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Body mass index for age criteria: a school based study in Meerut (U. P)

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ABSTRACT

Background: Under nutrition, overweight and obesity are important determinants of health leading to adverse metabolic changes and increase the risk of non communicable diseases, with the adoption of western lifestyle the problem of overweight and obesity is gradually increasing in children and adolescents. With this background a school based cross sectional study was undertaken to assess the nutritional status of school going children of urban area Meerut City UP, India

Methods: A school based cross sectional study was conducted. A total of 4202 school students (05-18 years) were examined from one government and one private schools that were selected by simple random sampling method. Pre-designed and pre-tested questionnaire was used to elicit the information on individual characteristics. Height and weight of the children were measured, BMI and other parameters were calculated.

Results: On applying the BMI –for- age criteria 22.8% boys and 19.9% girls were found under weight while 04.1 % boys and 03.04 % girls were overweight , and 05.06% boys and 04.08% girls were found obese . 22.8% government and (16.00%) private school children were found under weight while 03.4 % government and 5.6 % private school students were overweight , and 03.8 % government and 11.8 % private school students were found obese .

Conclusions: Proper dietary habits and lifestyle modification must be advised to children to prevent occurrence of under nutrition, overweight and obesity in them. Family environment plays important role in predisposing the children tounder nutrition, overweight/obesity and hence the interventions need to be directed towards the families.

Keywords: School children,Body mass index (BMI –for- age criteria) , Under nutrition , Overweight, Obesity.

Introduction

Children age is often considered as school age. The foundation of good health and sound mind is laid during the school age period. This age is considered as dynamic period of growth and development because children undergo physical, mental, emotional and social changes. Malnutrition has been defined as " a pathological state resulting from a relative and absolute deficiency or excess of one or more essential nutrients". It comprises four forms- under nutrition, over nutrition, imbalance and specific deficiency of nutrients.According WHO (2005) 22 million children under 5 years of age were overweight [1].

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The most recent estimates (1996-2005), in developing world, state that approximately 146 million children are underweight, out of these 57 million children live in India[2].

In India, 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 television, video games and computers have replaced outdoor games and other social activities[3].The most significant long term consequence of childhood and adolescent overweight and obesity are their persistence into adulthood with all of the associated with an increased risk of developing cardiovascular disease, dyslipdemia, hyperinsulinemia, diabetes mellitus, hypertension, arthritis, other non communicable diseases and behavioral problems[4]. Hence evaluation of overweight and obesity in children is important as it provides an opportunity to identify the problems and prevent disease progression in to adulthood[5].There are many community based studies to assess the nutritional

status of school aged children but very few school based studies to assess the same. In view of these, a school based study was planned with following objectives.

1. To assess the prevalence of under nutrition, overweight and obesity among children .
2. To study the factors associated with overweight and obesity in school aged children.

Materials and methods

A school -based cross sectional study was conducted to assess the BMI measurement and nutritional status of school children. One government and one private school of Meerut district were selected from the list which has been obtained from the office of educational authority of Meerut District through simple random sampling method. A total of 4202 school children aged 5-18 years were enrolled in the study and examined with due permission from school authorities and parents . Data was collected from September 2013 to December 2013. A pre-designed and pre tested performa was used for the study. Body weight was measured using a weighing machine with an accuracy of ±100 gm. The subjects were asked to remove their footwear and accessories before measuring their weights.

Under weight , normal overweight and obese were classified on basis of WHO Growth Charts for BMI - for- age criteria, for 5-18 years old boys and girls. Under weight was less than 5th percentile, healthy/normal was between 5th to less than 85thpercentile, overweight being 85thto less than 95thpercentile, and obese was equal to or greater than 95thpercentile [6].Anthropometric measurements of the children were taken by trained medical staff. Height was measured (to the nearest 0.5 cm) with the subject standing are footed in an erect position against a vertical scale of portable stadiometer. All the entries were double checked for any possible keyword error. Prevalence of overweight and obesity was expressed as percentages. Association of variables with overweight and obesity (outcome variable) was assessed with the Chi square test.

