Prevalence of Childhood Obesity in School Children from Rural and Urban Areas in Mysore, Karnataka, India

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ABSTRACT Prevalence studies on obesity in school children has been carried out extensively worldwide but such explorations are very limited in Indian populations, especially a comparative account between rural and urban areas. Very few earlier investigations in India have reported an increased prevalence of childhood obesity ranging from 5.5 % to 17%. This study was designed to know the prevalence of childhood obesity in school children from rural and urban areas in Mysore population. Data on the prevalence of obesity in children were collected and analyzed from three and four major schools from urban and rural areas of Mysore district respectively. The prevalence of childhood obesity in Mysore is not very high as compared to other reports from different regions of the country. However, it is an important multifactorial condition which needs immediate medical attention to stop the march of healthy children towards chronic disorders.

INTRODUCTION

Obesity in general is defined as the presence of excess adipose tissue in the body to such a degree that it may lead to health hazards (Prentice et al. 2001; Rossner 2002). Obesity can be seen as the first wave of a defined cluster of non-communicable diseases called "new economic syndrome'' creating an enormous socio-economic and public health burden in poorer countries (WHO 2000). Obesity is not a single disorder but a heterogeneous group of conditions with multiple causes. Body weight is determined by an interaction between genetic, environmental, psychological factors acting through the physiological mediators of energy intake and expenditure. Even in India, malnutrition has attracted the focus of health workers, as childhood obesity was rarely observed. But over the past few years, childhood obesity is increasingly being observed with the changing lifestyle of families with increased purchasing power, increasing hours of inactivity due to addiction to television, videogames and computer, which have replaced outdoor games and other social activities (Singh and Sharma 2005).

Globally, an estimated 10 percent of school children aged between 5 to 17 years are overweight and obese (Childhood Obesity-the Global Picture 2006). The prevalence of obesity in children has increased over the past few decades and its statistics are alarming. The prevalence and etiologies behind the childhood obesity may vary according to an individual lifestyle and their socio-economic status. Most of the reports with regards to childhood obesity are from studies conducted at metropolitan cities in India and no systematic studies on childhood obesity have been carried out at Mysore so far. Hence, in this view the present study was carried out to investigate the prevalence of childhood obesity and its etiologies in school children from different rural and urban areas of Mysore District, South India.

MATERIALS AND METHOD

The study was a cross-sectional randomized epidemiological study among high school students of 8th, 9th, and 10th standard in urban and rural areas of Mysore city in the year 2008-2009. A total number of 2189 school children aged 13 to 17 years had participated in this study. Out of them, 1439 were from urban and 750 were from rural area. In the urban area, 860 were boys and 579 were girls, and from the rural area, 360 were boys and 390 were girls. The body weight was measured without shoes using a measuring scale and height to the nearest centimeter was taken.

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Body Mass Index (BMI) was calculated as weight (in kilograms) divided by height (in meter squared). Healthy children have a BMI percentile ranging between 5th percentile to 85th percentile. The children whose weight were more than 85th to less than the 95th percentile were considered as overweight and obese who were equal to or greater than the 95th percentile (WHO 2000). Physical activity was recorded with the help of school curriculum and questionnaire specially designed for them. The consent was taken from DDPI (Deputy Director of Public Instruction) and head of the institute before their inclusion in the study.

The prevalence of childhood obesity was compared between urban and rural areas and expressed in percentage (%). Student t- test was used to find out the significance between urban and rural areas with respect to childhood obesity. Logistic regression analysis was carried out in the present study to find out the etiologies of childhood obesity. A total of 100 confirmed overweight and obese children were selected as cases out of 132 overweight and obese children and out of 1259 normal weight children, 100 children were selected as controls based on the BMI calculation according to WHO growth charts. The extrusion criteria used while selecting the controls are family with any history of obesity, hypertension and diabetic conditions were extruded for logistic regression analysis. To generate a case control dataset out of 100 childhood obese and overweight cases and one child from each of the 100 control families were used. Care was taken to maintain similarity of ethnic and socio-economic backgrounds between the case–control groups. Case-control dataset was used for logistic regression analysis.

RESULTS

Table 1 shows the distribution of sample according to BMI in urban and rural population.

The prevalence of overweight/obesity was recorded as 8.75 percent and 0.8 percent in urban and rural area respectively. In the present study, we found higher frequency of overweight and obesity in urban girls (10.36 percent) and rural girls (1.02 percent) compared to boys (7.67 percent) in urban and (0.5 percent) in rural areas. Which might be due to physiological changes such as hormonal variations with respect to their age. The prevalence of underweight is 31.82 percent in urban and 45.33 percent in rural population. The significant increase in overweight and obesity in the children belonging to urban area and high prevalence of underweight in rural area was observed in Figure1

When outdoor activities of the children are compared with their BMI status, there is significantly higher prevalence of overweight and obesity in children with only indoor activities such as television viewing (>20hrs/week), computer and videogame (>10hrs/week), indoor games (>10hrs/week) sleeping (>10hrs/day) and long school hours (Fig. 2). The logistic regression analysis was carried out in all combinations to establish specific relation of physical activity and overweight and obesity. The results are statistically significant which support the strong influence of physical inactivity on overweight. The odds ratios were significant at 95 percent confidence interval for the effect of physical inactivity on overweight/obesity (Table 2).

