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# Association of socio-demographic factors with overweight and obesity among rural school going adolescents in Rohtak district, Haryana

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## ABSTRACT

### Introduction

**Childhood obesity is one of the most serious public health challenges of the 21st century. The problem is global and is steadily affecting many low-income and middle-income countries. Childhood obesity is associated with higher chances of premature deaths and disabilities in adulthood. It is also evident that nearly 75% of the obese adolescents remain obese as adults thus increasing the risk of Non Communicable Diseases (NCDs).**

### Aim and Objectives

**To study the prevalence and associated socio-demographic factors of overweight and obesity among rural school going adolescents.**

### Material and Methods

**The present study was conducted in Lakhanmajra block of Rohtak district over a period of one year from July 2016 to June 2017. 750 students from six co-educational government senior secondary schools were included in the study. Data were collected using pre-designed, pre-tested, semi structured interview schedule. Collected data were analyzed using SPSS version 20.0.**

### Results

**Prevalence of overweight and obesity was 6.7% and 1.1% respectively. Maximum prevalence of obesity/overweight was found in the age group 13-14 years (11.2%). Obesity/overweight was more prevalent in males (9.4%) in comparison to females (3.4%). 14.3% of the study subjects belonging to three generation family, 11.7% belonging to joint and 4.5% belonging to the nuclear families were found to obese/ overweight. 11% and 5.1% of the study subjects with 6-10 family members and 5 and less than five family members were obese/ overweight.**

### Conclusion

**Childhood obesity continues in adult life and thus gives rise to diabetes and cardiovascular diseases. Thus it is the need of the hour to address this problem and to devise programs and strategies to prevent overweight/obesity among children and adolescents because today's children are future of the nation.**


**Keywords:** Overweight, Obesity, Socio-demographic Factors, Adolescents

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## INTRODUCTION

Adolescence is described as the period in life when an individual is no longer a child, but not yet an adult. It is the period of transition from childhood to adulthood.[1]

In recent times, the non-communicable diseases (NCDs) have attained a magnitude of epidemic proportion, with increasing number of adolescents being reported as obese. Childhood obesity is associated with higher chances of premature deaths and disabilities in adulthood. It is also evident that nearly 75% of the obese adolescents remain obese as adults, increasing the risk of NCDs.[2-4]

Childhood obesity is one of the most serious public health challenges of the 21st century. The problem is global and is steadily affecting many low-income and middle-income countries. The prevalence has increased at an alarming rate. Globally, in 2015 the number of overweight children under the age of five is estimated to be over 42 million. Almost half of all overweight children under five live in Asia.[5]

Overweight and obese children are likely to stay obese into adulthood and more likely to develop non-communicable diseases like diabetes and cardiovascular diseases at a younger age.[5]

The transition in nutrition and lifestyle by the popularity of fast foods, soft drinks, sedentary life style, and lack of physical exercise, increased television watching and mobile phone usage are the common trends adopted by children today. These may be the causes of overweight and obesity seen in children of both rural and urban areas.

Increased body weight in children and adolescents is associated with increased systolic and diastolic blood pressure and can multiply the risk for cardiovascular diseases in adulthood. Hence, it is essential to assess the magnitude of these risk factors in adolescents in order to achieve the goal of primordial prevention in this age group.

The present study was conducted with the aim to study the prevalence and associated socio-demographic factors of overweight and obesity among rural school going adolescents.

## MATERIAL AND METHODS

A cross sectional study was conducted in the community development block Lakhan Majra (district Rohtak), which is a rural field practice area attached to the Department of Community Medicine, Pt. B. D. Sharma PGIMS, Rohtak over a period of one year from July 2016 to June 2017. The school going adolescents in the age group 13-19 years studying in classes 8th to 12th in six co-educational government senior secondary schools of the block formed the study population.

### Sample Size

According to the study conducted by Kowsalya et al[6] in Salem district of Tamil Nadu, the prevalence of overweight/obese among school going adolescents was 12.11%. Considering the prevalence as 12.11%, with 95% confidence interval and allowable error of 20%.

