

## Correlates of overweight & obesity among school going children of Wardha city, Central India

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**Background & objectives:** Overweight and obesity are important determinants of health leading to adverse metabolic changes and increase the risk of non communicable diseases. Following the increase in adult obesity, the proportion of overweight and obese children and adolescents has also been increasing. Hence, the present study was undertaken to study the magnitude of overweight/obesity and its correlates among school going children of Wardha city in central India and suggest interventions.

**Methods:** The cross-sectional study was carried out in all the 31 middle-schools (5<sup>th</sup> to 7<sup>th</sup> standard) and high-schools (8<sup>th</sup> to 10<sup>th</sup> standard) of Wardha city. Probability proportionate to size of population technique (PPS) was used to decide the number of children to be studied from each school, each class and then each section. Systematic random sampling technique was used to select the children from each section. Pre-designed and pre-tested questionnaire was used to elicit the information on family characteristics and individual characteristics. Height and weight was measured and BMI was calculated. Overweight and obesity was assessed by BMI for age. Student who had BMI for age  $\geq 85$ th and  $< 95$ th percentile of reference population were classified as overweight and BMI for age  $\geq 95$ th percentile of reference population were classified as obese.

**Results:** Overweight and obesity was found to be 3.1 per cent (95% CI: 2.5-3.8%) and 1.2 per cent (95% CI: 0.8-1.8%) respectively; together constitute 4.3 per cent (95% CI: 3.6-5.2%) for overweight/obesity. Final model of the multivariate logistic regression showed that the important correlates of overweight/obesity were urban residence, father and/or mother involved in service/business, English medium school and child playing outdoor games for less than 30 min.

**Interpretation & conclusions:** The magnitude of overweight/obesity among school going children of Wardha city was found to be 4.3 per cent. Family characteristics play important role in predisposing the children to overweight/obesity and hence the interventions need to be directed towards the families.

**Key words** Adolescence - BMI - childhood - fatness - non-communicable diseases - nutrition

In India, undernutrition attracted the focus of health workers, as childhood obesity was rarely seen. 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 television, video

games and computers have replaced outdoor games and other social activities<sup>1</sup>.

Obesity can be seen as the first wave of a defined cluster of non communicable diseases called "New World Syndrome" creating an enormous socio-economic and public health burden in poorer countries<sup>2</sup>. The World Health Organization has described obesity as one of today's most neglected public health problems. Following the increase in adult obesity, the proportion of children and adolescents who are overweight and obese have also been increasing<sup>3</sup>. Globally, an estimated 10 per cent of school-aged children, between 5 and 17 yr of age, are overweight or obese<sup>4</sup>. The most important consequence of childhood obesity is its persistence into adulthood with all its health risks. The health risks include cardiovascular diseases, diabetes, osteoarthritis, gallbladder disease and some sex hormone-sensitive cancers<sup>2</sup>. It is more likely to persist when its onset is in late childhood or adolescence<sup>5-9</sup>. If the underlying causes of the obesity epidemic are not addressed, it has the potential to overwhelm health systems throughout the world. Mortality risk increases with increased weight of children<sup>10</sup>.

A few studies have been conducted in India on overweight and obesity among children mostly in metropolitan cities. The present study was undertaken to study the magnitude of overweight/obesity and its correlates among children in Wardha city, central India.

### Material & Methods

*Study design and setting:* A cross-sectional study was carried out in middle-schools (5<sup>th</sup> to 7<sup>th</sup> standard) and high-schools (8<sup>th</sup> to 10<sup>th</sup> standard) of Wardha city. The population of Wardha city was 1,11,115 as per 2001 census. There were 31 schools (middle-schools and high-schools) and 19,396 children studying in schools of Wardha city. All school going children from fifth to tenth standard from all these schools were included in the study.

*Sample size and sampling design:* Considering the prevalence of obesity of 5.9 per cent as reported by Subramanyam *et al*<sup>11</sup>, alpha error of 5 per cent, 1 per cent absolute allowable error and 10 per cent non response rate, sample size calculated was 2345. Probability proportionate to size of the population (PPS) technique was used to decide the number of children to be studied from each school and then subsequently from each class and section. The required number of children from each section was selected by systematic random sampling. The rounding of fractional number at each stage resulted into the study of 2555 children.

*Study questionnaire:* A pre-designed and pre-tested questionnaire was used to interview the study participants to elicit the information on family characteristics like residence, type of school, religion, type of family, education and occupation of parents; and information on individual characteristics like age, sex, eating habits, and time spent on television viewing and outdoor games. Anthropometric measurements were taken and noted. The questionnaire was pre-tested on 5 students each from five schools selected purposively out of 31 schools included in the study. Necessary modifications were made in the questionnaire before the start of study.

