PREVALENCE AND DETERMINANTS OF OVERWEIGHT AND OBESITY IN SCHOOL CHILDREN

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HOW TO CITE THIS ARTICLE:

Shruthi Swamy, Mangala Subramanian, NS Chithambaram, Mini Jayan. "Prevalence and determinants of overweight and obesity in school children". Journal of Evolution of Medical and Dental Sciences 2013; Vol2, Issue 39, September 30; Page: 7392-7397.

ABSTRACT: CONTEXT: Childhood obesity is rampantly increasing throughout the world and needs to be detected and treated early to prevent non-communicable diseases like diabetes, hypertension and cardiovascular diseases in adulthood. **AIMS, SETTING AND DESIGN:** This study assessed the prevalence of overweight and obesity in an urban school and determined the factors contributing, using a cross sectional study design. **METHODS AND MATERIAL:** 1110 children and adolescents aged 6-17yrs took part in the study. The primary students were interviewed by the researcher and middle and high school students completed a questionnaire regarding frequency of meals, snacking, fruits and vegetables intake, time spent watching television/outdoors and family history of obesity. Their heights and weights were recorded according to World Health Organization standards. They were classified into 4 groups-Underweight (BMI less than 18.5kg/m²), Normal (BMI 18.5-22.9 kg/m²), Overweight (BMI 23-24.9kg/m²) and Obese (BMI of 25kg/m² and above). Statistical analysis was done based on percentages and proportions. **RESULTS:** Overall prevalence of overweight and obesity was 6.48%. It was 7.05% among girls and 5.95% among boys. Prevalence of overweight and obesity was 17. 1% higher in children who participated in physical activity less than once in two weeks (P<0.01) and in those whose fathers (P<0.01) and mothers (P<0.001) were overweight or obese. **CONCLUSIONS:** Any form of physical activity must be encouraged. The role of sports should be emphasized, with compulsory hours of sports in school curriculum. All families with overweight or obese children must be educated on healthy food habits and lifestyle.

KEY WORDS: obesity; children; adolescents.

INTRODUCTION: Obesity has reached epidemic proportions globally and there is an alarming trend in the rise in childhood obesity. In the majority it is caused by a poor diet and lack of exercise in children. With more fast-food restaurants appearing on every street corner it gives children an easy way to eat more unhealthy food. Children are also happier when they sit for hours in front of television or play on their play station. Around 38% of the children in the United States of America are estimated to be overweight, 20% (6-11yrs) and 18% among adolescents (12-19yrs). [1]

With India being at the threshold of an outbreak of obesity, insulin resistance syndrome and type-2 diabetes in children and adolescents, it is of immediate importance that we focus on primary prevention of obesity and inculcation of healthy diet and lifestyle practices right from childhood. [2, 3] 23% of children between 5-14years in India are estimated to be overweight. [4]

Children and adolescents with overweight and obesity are at an increased risk for development of metabolic syndrome, i. e., type 2 diabetes mellitus, hypertension, dyslipidemia and coronary heart disease. [5-9]

There are psychological problems among obese children also. They are more likely to be bullied than their non-obese peers regardless of sex, race, socioeconomic status, social skills or academic achievement according to a University of Michigan study in Pediatrics. [10]

Although much importance has been given to under-nutrition in our country, obesity is slowly creeping in as the future-killer. In this context, this study has been conducted with the following objectives:

- (i) To assess the prevalence of overweight and obesity in a randomly selected urban school in Bangalore.
- (ii) To determine factors associated with overweight and obesity in these children.

MATERIALS AND METHODS: This was a school-based, cross-sectional study carried out over a period of one month from 1 June to 30 June 2010. Sample size was calculated as 708 based on previous studies with 12% prevalence of overweight and obesity at 5% level of significance and 20% error.

The target group consisted of 1110 children and adolescents, 6 to 17 years of age, in a randomly selected school in Bangalore Urban District. The tool for the study was a pretested, semi-structured questionnaire. Students above 12 years of age were asked to complete it at school, while data from younger age group of children was collected by interviewing their parents.

Information was collected regarding frequency of meals and snacks, type of snacks, fruits or vegetables intake, frequency of breakfast eaten in a week, soft drinks, deep-fried food, bakery food, time spent watching television, playing computer or video-games, physical activity and homework. Information was also gathered regarding mode of transport used to go to school and family history of obesity.

Clinical examination was conducted on all the children and anthropometric measurements were taken as per World Health Organization standards. The students were weighed without heavy clothing and shoes, using a weighing scale with an error to the nearest $\pm 500\text{g}$. An average of two readings was taken. The weighing scale was regularly checked with known standard weights. A portable anthropometric rod was used for measuring the height (without shoes), with an error to the nearest $\pm 0.5\text{cm}$.