The sample size was thus calculated by using the formula:

$$n = \frac{(Z_{1-a/2})^2 \times p \times q}{d^2}$$

Sample size came out to be 696. By assuming a non-response rate of 5 %, a sample of 750 eligible subjects was included in the study.

### Sampling Technique

The list of all students currently studying from Class $8^{th}$ to $12^{th}$ was sought from the Principal of the respective schools. From each school, 125 students were selected which was proportionate to the strength of eligible students in each class. Simple random sampling for selection of students from each class was done using random number generator software.

### Inclusion Criteria

Students in the age group 13-19 years studying in classes $8^{th} - 12^{th}$.

**Exclusion Criteria**

1) Students who were not willing to participate in the study.
2) Students who were not present in the respective schools on the days of the visit.

**Study Instruments**

A pre-designed, pre-tested, semi-structured interview schedule was used to interview the study participants to elicit the information on their socio-demographic profile**.** Anthropometric measurements such as Height, Weight were recorded and Body mass index (BMI) for each student was calculated.

**Methodology**

The selected schools were visited in advance and prior permission was sought from the concerned Principals of the respective schools for conducting the study. The students were briefed about the nature and purpose of study and consent forms were distributed to them to get them signed from their parents/guardians. Only those students, who themselves along with their parents consented for the study, were interviewed. The students were interviewed one by one separately and their responses were noted. Confidentiality of the obtained information was maintained.

Study subjects were categorised into underweight, normal, overweight and obese using WHO reference 2007 standards for BMI for boys and girls aged 5-19 years.[7,8]

**Data Analysis:**

Data collected were compiled, coded appropriately and entered in the MS Excel spread sheet and analysed using statistical package for social sciences (SPSS) software version 20.0. the data were represented as frequency and proportions. Appropriate tests of significance were applied wherever necessary.

## RESULTS

A total of 750 adolescents aged 13-19 years studying in $8^{th}$-$12^{th}$ classes were included in the study. The majority (60.7%) of the study subjects were in the age group 15 -17 years followed by 13-14 years (31.1%) and 18-19 years (8.2%). The mean age of the study subjects was 15.38 $\pm$ 1.493 years. Majority (24.4%) of the study subjects belonged to $10^{th}$ class followed by $9^{th}$ (20.9%), $11^{th}$ (20%), $12^{th}$ (18.3%) and $8^{th}$ (16.4%) classes.

**Table 1 Distribution of Study Subjects according to their Socio-Demographic Characteristics (n=750)**

| Socio-Demographic | Frequency | Percentage |
|---|---|---|
| **Religion** | | |
| Hindu | 539 | 98.54 |
| Muslim | 11 | 1.46 |
| **Caste** | | |
| General | 532 | 70.9 |
| OBC | 61 | 8.1 |
| SC | 157 | 21 |
| **Type of Family** | | |
| Nuclear Family | 463 | 61.7 |
| Joint Family | 154 | 20.5 |
| Three Generation Family | 133 | 17.8 |
| **No. of Family Members** | | |
| 5 and less than 5 Members | 410 | 54.7 |
| 6-10 Members | 335 | 44.7 |
| >10 Members | 5 | 0.6 |

Table 1 shows the distribution of the study subjects according to their socio-demographic characteristics. Most of the study subjects were Hindus (98.54%) and only 1.46% were Muslims.

According to the distribution of study subjects by caste, more than two-third (70.9%) belonged to General caste followed by Scheduled caste (21%) and Other backward caste (8.9%).

By family distribution, 61.7% of the study subjects belonged to Nuclear family followed by Joint family (20.5%) and Three generation family (17.8%) respectively. More than half (54.7%) of the study subjects had 5 and less than 5 members in the family followed by 44.7% with 6 – 10 family members and only very few (0.6%) had more than 10 family members.

