

**OBESITY AMONG SCHOOL CHILDREN: AN EMERGING THREAT IN CENTRAL INDIA**

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**HOW TO CITE THIS ARTICLE:**

Garima Namdev, Mahesh Kumar Mishra, Dinesh Mahendra Kumar Saxena, Indu Jyotsna Ekka, Swarna Kanta Likhari. "Obesity among School Children: An Emerging Threat in Central India". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 43, September 11; Page: 10634-10642, DOI: 10.14260/jemds/2014/3385

**ABSTRACT: BACKGROUND:** Obesity in children and adolescents is rapidly reaching epidemic proportions globally as well as in India. It is a well-recognized risk factor for adult obesity, which in turn may be the basis of various chronic diseases. So, by preventing the development of obesity in childhood can reduce the likelihood of obesity in adulthood and its health consequences. **AIMS & OBJECTIVES:** To find out the prevalence of overweight and obesity among school children in Bhopal city. **MATERIAL & METHODS: STUDY DESIGN:** Cross sectional descriptive study. **STUDY POPULATION:** Students studying in IX, X, XI, XII class in government and private schools of Bhopal **STUDY PERIOD:** July 2012-June 2014 (24 Months) **SAMPLING PROCEDURE:** Multistage simple random sampling method was used to select schools from a list obtained by Ministry of education. Total 38 schools were chosen to fulfill the sample size, in which 120 students from each school were included under study. **METHODS OF DATA COLLECTION:** Data was collected by taking anthropometric measurements like body weight, height, BMI (Body mass index), WC (waist circumference). **RESULTS:** In present study, 256 (5.6%) students were overweight and 46 (1.0%) were obese. Total 2505 (55.0%) of students have waist circumferences between 70 to 85 cm, whereas only 187(4.0%) students have waist circumference more than 85 cm. **CONCLUSION:** The overall prevalence of overweight and obesity was 5.6% and 1.0% respectively among school children. It was more common in girls and among students of private schools.

**KEYWORDS:** Overweight, Obesity, Body mass index, Waist circumference.

**INTRODUCTION** - Worldwide, disease profiles are transforming at a rapid pace catching the attention of medical professionals and policy makers alike. This is particularly true among low and middle income countries that form the major chunk of global population. The emerging epidemics of obesity, cardiovascular disease (CVD) and diabetes form the crux of this phenomenal change. Among these entities, obesity has become a colossal epidemic causing serious public health concern and contributes to 2.6 million deaths worldwide every year. Obesity is associated with an increased risk of morbidity and mortality as well as reduced life expectancy. The last two decades of the previous century have witnessed dramatic increase in health care costs due to obesity and related issues among children and adolescents.<sup>1</sup>

Obesity has been recognized as a major public health problem worldwide. The prevalence of obesity is increasing rapidly in all age groups including adult, adolescent and childhood groups.<sup>2</sup> Globally, the prevalence of childhood obesity varies from over 30% in the USA to less than 2% in Sub-Saharan Africa. Currently the prevalence of obese school children is 20% in the UK and Australia, 15.8% in Saudi Arabia, 15.6% in Thailand, 10% in Japan and 7.8% in Iran.<sup>3,4</sup> Although, representative data are scarce for older children in Asia, but taken together, paint a worrisome picture of obesity

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trends.<sup>5</sup> Yi et al found the overall prevalence of obesity among school children 4.11% (4.63% in boys and 3.57% in girls) in China.<sup>6</sup> In neighboring country, Pakistan, prevalence of obesity was found 12% (15% in boys and 8% in girls) in a study conducted by Ahmed et al in 2012.<sup>7</sup>

