5%)	1351 (87.5%)	1528 (100.0%)
Total	197	1369	1566

$X^2 = 56.8, p = 0.0001$

Prevalence of obesity was more among children who consumed vegetarian diet (14.5%) when compared with children who consumed mixed diet. But this difference was not statistically significant**.** Maximum obese children i.e., 79 (21.7%) and 65 (19%) belonged to class I and class II socio- economic group respectively who were from private school. Low prevalence (1.4%) was seen in class IV group who were from government school. This association of higher socio-economic group and childhood obesity was found statistically significant (Table 5).

Table 5. Prevalence of obesity in relation to socio-economic status of the family

Socio-Economic Status	Children examined	Obese Children	
	No	No.	%
Class I	364	79	21.7
Class II	335	65	19.4
Class III	338	49	14.5
Class IV	282	04	1.4
Total	**1566**	**197**	**12.5**

$x^2 = 110.3, p = 0.0001$

Discussion

It is emerging convincingly that the genesis of Type 2 Diabetes and Coronary Heart Disease begins in childhood, with childhood obesity serving as an important factor. There has been a phenomenal rise in proportions of children having obesity in the last four decades especially in the developed world. Studies emerging from different parts of India within last decade are also indicative of similar trend. Examination of the factors involved in weight gain and obesity in developing countries where socioeconomic changes are going on, is crucial for predicting the future impact, because the problem of obesity is emerging at a time when under nutrition remains a significant public health problem[11].

In the present study the prevalence of overweight and obesity was 8% and 4% respectively. Similar prevalence was reported by Saraswathi et al.,[5] among children aged 13-17 yrs in Mysore (8.75%) and by Jalaja Kumari et al [12], in Guntur. But higher prevalence of about 14% and 22% was seen by Chhatwal J et al [13], in Punjab and Sharma A et al [14], in Delhi respectively. This difference in prevalence indicates a strong influence of nutritional habits and lifestyle pattern on overweight and obesity found in children. An increasing trend of prevalence of obesity with the age of children was seen which was similar to studies by S Kumar et al., in Davengere [15] and by P Mahajan et al., in Puducherry [2]. Higher prevalence of obesity in the pubertal age group might be due to increased adipose tissue and overall bodyweight in children during puberty. No much difference was seen in the prevalence of obesity between girls and boys in the present study. Similar situation was observed by Bharathi D R et al [**1],** in 31 middle-schools and high-schools of Wardha city. Most of the studies done in Davengere [15] and Mysore [5] have reported higher prevalence of obesity among girls than boys. But prevalence of obesity was higher in boys as compared to girls in Punjab [13]. The difference in results might be due to difference in age group of the study subjects selected for the study and the methodology used for the survey. Children in nuclear families showed higher prevalence of obesity in the present study. A study in Puducherry [2] revealed that students who belong to family size up to four showed a risk of having overweight/obesity 1.68 times that of students of

family size more than four. Similar finding has been reported by Tarek T A et al [16] and Kapil U et al [17].

Higher prevalence of obesity was observed among children whose parents were educated more than 10th standard, similar finding was seen in Wardha city, Central India[1] (parents education > 6th std). Ramesh K et al [3]. also observed a positive significant association between paternal/maternal better education and overweight/obesity among their children. The present study showed more prevalence of obesity among children of working mothers compared to the children of non-working mothers, similar to Kerala study[3]. This can be justified as, working mothers opt for outside food due to lack of time to prepare food at home and are not able to concentrate on their children's diet.

The genetic component of obesity etiology was brought out in this study too. The prevalence of obesity was found to be significantly high among the students whose parents were obese. Similar association was seen in studies by Uma Iyer et al[18] and Whitaker R C et al[19] Here it is to be noted that parental obesity leading to increased prevalence of obesity in their children is not only due to the genetic factor but also because of the life style practices and diet pattern followed in that household. High prevalence of obesity was observed among children of diabetic mothers when compared with children of non- diabetic mothers. The reverse was seen in case of paternal history of diabetes where in high prevalence was seen in children of non-diabetic fathers. However both these differences were not statistically significant. But significant association of family h/o diabetes with prevalence of obesity in children was seen in Kerala study [3] Difference in age group of study subjects and method of data collection might be the reason for this variation in findings.

Socioeconomic status may indirectly affect the development of overweight /obesity through the alteration of dietary habits / behaviors and physical activity patterns. Higher the socio-economic status, greater the sedentary lifestyle followed, which includes consumption of high calorie food and physical inactivity. Our study showed a very strong correlation between economic status and nutritional status of the child.

Private school children who are from high socio-economic class have sedentary lifestyle showing higher prevalence of overweight and obesity, where as children from low socio- economic class who go to government school show higher prevalence of underweight than private school children. This can be attributed to poor diet in spite of various nutritional programs by government .In India, studies in Punjab [13] and in Delhi [14] have shown raised prevalence of overweight/obesity among higher socio economic status which is similar to our study. But there is a powerful inverse relation between obesity and socioeconomic status in the developed world. A systematic review in America by Shrewsbury V et al [20]. Showed that socio economic status was inversely associated with adiposity. In developed countries most of the children stay away from their parents, so the influence of their economic status might be less on children.

Thus socioeconomic conditions, parental obesity and sedentary lifestyle were felt to be the important contributors towards overweight and obesity in our study population. The present study provides an overview of the burden of childhood obesity among representative sample of children aged 6 - 12 yrs. It also indicates the need to devise meaningful control measures, further research on risk factors for childhood obesity and also to monitor the trend in near future.

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