Results

A total of 4202 school students (05-18 years) consented to participate in the study. There were 2398 (57.06 %) boys and 1804 (42.94 %)girls . 3433 (81.70 %) students were enrolled in government school and 769 (18.30 %) belonged to private school.

Table no 1: Association of BMI status and gender

BMI CATEGORY	MALE		FEMALE		TOTAL		Chi Square VALUE	P-VALUE
	FREQUENCY	PERCENTAGE	FREQUENCY	PERCENTAGE	FREQUENCY	PERCENTAGE		
UNDERWEIGHT	547	22.8%	359	19.9%	906	21.60%	9.36	0.025 (SIG.)
NORMAL	1619	67.5%	1297	71.9%	2916	69.40%		
OVERWEIGHT	98	4.1%	62	3.4%	160	3.80%		
OBESE	134	5.6%	86	4.8%	220	5.20%		
TOTAL	2398	100.0%	1804	100.0%	4202	100.00%		

According to BMI- for- age criteria,the overall prevalence of underweight was 906 (21.06 %) , overweight 160 (03.08 %) , obesity 220 (05.02 %) and 2916 (69.04 %) students were found normal. According to gender wise distribution the prevalence of underweight was 574 (22.8%) , overweight 98 (04.1 %) and obesity 134 (05.06%) among the boys students. 1619 (67.05%) boys were normal. Among girls the prevalence of underweight,overweight and obesity were 359 (19.9%) ,62 (03.04 %), 86 (04.08%) respectively, although 1297(71.09%) were normal.