Subjects were classified into 4 groups- Underweight (Body Mass Index (BMI) less than 18.5 kg/m^2), Normal (BMI $18.5\text{-}22.9\text{ kg/m}^2$), Overweight (BMI $23\text{-}24.9\text{ kg/m}^2$) and Obese (BMI of 25 kg/m^2 and above) based on Asia-Pacific classification. [11-13]

Statistical analysis was done based on percentages and proportions and associations determined between independent variables and overweight/obesity using Chi square test. [14]

Results: A total of 1110 students in the age group of 6-17yrs participated in the study. There were 585 males and 525 females.

Prevalence of overweight and obesity in males was found to be 2.74% and 3.25% respectively; and in females it was found to be 3.81% and 3.24% respectively. The overall prevalence of overweight and obesity was 6.48%.

The prevalence of overweight and obesity assessed in this study (based on Asia-Pacific classification of BMI) are compared with two other classifications namely, WHO and Agarwal Charts. (Table 1)

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Category	Asia-Pacific	WHO	Agarwal Charts
	No. (%)	No. (%)	No. (%)
Overweight	36(3.24)	31(2.79)	113(10.18)
Obesity	36(3.24)	2(0.18)	14(1.26)

Table 1: Comparison of Prevalence of Overweight/Obesity

On analysis it was found that prevalence of overweight and obesity was 17. 1% higher in children who participated in physical activity once in a week or once in two weeks when compared to those who performed physical activity daily or 3-4 times a week. (Table 2)

Category	N	Daily or 3-4 times a wk	Once a week or Once in two weeks
		No. (%)	No. (%)
Underweight & normal	1038	711(68.5)	327(31.5)
Overweight & obese	72	37(51.4)	35(48.60)

Table 2: Obesity and Physical Activity

$$\chi^2 = 8.97 \text{ df}=1 \text{ P} < 0.01$$

Overweight and obesity was more among children whose fathers were also overweight or obese (Table 3).

CATEGORY	FATHERS' BMI	
STUDENTS' BMI	Underweight & normal	Overweight & obese
	No. (%)	No. (%)
Underweight & normal	579(55.8)	459(44.2)
Overweight & obese	26(36.1)	46(63.9)

Table -3: Obesity in Relation to Fathers BMI

$$\chi^2 = 10.51 \text{ df}=1 \text{ P} < 0.01$$

Children whose mothers were overweight or obese also tended to be overweight or obese as revealed by Table 4.

CATEGORY	MOTHERS' BMI	
STUDENTS' BMI	Underweight & normal	Overweight & obese
	No. (%)	No. (%)
Underweight & normal	699(67.3)	339(32.7)
Overweight & obese	32(44.4)	40(55.6)

Table -4: Obesity in Relation to Mothers BMI

$$\chi^2 = 15.69 \text{ df}=1 \text{ P} < 0.001$$

DISCUSSION: School based data on obesity in India shows a prevalence of 5.6 - 24% among children and adolescents. ^[15, 16] The large range in the reported prevalence maybe due to regional differences, different age range of children studied and the standards used for defining overweight and obesity. In the present study prevalence of overweight and obesity was 6.48% which is comparable to the study on South Karnataka children. ^[17]

Most studies have used the WHO standards for defining overweight and obesity which may not be suitable for Indian children. On comparing with WHO, Asia Pacific and Agarwal charts for BMI, the prevalence of overweight and obesity was lowest with WHO, followed by Asia Pacific chart and more with Agarwal charts (2.97% vs. 6.48% vs. 11.44%). If we use Agarwal standards in India, we can detect more children with overweight, thereby preventing further progression to obesity.

Complying with the studies by Ramesh and Shashidhar et al the present study showed a higher prevalence of overall overweight and obesity amongst girls (7.05%) as compared to boys (5.95%). ^[16, 17] However, the Ludhiana study showed a higher prevalence of obesity amongst boys than compared to girls which is quite contrary to most studies where girls are usually at a higher end of the obesity scale due to excess subcutaneous fat and lesser muscle mass. ^[18]

This study showed that physical activity was a very important determinant of obesity revealing that overweight and obesity was 17.1% more in children with low activity levels. Children who were physically active at least 3-4 times a week had relatively low incidence of overweight. These observations were consistent with results of previous studies. ^[19, 20]

The present study revealed that the parents of children who were overweight or obese were also suffering from the same problem. Further in depth studies need to be taken up to look into genetic factors and also lifestyle with regard to diet and physical activity among these families.

CONCLUSION: Prevalence of overweight was 2.74% in males and 3.81% in females and obesity was 3.25% in males and 3.24% in females in this study.

Prevalence of overweight and obesity was higher amongst children and adolescents who participated in physical activity less than once in two weeks. The role of physical activity, games, and sports should be emphasized, and facilities should be provided for outdoor games in schools, with compulsory hours of sports and games.