In India, obesity in children and adolescents is gradually becoming a major public health problem. The results of various studies among adolescents from parts of Punjab, Maharashtra, Delhi and South India revealed that the prevalence of overweight and obesity was high (11-29%).<sup>8</sup> In 2009, Mandal et al reported the prevalence of overweight and obesity 28.5% and 4.2% respectively among urban adolescent school girls in Kolkata city.<sup>9</sup> In Indore city of Madhya Pradesh, the overall prevalence of obesity among school children was found to be 14.97% (6.81% in boys and 8.16% in girls) in a study conducted in year 2012 by Najeem et al.<sup>10</sup> Thus, in India, the emergence of childhood obesity represents a cause for concern. Though more studies are needed to understand the precise prevalence of overweight and obesity in India, school based data demonstrates an obesity range of 5.6% to 24% for the children and adolescents in India.<sup>11</sup>

There is no published data on childhood obesity from a representative sample in Bhopal city. Therefore, an attempt is being made to assess the prevalence of overweight and obesity among school children of Bhopal.

**OBJECTIVES:** To determine the prevalence of overweight and obesity among school going children.

**MATERIAL AND METHODS:** A cross sectional study was carried out among school children in Bhopal city for a period of 2 years. Multistage simple random sampling method was used to select schools from a list of private and government schools obtained by Ministry of Education, Govt. of Madhya Pradesh. The sample size has been calculated using the following formula:

$$n = P (1-P)/l^2.$$

Where P = Prevalence of obesity among school children from the previous study (9%)<sup>12</sup>

l= allowable error = 10%.

Sample size obtained (n) = 4044.

After adding the non-response error i.e. 10%.

Finally the total calculated sample size came = 4448.

Total 38 schools (19 governments and 19 private) were selected by Lottery method to fulfil the sample size and from each school, four classes (IX, X, XI, XII) were included for study. Considering 30 students from each class and so, minimum 120 students from each school were included in the study. Thus, final sample came 4560 approximately.

All students present on the day of examination were included in study. Those who were absent for some reason were excluded from the study. The principals of all selected school were approached personally along with a consent letter and students were explained in detail about the purpose of study and verbal consent was obtained from them.

Data was collected by taking anthropometric measurements like body weight, height and waist circumference and calculate Body mass index (BMI). In present study, WHO classification of BMI for South East Asians is used to interpret overweight and obesity.

The electronic weighing machine was placed on a hard flat surface, checked and adjusted for zero balance before each measurement. The subjects were asked to stand in the center of the platform without shoes and to look straight ahead and then weight was recorded. Height was measured by using a portable, stadiometer, standing upright on a flat surface without shoes.

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The position of the eyes and ear lobes was horizontal, feet were together, knees straight and heels, buttocks and shoulders blades was in contact with vertical surface of stadiometer. Arms were hanging loosely at the sides with palm facing the thighs. Subjects were asked to take a breath and stand erect to aid the straightening of the spine. Shoulders were relaxed. Height was recorded to the nearest cm.

If the reading fell between two values, the lower reading was recorded. Waist circumference was also measured by using measuring inch tape to the nearest 0.1 cm horizontally at the narrowest point between lower end of rib cage and iliac crest.

The data was processed and analyzed by the Statistical Packages for Social Sciences (SPSS) version 20 software programme.

**RESULTS:** The present study was carried out to determine the prevalence of overweight and obesity among school children. Out of 4560 students, 2398 (52.6%) were from private schools and 2162 (47.4%) from government schools comprising of 2596 (56.9%) girls and 1964 (43.1%) boys. Maximum number of students 2787(61.1%) were in the age group 15- 17 years.

Figure 1 shows that 5.6% students were overweight and 1.0% obese. The number of overweight 162(63.3%) and obese 27(58.7%) students was little higher in private schools as compared to government schools as shown in table 2 which was found highly statistically significant. Figure 3 shows that girls are more overweight 148(57.8%) and obese 31 (67.4%) as compared to boys with 108 (42.2%) overweight and 15 (32.6%) obese. It was found highly statistically significant.

**DISCUSSION:** This comprehensive study is an attempt to document the prevalence of overweight and obesity and their associated factors amongst school children aged 12 to 19 years.