DISCUSSION

In India, very few studies have been carried out to study the overweight/obesity in school children and majority of them have been carried out in metropolitan cities in high income schools (Subramanyam et al. 2003; Kaur et al. 2005; Sidhu et al.2005; Kaneria et al. 2006; Laxmaiah et al. 2007; Aggarwal et al. 2008). Ramchandran et al. (2002) reported obesity to be 4.5 percent in low income schools and 22 percent in better-

Table 1: Prevalence of normal weight, under weight and overweight/obese children from rural and urban areas

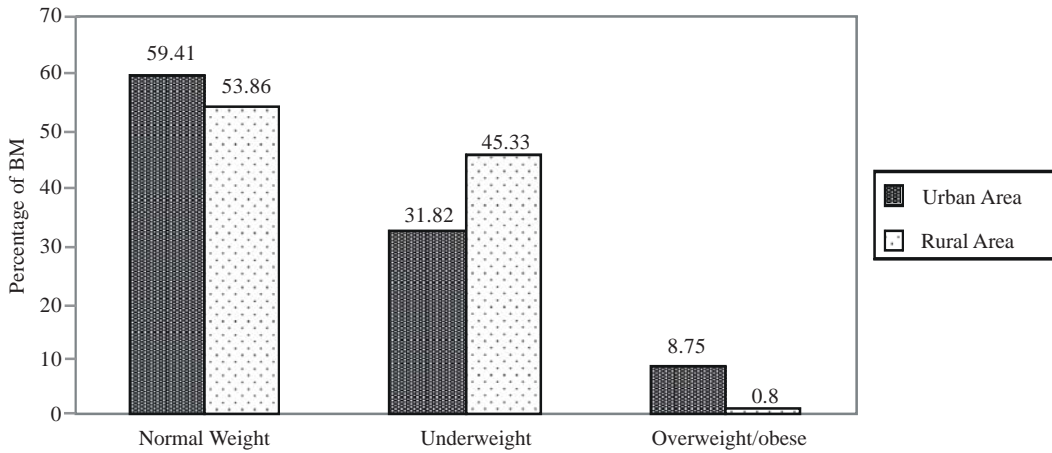| | Urban area | | | | | | Rural area | | | | | |
	Normal weight		Under weight		Overweight/ obese		Normal weight		Under weight		Overweight/ obese	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Boys	488	56.74	306	35.58	66	7.67	260	72.22	98	27.2	2	0.5
Girls	367	63.38	152	26.25	60	10.36	144	36.92	242	62.05	4	1.02
Total	855	59.41	458	31.82	126*	8.75	404	53.86	340	45.33	6*	0.8

Fig. 1. Comparision of rural and urban children for normal weight, under weight and overweight/obese in Mysore

Table 1a: Comparison of normal weight, and over-weight/obese children from urban and rural areas along with t-test

Conditions	No. of children	Mean± SD
BMI of obese children from urban	126	25.30±2
BMI of obese children from rural area	6	25.08±1.2

p value= 0.02

off schools of Chennai. Obese conditions were reported from different corporations and well-off schools from Delhi and Pune are found to be 7.4 percent and 6 percent respectively. Kapil et al. (2002), Bhave et al. (2004), and Anju et al. (2007) also reported prevalence of overweight and obesity in affluent adolescent school girls in Bangalore as found to be 13.1 percent and 5.0 percent respectively. Studies from rural areas mainly emphasize on underweight and data on overweight and obesity are not available.

A cross- sectional study conducted in Mysore city by Premanath et al. (2009), showed the prevalence of overweight and obesity in school children aged between 5 to 16 years to be 8.5 percent of overweight and 3.4 percent of obesity in urban area respectively, but there is no report regarding rural area study.

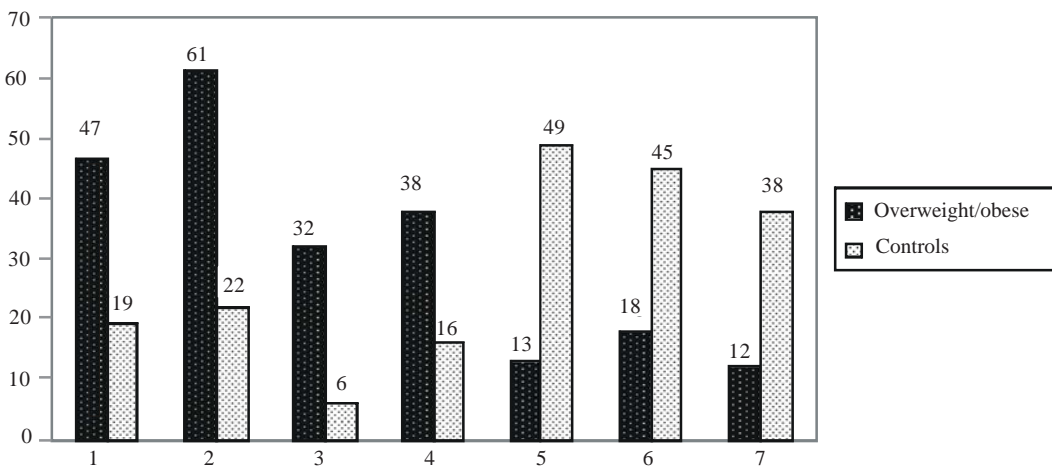The present study was carried out in Mysore