According to parents' education status, 44.4% of the study subjects had their fathers educated up to high school followed by primary education (24.4%). As for mothers' education, 34.7% of the study subjects had their mothers illiterate and 26% primary educated. None of the students had both of their parents illiterate. By monthly family income, 38.3% of the study subjects had monthly family income between Rs 10,000 to 15,000 followed by 30.7% with income less than 10,000 rupees and 19.8%, 11.2% belonging to income range >15,000 to 20,000 rupees and >20,000 rupees respectively.

**Table 2 Distribution of Study Subjects according to WHO BMI Cut Off Values**

| Category | Frequency | Percentage |
|---|---|---|
| Underweight | 67 | 8.9 |
| Normal | 625 | 83.3 |
| Overweight | 50 | 6.7 |
| Obese | 8 | 1.1 |
| Total | 750 | 100 |

Table 2 shows the distribution of study subjects according to WHO BMI cut off values. 6.7% and 1.1% of the study subjects were found to be overweight and obese respectively. 8.9% were underweight.

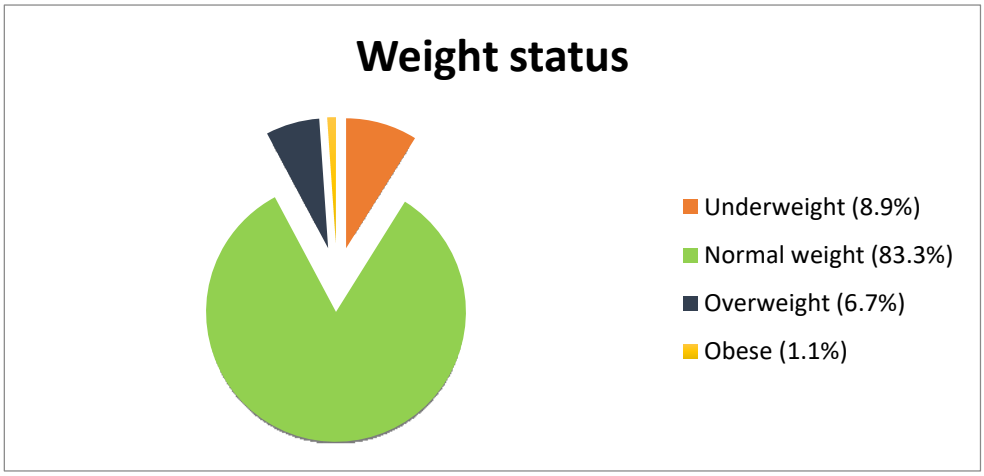


**Fig 1 Weight Distribution of Study Subjects**

Among the study subjects, the maximum prevalence of obesity/overweight was found in the age group 13-14 years (11.2%) followed by 15-17 years (6.6%) while 18-19 years age group was found to have the least number of obese/overweight study subjects. The finding was statistically significant. Obesity/overweight was more prevalent in males (9.4%) in comparison to females (3.4%). This finding was statistically significant.

7.8% of the Hindus were obese /overweight and none of the Muslims were found to be obese /overweight. 9.8% of the study subjects belonging to OBC, 7.6% of SC and 7.5% belonging to general caste were found to be obese /overweight. 14.3% of the study subjects belonging to three generation family, 11.7% belonging to joint family and 4.5% belonging to the nuclear family were found to be obese /overweight. This finding was statistically significant. 11% and 5.1% of the study subjects with 6-10 family members and 5 and less than five family members were obese/overweight. None of the study subjects with more than 10 family members were obese /overweight. This finding was statistically significant. (Table 3)