*Data collection:* Consent of school authorities was obtained after explaining the objectives as well as the method of study. Data were collected from January 2005 to October 2006. Body weight was measured (to the nearest 0.5 kg) with the subject standing motionless on the weighing scale with feet 15 cm apart, and weight equally distributed on each leg. Height was measured (to the nearest 0.5 cm) with the subject standing in an erect position against a vertical scale of portable stadiometer and with the head positioned so that the top of the external auditory meatus was in level with the inferior margin of the bony orbit. Body mass index (BMI) was calculated as weight in kilograms / (height in meter)<sup>2</sup>. Overweight and obesity was assessed by BMI for age<sup>12</sup>. Student who had BMI for age  $\geq 85^{\text{th}}$  and  $< 95^{\text{th}}$  percentile of reference population were classified as overweight. Students who had BMI for age  $\geq 95^{\text{th}}$  percentile of reference population were classified as obese.

*Statistical analysis:* Data were analyzed using epi\_info 2002 v 3.3 and SPSS 12.0.1 (SPSS for windows, version 12.0.1.2001.Chicago:SPSS Inc.). Prevalence of overweight and obesity is presented as percentage. Odds ratio (OR) and 95 per cent confidence interval (95% CI) was calculated for each categorical risk factor. Multiple logistic regression was performed with overweight and obesity together as dependent variable with dichotomous outcome and with age, sex, residence, religion, type of school, type of family, education level of parents, occupation of parents, duration spent in television viewing and outdoor games and eating habits as the independent variables.  $P < 0.05$  was considered as statistically significant.

### Results

A total of 2555 children of fifth to tenth standard participated in the study. The age ranged from 10 to 17 yr.

Of them, 1196 (46.8%) were boys and 1359 (53.2%) were girls. Overall, 79 (3.1%; 95% CI: 2.5-3.8) children were overweight while 32 (1.2%; 95% CI: 0.8-1.8) were obese. Therefore, 4.3 per cent (95% CI: 3.6-5.2) of the children were overweight/obese. The proportion of overweight/obesity was higher (5.0%) in late adolescence ( $\geq 15$  yr of age) than in early adolescence ( $< 15$  yr of age). But the difference was not statistically significant. The proportion of overweight/obesity was 4.4 and 4.3 per cent among boys and girls respectively (Table I).

On univariate analysis, the risk of overweight/obesity was significantly higher among children from urban area than from rural area (OR=3.046; 95% CI=1.662-5.582), children studying in English medium school than in non-English medium school (OR=2.769; 95% CI=1.778-4.397), Hindu children than children of other religion (OR=1.730; 95% CI=1.036-2.889), children whose father and/or mother had education  $\geq 6^{\text{th}}$  standard, children whose father and/or mother had service/business and children who played outdoor games for less than 30 min (OR=2.064; 95% CI=1.350-3.155) (Tables I, II).

Step-down multiple logistic regression using backward LR method was applied to determine the significant correlates of overweight/obesity in the study population. The final model (Table III) showed that urban residence (OR=2.198; 95% CI 1.183 - 4.085), father and/or mother involved in service/business (OR=3.333; 95% CI 1.962 - 5.660 and OR=2.230; 95% CI 1.384 - 3.593), child playing outdoor games for

less than 30 min (OR=2.133; 95% CI 1.376 - 3.307) and English medium school (OR=1.632; 95% CI 1.003 - 2.656) were significantly associated with overweight/obesity among the study population. The area under curve for this final model derived by multivariate logistics regression was found to be 73.7 per cent suggesting a good fit of the model.

## Discussion

Overweight/obesity among children is progressing towards epidemic level. The health risk of excessive body fat is associated with even relatively small increase in body weight, not only with marked obesity<sup>2</sup>. Overweight/obesity in adolescents predict broad range of adverse health effects that are independent of adult weight. The treatment of adult obesity has been disappointing; less than 5 per cent of adults who lost weight were able to maintain their weight at 5 yr and 62 per cent regained all of the lost weight<sup>13</sup>. Hence, the effective treatment and prevention of obesity must start in the childhood. It has become increasingly important to identify the risk factors predisposing to overweight/obesity. Examination of the factors involved in weight gain and obesity in developing countries where socio-economic changes are going on is crucial for predicting the future impact, because the problem of obesity is emerging at a time when undernutrition remains a significant public health problem<sup>2</sup>.