**PREVALENCE OF OVERWEIGHT & OBESITY AMONG SCHOOL CHILDREN:** The overall prevalence of overweight and obesity among school children was found to be 5.6% and 1.0% respectively in our study. Bishwalata et al (2005)<sup>13</sup> found the prevalence of overweight 4.2% and of obesity 0.8% in a study done at Manipur. This finding is slightly lower than our study. Bharti et al (2008)<sup>14</sup> at Wardha city, found the prevalence of overweight 3.1% which is much lower than our study while prevalence of obesity was 1.2% which is slightly higher than our study. At lucknow, Vohra et al (2010)<sup>15</sup> reported prevalence of overweight & obesity 4.17% & 0.73% respectively. These findings are slightly lower than our study. However, some studies reported higher prevalence of overweight and obesity than our study. Tilaki et al (2006)<sup>16</sup> found the overall prevalence of overweight and obesity among school children 12.3% and 5.8% respectively. Warrich et al (2008)<sup>17</sup> at Karachi found that the 6% school children were obese and 8% were overweight. These findings are much higher than our study. The possible explanation behind this may be the difference in the cultural pattern of area of study and dietary preference for non-vegetarian food items.

In metropolitan city, Delhi, Kapil U. et al (2002)<sup>18</sup> found the prevalence of obesity 7.4% while Sharma et al (2005)<sup>19</sup> found 22% overweight and 6% obese students. In Ludhiana, Punjab, Chhatwal (2004)<sup>20</sup> found that the prevalence of overweight and obesity was 14.2% and 11.2% respectively. Thakre et al (2009-11)<sup>21</sup> reported the 9.0% overweight and 5.5% obese while Kamath et al (2012)<sup>22</sup> found 10% and 5% respectively. The possible reason of very high prevalence of overweight and obesity may be rapidly altered dietary habits and sedentary life style of metropolitan cities. These studies have small sample size and included school children only from affluent society and different

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criteria used for overweight and obesity. In our study, we included a large sample size of school children comprising wider age group of 12-19 yrs. and children selected from both private and government schools, may be the reason for relatively lower prevalence of overweight and obesity.

In our study, the prevalence of overweight and obesity among school children was more in private schools (63.3% & 58.7%) in contrast to government schools (36.7% & 41.3%). It is significantly higher in private schools as compared to government schools. This finding is supported by study done by Manu raj et al (2003-05)<sup>23</sup>, where he found much higher overweight children in private schools (7.17%) as compared with government schools (3.23%). Premnath et al (2005)<sup>24</sup> also found that the prevalence of overweight and obesity (9.0% & 3.6%) in private schools which is more than government schools (5.9% & 2.1%). Tilaki et al (2006)<sup>25</sup> also found that the prevalence of overweight and obesity was 2.17 fold greater in private schools as compared than government schools. These findings are in consonance with our study. The possible reason for higher prevalence of overweight and obesity in private schools may be because of different lifestyle pattern of students. Secondly, economic status of parents is higher and belonging to well to do families.

In our study, maximum 66.8% overweight and 71.7% obese students were found in the age group of 15-17 yrs. while the minimum 4.7% overweight and 2.2% obese reported in the age group of 18-19 yrs. These findings suggest that there is decrease in overweight and obesity with increasing the age. Kapil U et al (2002)<sup>18</sup> found the maximum prevalence of overweight and obesity (20.7% & 12.2%) in the age group of 10-12 years. After that, it starts to decline in higher age group (15.8% & 5.3%). Goyal et al (2008)<sup>26</sup> also reported similar results, where the prevalence of overweight and obesity decreases with the increasing age. However, study done by Keerthan et al (2011)<sup>27</sup> found that the prevalence of overweight and obesity was 1.5% & 1.5% in age of 12 yr., while 5.0% & 4.0% in age of 15 yr. This is contrary to our study. The possible reason for decreasing the overweight and obesity with increasing age may be due to the fact that children become more conscious about their looks with increasing age and restrict their dietary intake.