**Table 3 Association of Obesity/Overweight with Socio-demographic Characteristics of Study Subjects**

| Characteristics | Obese/Overweight | | | | $\chi^2$ value | df | p value |
|---|---|---|---|---|---|---|---|
| | Yes | | No | | | | |
| | Freq | % | Freq | % | | | |
| Age Categories (Years) | | | | | | | |
| 13-14 | 26 | 11.2 | 207 | 88.8 | 6.426 | 2 | 0.04* |
| 15-17 | 30 | 6.6 | 425 | 93.4 | | | |
| 18-19 | 2 | 3.2 | 60 | 96.8 | | | |
| Gender | | | | | | | |
| Male | 51 | 9.4 | 493 | 90.6 | 7.481 | 1 | 0.006* |
| Female | 7 | 3.4 | 199 | 96.6 | | | |
| Religion | | | | | | | |
| Hindu | 58 | 7.8 | 681 | 92.2 | | 1 | 0.41 |
| Muslim | 0 | 0 | 11 | 100 | | | |
| Caste | | | | | | | |
| General | 40 | 7.5 | 492 | 92.5 | | 2 | 0.065 |
| OBC | 6 | 9.8 | 55 | 90.2 | | | |
| SC | 12 | 7.6 | 145 | 92.4 | | | |
| Type of Family | | | | | | | |
| Nuclear | 21 | 4.5 | 442 | 95.5 | 18.01374 | 2 | 0.0001* |
| Joint | 18 | 11.7 | 136 | 88.3 | | | |
| Three generation | 19 | 14.3 | 114 | 85.7 | | | |
| No. of Family Members | | | | | | | |
| 5 and less | 21 | 5.1 | 389 | 94.9 | | 2 | 0.003* |
| 6 - 10 | 37 | 11 | 298 | 89 | | | |
| >10 | 0 | 0 | 5 | 100 | | | |

***Significant (*), Those without Chi square values are Fischer exact values***

Regarding parents' education, 25% and 11.9% of the study subjects whose fathers were educated up to graduation and higher secondary were obese/ overweight. As for mothers' education status, 33.3% and 12.5% of the subjects who had their mothers educated up to graduation and higher secondary school were obese/ overweight. Obesity/overweight among study subjects had a linear relationship with the educational status of their parents. The findings were statistically significant. (Table 4)

**Table 4 Association of Obesity/Overweight with Parent's Education Status**

| Education Status | Obese/Overweight | | | | $\chi^2$ value | df | p value |
|---|---|---|---|---|---|---|---|
| | Yes | | No | | | | |
| | Freq | % | Freq | % | | | |
| Father | | | | | | | |
| Illiterate | 3 | 5.4 | 53 | 94.6 | 12.08 | 5 | 0.034* |
| Primary | 9 | 4.9 | 174 | 95.1 | | | |
| Middle | 5 | 5.3 | 90 | 94.7 | | | |
| High School | 29 | 8.7 | 304 | 91.3 | | | |
| Higher Secondary | 8 | 11.9 | 59 | 88.1 | | | |
| Graduation and Above | 4 | 25 | 12 | 75 | | | |
| Mother | | | | | | | |
| Illiterate | 15 | 5.8 | 245 | 94.2 | | 5 | 0.0001* |
| Primary | 9 | 4.6 | 186 | 95.4 | | | |
| Middle | 12 | 10.3 | 105 | 89.7 | | | |
| High School | 14 | 10.9 | 115 | 89.1 | | | |
| Higher Secondary | 5 | 12.5 | 35 | 87.5 | | | |
| Graduation and Above | 3 | 33.3 | 6 | 66.7 | | | |

***Significant (*), Those without Chi square values are Fischer exact values***

About one fourth (23.8%) of the study subjects who had monthly family income more than 20,000 rupees were obese/overweight. 15.4% of the study subjects who had monthly family income between 15,000 to 20,000 rupees were found to be obese/overweight. Obesity/overweight among study subjects increased with increase in monthly family income. This finding was statistically significant. (Table 5)

**Table 5 Association of Obesity/Overweight with Monthly Family Income**

| Monthly Family Income in Rupees | Obese/Overweight | | | | $\chi^2$ value | df | p value |
|---|---|---|---|---|---|---|---|
| | Yes | | No | | | | |
| | Freq | % | Freq | % | | | |
| < 10,000 | 3 | 1.3 | 227 | 98.7 | 61.21377 | 3 | 0.0001* |
| 10000-15,000 | 12 | 4.2 | 275 | 95.8 | | | |
| > 15,000 - 20,000 | 23 | 15.4 | 126 | 84.6 | | | |
| >20,000 | 20 | 23.8 | 64 | 76.2 | | | |