Fig. 2. Comparison of overweight/obese and control for physical activity (1=Television viewing >20hrs/week, 2= Computer and videogame >10hrs/week, 3= Indoor games >10hrs/week, 4= Sleeping>10hrs/day, 5= Out door games >20hrs/week, 6= Household work >10hrs/week, 7= Exercise/swimming/jogging >10hrs/week)

Table 2: Logistic regression analysis of overweight/ obese and controls for physical activity (c.i.=confidence intervals)

Logistic regression analysis		
Variables (Criteria's)	Univariate	
	Odds ratio (95% c.i.)	P value
Television viewing >20hrs/week	4.040 (2.122 ; 7.691)	0.001*
Computer and videogame > 10hrs/week	5.545 (2.981 ; 10.316)	0.001*
Indoor games > 10hrs/week	7.373 (2.920 ; 18.613)	0.001*
Sleeping> 10hrs/day	3.167 (1.622 ; 6.184)	0.002*
Outdoor games > 20hrs/week	0.156 (0.077 ; 0.314)	0.001*
Household work >10hrs/week	0.268 (0.141 ; 0.511)	0.001*
Exercise/swimming/ jogging >10hrs/week	0.222 (0.108 ; 0.40)	0.003*

* = significant

district of south Karnataka where the population size was reported as 7, 99,228, whereas in each rural village the population size was around 4000 – 6000 in number according to the 2001 census. Study subjects were included randomly and no particular selection criteria were adopted. The collection of samples was carried out from three well-off schools of Mysore city which are 3-5 km. in distance. The study subjects from the Mysore city were from middle and high income families leading a comfortable life when compared to the subjects of rural area. Four different schools were selected randomly from rural areas which were 20-30 km. in distance from Mysore city. Here the subjects were from low income families which mainly depend on farming and agriculture. In our study, overweight and obesity were found to be 8.75 percent in urban schools and 0.8 percent from rural area according to the BMI calculation showing a significant p value of 0.02 (Table 2) It is evident that the prevalence of overweight and obesity is high in urban and less in rural area and prevalence of underweight is 31.82 percent and 45.33 percent in urban and rural population respectively.

The reason for the higher prevalence of overweight and obesity among children in urban area and lower prevalence in rural area are largely unknown. Giammattei et al. (2003) also reported that children who spent more time watching television had a higher BMI, a higher percent of body fat and were physically less active. Unsafe roads, lack of free space for playing, increased television viewing and computer usage has made life sedentary (Bhave et al. 2004). The results in our study clearly indicate that the prevalence was significantly lower among the adolescents who participated regularly in the household activities, played outdoor games and performed physical exercises. The average duration of participation of controls in outdoor sports and games (>20hrs/ week) was significantly higher (p < 0.001) as compared to the cases (<20hrs/week). On the other hand, the prevalence of overweight and obesity was higher among the adolescents who were involved in sedentary activities such as spending time by watching television (>20hrs/ week) when compared to controls with a significant p value <0.001, which is consistent with earlier studies (Klesges et al. 1993).

The possible risk factors in causing childhood obesity are sedentary lifestyle which makes them stay physically inactive. Often parents are working and unable to concentrate on balanced nutritional food for their children. They find it easier to let their children consume junk and fast foods. Even the burden of school work and academic competitiveness has decreased the participation in sports and other form of physical activities in urban area which leads to high frequency of overweight and obesity.

The study also suggests that malnutrition rates remain high both in urban and rural children. Underweight is predominant in rural school children and in some cases the total body fat percent is much below the prescribed limit. This shows that the children in rural areas are undernourished and prone to several deficiencies and disorders. The possible risk factors may be due to socioeconomic conditions and poverty.

CONCLUSION

The present findings indicate that prevalence of childhood obesity in Mysore is not as high as the incidence reported by other studies. However, we found higher frequency of overweight and obesity in urban areas as compared to the rural. The frequency of overweight and obesity was observed to be much higher in girls when compared to boys of both urban as well as rural children. Hence, it is a serious problem, which requires immediate attention, creating a awareness program in the schools and parents encour-

aging their children to be involved in more physical exercises, sports and outdoor activities, thus avoiding the march towards obesity.

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