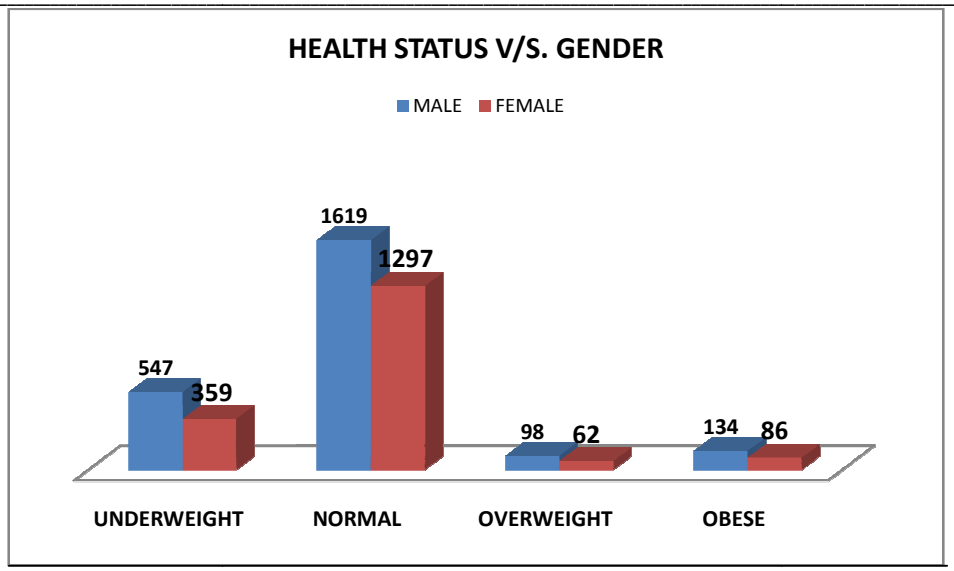

Figure 1: Health status versus gender

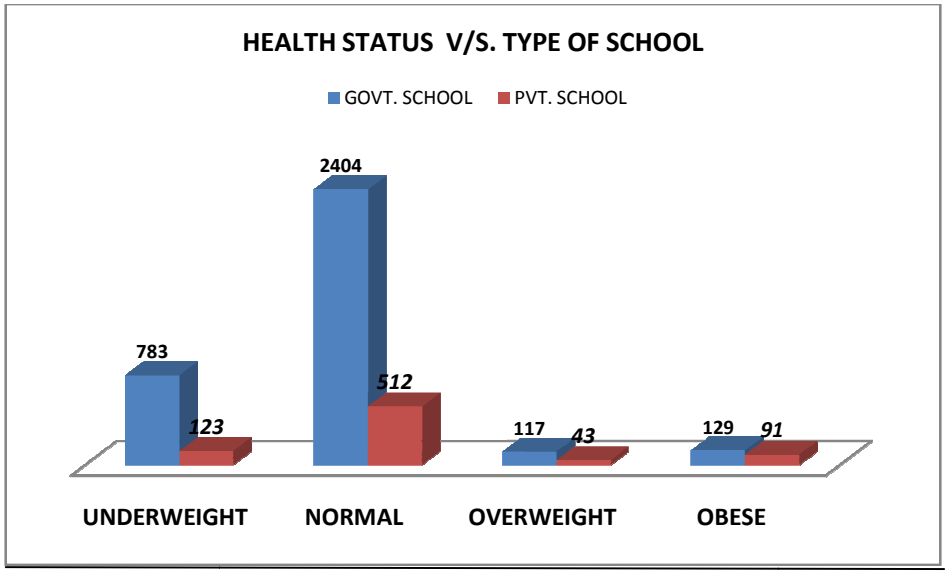

Figure 2: Health status versus type of school

The distribution of undernourished /normal/ overweight and obese was significantly different between boys and girls with (p<.0001) . In Government school prevalence of underweight was 783 (22.8%) , overweight 117 (03.4 %) and obese 129 (03.8 %) and 2404 (70.00%) students were normal. In private school the prevalence of hool underweight, overweight and obesity were 123 (16.00%) , 43 (5.6 %), 91 (11.8 %) respectively while 512(66.06%) students were normal. The distribution of undernourished /normal/overweight and obese was significantly different between private school and government school with (p<.0001).

Table 2: Weight with respect to type of school

BMI CATEGORY	GOVT. SCHOOL		PVT. SCHOOL		TOTAL		Chi Square VALUE	P-VALUE
	FREQUENCY	PERCENTAGE	FREQUENCY	PERCENTAGE	FREQUENCY	PERCENTAGE		
UNDERWEIGHT	783	22.8%	123	16.0%	906	21.6%	100.7	<0.001 (SIG.)
NORMAL	2404	70.0%	512	66.6%	2916	69.4%		
OVERWEIGHT	117	3.4%	43	5.6%	160	3.8%		
OBESE	129	3.8%	91	11.8%	220	5.2%		
TOTAL	3433	100.0%	769	100.0%	4202	100.0%		

Discussion

Underweight, overweight and obesity among children is progressing towards epidemic level. The World Health Organization has described obesity as one of today's most neglected public health problems, the proportion of children and adolescents who are overweight and obese have also been increasing[7].Obesity can be seen as the first wave of a defined cluster of non communicable diseases crating an enormous socio-economic and public health burden in poorer countries[8]. At the other end of the spectrum are the urban affluent children among who over nutrition has steeply increased because of sedentary life styles and intake of energy –dense junk foods. It is essential to improve physical activity and promote balanced food intake in school aged children. In this study the overall prevalence of underweight (21.06 %) , overweight (03.08 %) and obesity (05.02 %) was observed. A study conducted by Rawat R, *et al*. (2012) revealed that the thinness or underweight in children (BMI for age < 5th percentile) was observed as 48.0%) and 9.8 % children were found to be overweight and 3.7% were found to be obese[10].A study conducted by Raj M *et al* (2007) on urban Indian school children report a high prevalence of obese and overweight children[9]. These findings were similar to Banerjee *et al* (2011) in Goa reported 3.3% as overweight, Aggarwal *et al* (2008) in Punjab found 3.4% children as obese . Several studies done by Goyal *et al* (2011) in Gujrat, and Chhatwal *et al* (2004) in Ludhiana, were found higher prevalence of overweight (13.9%-17.7%) and obesity (5.0%-11.1%) in their studies[10-13].