In present study, the prevalence of overweight and obesity was found to be significantly more among girls (57.8% & 67.4%) as compared with boys (42.2% & 32.6%). It is almost similar with the study done by Kumar S et al (2007),<sup>28</sup> in which he reported that the higher prevalence of obesity in girls (8.82%) than boys (4.42%). Najeem et al (2012)<sup>10</sup> also found that 8.16% girls were more overweight than 6.81% boys. At jaipur, Bansal et al (2013)<sup>29</sup> also reported that the prevalence of obesity was high in girls (6.57%) in comparison to boys (5.11%). Another study done by Tejas et al (2013)<sup>30</sup> reported more obese girls (45.7%) as compared with boys (25.7%). These findings are in consonance with our results. The prevalence of overweight and obesity was found higher among boys (11% & 4%) than girls (9% & 5%) in a study conducted by Kamath et al (2012)<sup>22</sup> and Kapil U et al (2002)<sup>18</sup> also found the prevalence of obesity higher in boys (8%) than girls (6%). These findings are contrary to present study. The differences in the pattern of overweight and obesity between the genders may be explained by the different patterns of growth with respect to age and gender, to the different nutritional behavior or to other lifestyle related factors between the two genders.

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Variables		No.	Percentage (%)
<b>Type of school</b>	Government	2162	47.4
	Private	2398	52.6
<b>Class</b>	IX	1142	25.0
	X	1140	25.0
	XI	1141	25.0
	XII	1137	24.9
<b>Age</b>	12-14 yrs.	1563	34.3
	15-17 yrs.	2787	61.1
	18-19 yrs.	210	4.6
<b>Gender</b>	Boys	1964	43.1
	Girls	2596	56.9

**Table 1: Socio demographic distribution of School students (n = 4560)**

Type of school	Normal weight	Under weight	Over weight	Obese	Total	$\chi^2$ (P value)
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	
Government	850(42.9)	1199(52.7)	94(36.7)	19(41.3)	2162(47.4)	54.04 (<0.0001)
Private	1132(57.1)	1077(47.3)	162(63.3)	27(58.7)	2398(52.6)	
<b>Total</b>	1982(43.5)	2276(49.9)	256(5.6)	46(1.0)	4560	

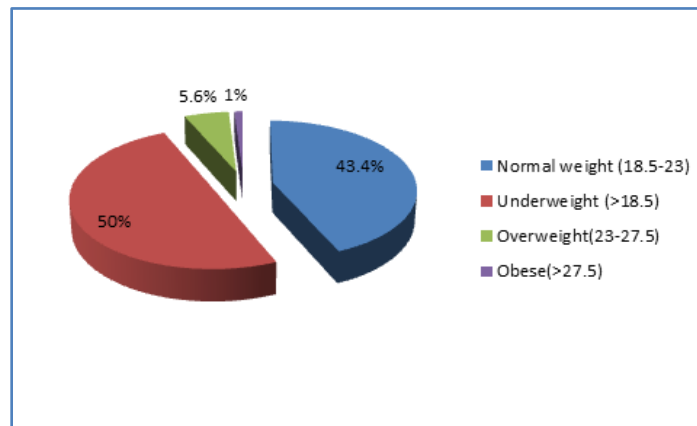
**Table 2: Association of BMI of School Students with type of school (n= 4560)**

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Gender	Waist circumference				$\chi^2$ (P value)
	< 70 cm	70-85 cm	>85 cm	Total	
	No. (%)	No. (%)	No. (%)	No. (%)	
Boys	767(41.1)	1116(44.6)	81(43.3)	1964(43.1)	5.32 (0.07)
Girls	1101(58.9)	1389(55.4)	106(56.7)	2596(56.9)	
<b>Total</b>	1868(41)	2505(55)	187(4.0)	4560	