Obesity was also more in children whose parents were also obese or overweight.

There is an urgent need for primary prevention to educate on the aspects of healthy food habits and desired lifestyle to prevent overweight and obesity and thereby prevent the risk of a web of diseases.

ACKNOWLEDGEMENT: We would like to express our deep sense of gratitude to Indian Council of Medical Research for funding this student project. We would also like to thank Vydehi Institute of Medical Sciences & Research Centre for providing the resources and facilities.

REFERENCES:

1. Lobstein T, Jackson-Leach R. Child overweight and obesity in the USA: prevalence rates according to IOTF definitions. *Int J Pediatr Obes.* 2007; 2(1):62-4.
2. A Misra, N K Vikram, S Arya; High prevalence of insulin resistance in postpubertal Asian Indian children is associated with adverse truncal body fat patterning, abdominal adiposity and excess body fat. *International Journal of Obesity.* 2004; 28: 1217-1226.

3. Ramachandran A, Snehalatha C, Satyavani K, Sivasanakri S, Vijay V. Type 2 diabetes in Asian Indian urban children. *Diabetes Care*. 2003; 26: 1022-5.
4. Youfa Wang & Tim Lobstein. Worldwide trends in childhood overweight and obesity, *International Journal of Pediatric Obesity*. 2006; 1: 11-25
5. Anoop M, Lokesh Khurana. Obesity and the Metabolic Syndrome in Developing Countries. *Journal of Clinical Endocrinology*. 2008; 93: 9-30.
6. Venkatnarayan KM, Campagna A, Imperatore G. Type 2 diabetes in children. A problem lurking in India. *Indian Pediatrics*. 2001; 38; 701-4.
7. Raj M, Sundaram KR, Paul M, Deepa AS, Kumar RK. Obesity in Indian children: time trends and relationship with hypertension. *National Medical Journal India*. 2007; 20(6): 288-93.
8. Freedman DS, Dietz WH, Srinivasan SR, et al. The relation of overweight to cardiovascular risk factors among children and adolescents: the Bolalusa Heart Study. *Pediatrics*. 1999; 103: 1175-82.
9. Ann Jessup, Joanne S. Harrell. The Metabolic Syndrome: Look for It in Children and Adolescents, Too. *Clinical Diabetes* January. 2005; 23: 26-32.
10. Lumeng, Joyce M. Lee, Niko Kaciroti, Robert F. Corwyn, Robert H. Bradley and Julie C. Unsuspected Consequences of the Adolescent Overweight Epidemic. *Pediatrics* 2007; 120: 925-926.
11. Corazon Barba, Jeffery Cutter. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies *The Lancet*. 2004; 363: 157-163.
12. Robert C Weisel. Body mass index as an indicator of obesity. *Asia Pacific J Clin Nutr*. 2002; 11: 681-684.
13. World Health Organization, International Association for the Study of Obesity, International Obesity Task Force. *The Asia-Pacific Perspective: Redefining obesity and its treatment*. Sydney: Health Communications, 2000.
14. BK Mahajan. *Methods in Biostatistics*, 6th Ed. 1997. Jaypee Brothers Medical Publishers (P) Ltd.
15. Kapil U, Singh P, Pathak P, Dwivedi SN, Bhasin S. Prevalence of obesity among affluent school children in Delhi. *Indian Pediatrics* 2002; 41: 449- 452.
16. Ramesh K. Prevalence of overweight and obesity among high school students of Thiruvananthapuram City Corporation, Kerala, India. *Australasian Medical Journal*. 2010; 3(10): 650-661.
17. M Shashidhar Kotian, S Ganesh Kumar, Suphala S Kotian. Prevalence and determinants of overweight and obesity among adolescent school children of South Karnataka, India. *Indian Journal Community Med* 2010; 35: 176-178.
18. T Agarwal, RC Bhatia, D Singh, Praveen C Sobti. Prevalence of Obesity and Overweight in Affluent Adolescents from Ludhiana, Punjab. *Indian Pediatrics*. 2008; 45(6): 500-502.
19. Laxmaiah, Balakrishna Nagalla, Kamasamudram Vijayaraghavan, Mohanan Nair. Factors Affecting Prevalence of Overweight Among 12- to 17-year-old Urban Adolescents in Hyderabad, India. *Obesity*. 2007; 15: 1384-1390.
20. Patrick K., Calfas G. J., Zabinski M. F., Cella J. Diet, physical activity, and sedentary behaviours as risk factors for overweight in adolescence. *Archives of Pediatrics & Adolescent Medicine*. 2004; 158(4): 385-390.

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Date of Submission: 17/09/2013.

Date of Peer Review: 18/09/2013.

Date of Acceptance: 20/09/2013.

Date of Publishing: 24/09/2013