Kapil *et al* (2002) reported high prevalence of overweight as well as obesity. Studies from rural areas mainly emphasize on under nutrition and data on overweight/obesity are not available[14].However, Deshmukh *et al* (2006) reported prevalence of overweight/ obesity to be 2.2 % in rural area of Wardha district.[15]In this study the high prevalence of underweight (22.8%) , overweight (04.1 %) and obesity (05.06%) was found among the boys students and prevalence of underweight (19.9%) , overweight (03.04 %) and obesity (04.08%) was found among the girls students.A study conducted by Gupta R *et al* (2013) in Delhi revealed that prevalence of overweight 17.4% and obesity 7.6% was among boys than overweight 12.4% and obesity 6.7 % among girls[16].An another study conducted by Singh *et al* (2006) observed that 18.6%of the males and 16.5% of the females were overweight or obese according to percentile for age growth charts[17].The higher prevalence of overweight and obesity among school boys may be attribute to the cultural advantage males enjoy in India. They get larger helpings of food, more freedom to go out of the house and indulge in snacking and also do not contribute much to the household chores. In this study the prevalence of underweight (22.8%), overweight (03.4 %) and obesity (03.8 %) was found among the students studying in government school and underweight. (16.00%), overweight (5.6 %) and obesity (11.8 %) was also found among the students studying in private school . A study conducted by Ramchandran *et al* (2002) reported it to be 4.5 % in low income schools and 22 % in better-off schools of Chennai[18].An another study done by Sethi&Kapoor (2003) reported the prevalence of obesity to be 7.8 % and 13.4% observed in Delhi[19].Similar findings were reported by the study of Bhave S *et al* (2004) in Pune suggested that 6.00 % in corporation schools and 24 % in well-off schools[20].The reasons that children

attending private schools are better nourished and probably enjoy a higher socio-economic status enabling them to afford enrollment in private schools. Overweight/obesity has classically been the disease of urban area in all age groups. Food in urban area has been replaced by high calorie snacks and junk food. Due to unsafe roads, lack of free space for playing and increased television viewing and computer use has made life sedentary. The prevalence of obesity as well as overweight in low SES group was the lowest as compared to other group. Eating habit like junk food, chocolate, eating outside at weekend and physical activity like exercise, sports, sleeping habit in afternoon having remarkable effect on prevalence on overweight and obesity among middle to high SES group. Giammattei *et al* (2003*)* also reported that children who spent more time watching television had a higher BMI and a higher per cent of body fat and were less physically active[21-22].

Conclusion

Under nutrition, overweight and obesity experience were significantly associated in school children of Meerut District. The prevalence of overweight ⁄ obesity was higher in our study which has common risk determinants and requires a comprehensive multidisciplinary approach to pediatric patients by both medical and healthcare professionals. The results of the study highlight the fact that the percentage of under nutrition is considerably higher than overweight and obese in school children. This study also shows that the overweight and obese seen more among boys than girls and seen more among private school than government school. Over weight and obesity is an emerging health problem in adolescent population which needs to be addressed with priority. There is need for immediate action to reduce the incidence of overweight and obesity through appropriate nutritional interventional programs, health education, involving school children, their parents and school authorities regarding adverse effects of over nutrition. Proper dietary habits and lifestyle modification must be advised to children to prevent occurrence of under nutrition, overweight and obesity in them. Family environment plays important role in predisposing the children to overweight/obesity and hence the interventions need to be directed towards the families. The results suggest the need for greater public awareness and prevention programmes on childhood overweight and obesity. Furthermore, School based interventions are required to reduce the morbidity associated with non-communicable diseases. Authors have planned family passed interventions for the malnourished children of both schools.

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