In India, very few studies have been carried out to study the overweight/obesity and majority of them have

**Table I.** Risk factors of overweight/obesity: Individual characteristics

Variable	Total No. (%)	Overweight/obesity No. (%)	OR (95% CI)	P value
<i>Overall:</i>	2555 (100)	111 (4.3%)	-	-
<i>Age:</i>				
Early adolescence	1493 (58.4)	58 (3.9)	1	
Late adolescence	1062 (41.6)	53 (5.0)	1.300 (0.888 - 1.902)	0.178
<i>Sex:</i>				
Male	1196 (46.8)	53 (4.4)	1	
Female	1359 (53.2)	58 (4.3)	0.961 (0.657 - 1.407)	0.84
<i>Television viewing:</i>				
< 30min	264 (10.3)	9 (3.4)	1	
$\geq 30$ min	2291(89.7)	102 (4.5)	1.320 (0.660-2.642)	0.433
<i>Outdoor games:</i>				
$\geq 30$ min	2122 (83.1)	79 (3.7)	1	
< 30 min	433 (16.9)	32 (7.4)	2.064 (1.350-3.155)	0.001
<i>Eating habits:</i>				
Vegetarian	1408 (55.1)	62 (4.4)	1	
Non vegetarian	1147 (44.9)	49 (4.3)	0.969 (0.661-1.421)	0.869

**Table II.** Risk factors of overweight/obesity: Family characteristics

Variable	Total No. (%)	Overweight/obesity No. (%)	OR (95% CI)	P value
<i>Residence:</i>				
Rural	671 (26.3)	12 (1.8)	1	
Urban	1884 (73.7)	99 (5.3)	3.046 (1.662 - 5.582)	0.001
<i>Type of school:</i>				
Non-English medium	2276 (89.0)	84 (3.7)	1	
English medium	279 (11.0)	27 (9.7)	2.796 (1.778 - 4.397)	0.001
<i>Religion:</i>				
Other	631 (24.7)	18 (2.9)	1	
Hindu	1924 (75.3)	93 (4.8)	1.730 (1.036 - 2.889)	0.036
<i>Type of family:</i>				
Nuclear	1726 (67.6)	68 (3.9)	1	
Joint	829 (32.4)	43 (5.2)	1.334 (0.902 - 1.927)	0.149
<i>Mother's education:</i>				
< 6th standard	537 (21.0)	11 (2.0)	1	
≥ 6th standard	2018 (79.0)	100 (5.0)	2.493 (1.328 - 4.681)	0.004
<i>Father's education:</i>				
< 6th standard	433 (16.9)	6 (1.4)	1	
> 6th standard	2122 (83.1)	105 (4.9)	3.705 (1.617 - 8.490)	0.002
<i>Mother's occupation:</i>				
Labourers and housewives	2304 (90.2)	84 (3.6)	1	
Service and business	251 (9.8)	27 (10.8)	3.186 (2.021 - 5.020)	0.001
<i>Father's occupation:</i>				
Labourers	1150 (45.0)	18 (1.6)	1	
Service and business	1405 (55.0)	93 (6.6)	4.458 (2.608 - 7.688)	0.001

**Table III.** Correlates of overweight: Final model - Multivariate logistic regression by backward LR method

Variable	Odds ratio	95% CI	P value
Urban residence	2.198	1.183-4.085	0.013
Fathers' occupation of service and business	3.333	1.962-5.660	0.000
Mothers' occupation of service and business	2.230	1.384-3.593	0.001
Outdoor games of < 30 min	2.133	1.376-3.307	0.001
English medium school	1.632	1.003-2.656	0.048

been carried out in metropolitan cities. In the present study, the overweight/obesity was found to be 4.3 per cent. Ramchandran *et al*<sup>14</sup> reported it to be 4.5 per cent in low income schools and 22 per cent in better-off schools of Chennai. Similar findings were reported from Pune *i.e.*, 6 per cent in corporation schools and 24 per

cent in well-off schools<sup>15</sup>. In the present study higher prevalence (9.7%) was also found among English medium schools as compared to other schools (3.7%). Sethi & Kapoor<sup>16</sup> reported prevalence of obesity to be 7.8 and 13.4 per cent from Delhi. Kapil *et al*<sup>17</sup> and Subramanyam *et al*<sup>11</sup> reported high prevalence of overweight as well as obesity. Studies from rural areas mainly emphasize on undernutrition and data on overweight/obesity are not available. However, Deshmukh *et al*<sup>18</sup> reported prevalence of overweight/obesity to be 2.2 per cent in rural area of Wardha district using the same definition. It is almost half of the proportion found in the present study.

In the present study, the important determinants of the overweight/obesity were urban residence, father and mother involved in service or business, English medium school and outdoor play of less than 30 min. Of these five factors, four factors except outdoor play were family characteristics. This implies the importance of the family characteristics in the causation or predisposition of an individual to overweight/obesity.

Pandez *et al*<sup>19</sup> reported similar predisposition in Portuguese children. All these factors are related with affluence and sedentary lifestyle. 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<sup>15</sup>. Giammattei *et al*<sup>20</sup> 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. Father's and/or mother's service/business adds to the affluence and found to increase the risk of overweight/obesity in the present study. However, Gulliford *et al*<sup>21</sup> disagree to this.

To conclude, at least 30 per cent of obesity begins in childhood. Conversely 50 to 80 per cent obese children become obese adults. Since, family characteristics have been found to be important for the predisposition of an individual to overweight/obesity, preventive and promotive efforts need to be directed towards family for the health of future generation.

*Statement of competing interest:* We declare that the authors do not have any competing interest.

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