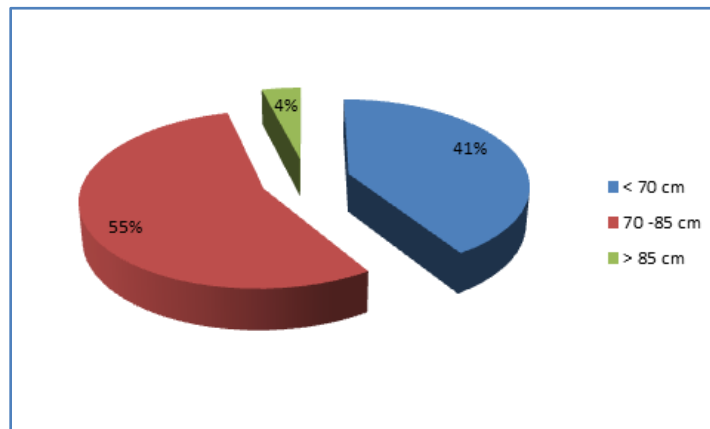
**Table 3: Association of Waist Circumference of School Students with Gender (n= 4560)**

**Fig. 1: Distribution of School Students according to BMI (n=4560)**



**Fig. 1**

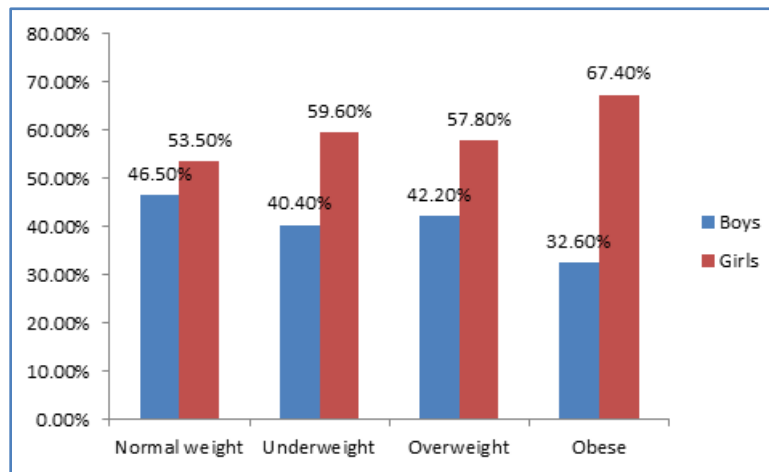
**Fig. 2: Distributon of School Students according to Waist circumference (n=4560).**



**Fig. 2**

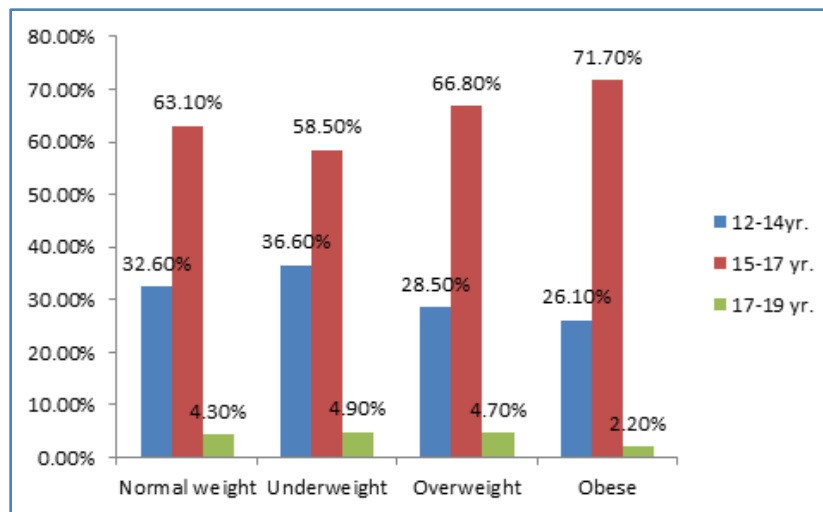
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**Fig. 3: Association of BMI of School Students with Gender (n=4560).**



**Fig. 3**

**Fig. 4: Association of BMI of School Students with Age (n=4560).**



**Fig. 4**



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Date of Submission: 28/08/2014.  
Date of Peer Review: 30/08/2014.  
Date of Acceptance: 06/09/2014.  
Date of Publishing: 09/09/2014.