***Significant (*)***

## DISCUSSION

The present study included 750 school going adolescents aged 13-19 years studying in classes 8th-12th in Government Senior Secondary Schools of Lakhan Majra block, Rohtak district. Out of the total study subjects, majority (60.7%) were in the age group 15-17 years. Males (72.5%) outnumbered the females (27.5%). 24.4% of the study subjects belonged to class 10th followed by 20.9% belonging to 9th class. 98.54% of the study subjects were Hindus. More than two-third (70.9%) belonged to general caste. 61.7% of the study subjects belonged to nuclear family. More than half (54.7%) of the study subjects had 5 or less than 5 members in their family. 44.4% of the study subjects had their fathers' educated up to high school and 34.7% of the students had their mothers' illiterate. 38.3% of the study subjects had monthly family income between 10.000 to 15,000 rupees followed by 30.7% with monthly income less than 10,000 rupees.

### Prevalence of overweight/obesity

The present study depicts the prevalence of overweight and obesity to be 6.7% and 1.1% respectively (Table 2) among rural school going

adolescents of Rohtak district, Haryana. Similar prevalence of overweight (6.6%) and obesity (1.1%) was observed in the study conducted by Tiwari et al[9] in Allahabad in which WHO BMI cut off values were used to categorize the study subjects as overweight and obese.

Higher prevalence of overweight and obesity were reported in studies conducted by Choudhary et al[10] in Patna (6.3% obese and 10.3% overweight), Prajapati et al[11] in Vidarbha (11.8% obese and 15.8% overweight). This may be because studies were conducted in different areas and included different age groups.

A study conducted by Mithra et al[12] in Udupi district of Karnataka reported prevalence of overweight and obesity to be 2.4% and 1.4%. This was much lower compared to the present study. The reason may be attributed to larger sample size (2963 students) and inclusion of students belonging to age group 10 – 18 years.

**Overweight/obesity and age group**

In the present study, maximum (11.2%) prevalence of obesity/overweight was observed in the age group 13-14 years followed by 6.6% in 15-17 years (Table 3). Similar results were reported by Tiwari et al[9] in their study where the prevalence of obesity and overweight was high (1.1% obese and 6.6% overweight) in early adolescence and decreased in middle and late adolescence.

The studies conducted by Mithra et al[12] and Baradol et al[13] in Karnataka also reported higher prevalence of overweight/obesity in 13-14 years age group. The prevalence decreased with increase in age. This increase in prevalence of obesity/overweight in the early adolescent age group may be associated with the increase in adipose tissue and overall weight gain during the pubertal growth spurt.

The studies conducted by Choudhary et al[10] in Patna, Kumar et al[14] in Karnataka and Prasad et al[15] in Pondicherry reported higher prevalence of obesity/overweight in the mid adolescence age group of 15-16 years. This can be attributed to the fact that playing outdoor games are compromised in this age group to concentrate more in studies and they spend more time in studying.

**Overweight/obesity and Gender**

In the present study, higher prevalence of obesity/overweight was observed among male students (9.4%) as compared to females (3.4%). This may be due to the presence of more males (72.5%) in the study as compared to females (27.5%).

Mithra et al[12] in their study reported equal prevalence of overweight (2.4%) among both male and female study participants, while males had slightly higher prevalence of obesity (1.6%) as compared to females (1.3%). This may be due to the inclusion of more male students in the study in comparison to females.

Higher prevalence of obesity/overweight was reported in females as compared to males in the studies conducted by Rani et al[16] in Haryana, Tiwari et al[9] in Allahabad, Choudhary et al[10] in Patna, Prasad et al[15] in Pondicherry and Kowsalya et al[6] in Tamil Nadu. This finding can be explained by the physiological fact that adolescence is a period of increase in fat deposition in females and a relative decrease of fat in males due to increase in muscle and bone mass in their body. Due to some social reasons, girls' play less outdoor games as compared to boys as parents' don't allow them to go far away from their houses to play.

**Overweight/obesity and Religion**

In the present study, it was observed that 7.8% of the Hindus were obese /overweight but none of the Muslims were obese /overweight (Table 3). This may be because of the difference in proportion of Hindus and Muslims in the study. Hindus comprised about 98% of the study subjects, whereas, Muslims comprised only 1.4% of them (Table 3). The study conducted by Vohra et al[17] in Lucknow city reported the prevalence of overweight/obese as 4.7% in Hindus and 6% among those belonging to other religions. This can be attributed to the difference in eating habits of different religions.

**Overweight/obesity and type of family**

Higher prevalence of overweight/obesity was observed among study subjects belonging to Three generation (14.3%) and Joint (11.7%) families than

Nuclear families (4.5%). Similar results were reported by Vohra et al[17] in their study, where the prevalence of overweight/obesity among study subjects belonging to Joint/Extended families was higher as compared to those belonging to Nuclear families.

Contradictory findings were reported in the studies conducted by Kumar et al[14] in Karnataka, Tiwari et al[9] in Allahabad, where the prevalence was high among study participants who belonged to Nuclear families than those belonging to Joint families. The reason may be less number of family members in nuclear families and increased availability of food for each member leading to overweight/obesity.

**Overweight/obesity and number of family members**

Higher prevalence of overweight/obesity was observed among study subjects who had 6-10 family members (11%) as compared to those who had up to 5 family members (5.1%) in the present study. This finding was statistically significant. Since most of the families with 6-10 members were joint families, the family income was also high due to more number of earning members. Moreover, in the joint families as the resources are pooled so the individual member gets more and that may be the reason for higher prevalence of overweight / obesity.

**Overweight/obesity and Parents education status**

As for parents education was concerned, higher prevalence of overweight/obesity was observed among study subjects whose parents' educational status was graduate and above. The prevalence also increased with increase in the education status of the parents (Table 4). This finding was statistically significant. Similar results were reported by Vohra et al[17] in their study where the prevalence of overweight/obesity was higher in students whose fathers education was graduation and above, in comparison to those whose fathers were educated only up to high school. This finding was statistically significant. In the same study, regarding mother's education, the proportion of overweight/ obesity was more among students whose mothers were educated more than 6$^{th}$ class compared to those whose mothers were educated only upto 6$^{th}$ class. However, this finding was not statistically significant. This can be explained by the notion that when both the parents are well educated so, both the parents may be working and are having better earning. With higher income there will be better accessibility to energy dense foods. Their children may also get pocket money for spending in school. With this money they may also purchase junk foods which may be the cause of higher prevalence of overweight/ obesity among these children.

Contradictory findings were observed in the study conducted by Choudhary et al[10], in which it was reported that the prevalence of overweight/obesity decreased with increase in parents' education status. This finding was statistically significant. This can be due to the fact that uneducated parents or parents with less education are of the belief that overweight children are healthier than normal weight children and probably preferred high calorie foods for their children which led to obesity.

**Overweight/obesity and monthly family income**

In the present study, prevalence of overweight/obesity was higher (23.8%) among students belonging to families having monthly income more than 20,000 rupees (Table 5). There was statistically significant relationship between higher family income and overweight/obesity. Similar results were reported by Jain et al[18] and Tiwari et al[9] in their studies, where higher prevalence of overweight/obesity was observed among study subjects belonging to higher socio-economic class as compared to those belonging to lower class. One possible explanation for the higher income and overweight/obesity relationship in developing countries like India is the influence of income on people's lifestyles such as food consumption patterns. Rich people have better access to energy dense foods than people with relatively low income.

## CONCLUSION

The present study showed that the prevalence of overweight/ obesity among adolescents is on an increasing trend in rural areas. Age, gender, parents education status, monthly family income, total family members was found to be significantly associated with overweight /obesity. As stated earlier, childhood obesity continues in adult life and thus gives rise to

non-communicable diseases (NCDs) like diabetes and cardiovascular diseases. Thus it is the need of the hour to address this problem and to devise programs and strategies to prevent overweight/obesity among children and adolescents because today's children are future citizens of the nation. If the children will be unhealthy so the nation will also become unhealthy in near future.

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