Prevalence of overweight and obesity and its associated factors among students in secondary schools in the urban field practice area of a medical college in Mangalore

Keerthi S Yalaburgi[1*], Prashant M Naik[2], Oliver D'Souza[3], Krutarth R Brahmbhatt[4]

[1]Assistant Professor, Department of Community Medicine, USM-KLE International Medical Programme, Belgaum, Karnataka, INDIA.
[2]Assistant Professor, Department of Community Medicine, Karwar Institute of Medical Sciences, Karwar, Karnataka, INDIA.
[3]Assistant Professor, Department of Community Medicine, Father Muller Medical College, Mangalore, Karnataka, INDIA.
[4]Associate Professor, Department of Community Medicine, GMERS Medical College, Junagadh, Gujarat, INDIA.
Email: drkeerthisy@gmail.com

Abstract
Background: Obesity is a chronic complex, multifactorial and most common nutritional disorder, prevalent all over the globe and affecting children as well as adults. The disease and its complications increase the risk of chronic and non-communicable diseases. The World Health Organization has described obesity as one of todays' most neglected public health problem. This problem is increasing in adolescents and various factors contribute to it. Hence this study was undertaken to assess the prevalence of overweight and obesity among secondary school students and to identify the associated risk factors. **Objectives:** 1. To study the prevalence of overweight and obesity among students pursuing secondary education in schools in the Urban Field Practice Area of A.J. Institute of Medical Sciences and Research Centre, Kavoor, Mangalore. 2. To study the factors influencing overweight and obesity **Methods:** A cross-sectional study was done among 1025 students in secondary schools located in the urban field practice area of A.J. Institute of Medical Sciences and Research Centre, from June 2012 to May 2013 using a pretested, semi-structured, self-administered questionnaire from the students in classes 8,9 and 10.Height and weight was recorded and BMI calculated using WHO age and sex-specific percentiles. Statistical analysis was performed using SPSS software. **Results:** 1025 students in the age-group of 12-17years were part of the study. The prevalence of overweight and obesity among boys was 3.7% and 2.5% respectively. In girls, the corresponding figures were 4.2% and 1.4% respectively. Some of the associated factors for overweight/obesity were found to be parents' education level, family history of overweight/obesity, non-consumption of fruits, using vehicles as a mode of transport to school and television viewing. **Conclusion:** The study concludes that the prevalence of overweight/obesity is high among the students of our urban field practice area. There is an urgent need to address the problem early as most of the variables found to be significantly associated are modifiable risk factors.
Key Words: Obesity; overweight; students; schools; WHO.

Obesity is a global nutritional concern. The increasing prevalence of overweight, obesity and its consequences prompted the World Health Organization to designate obesity as a global epidemic[1]. Throughout most of human history, weight gain and fat storage have been viewed as signs of health and prosperity. In times of hard labor and frequent food shortage, securing an adequate energy intake to meet requirements has been the major nutritional concern. Today, however as standards of living continue to rise, weight gain and obesity are posing a growing threat to health in countries all over the world.

Obesity is a chronic complex, multifactorial and most common nutritional disorder, prevalent in both developed and developing countries, and affecting children as well as adults. Indeed it is now so common that it is replacing the more traditional public health problems, including undernutrition and infectious diseases, as one of the most significant contributors to ill health. Overweight and obesity are defined as "abnormal or excessive fat accumulation that presents a risk to health." Overweight and obesity result from an energy imbalance due to eating too many calories and not doing enough physical activity to use up the calories. This change in dietary and physical activity patterns have resulted from environmental and societal changes associated with development and lack of supportive policies in sectors such as health, agriculture, transport, urban planning, environment, food processing, distribution, marketing and education[2]. India, like many low and middle-income countries, is now facing a "double burden" of disease. As they continue to struggle with the problems of infectious diseases and under-nutrition, at the same time they are experiencing a rapid increase in the risk factors of non-communicable diseases (NCDs) such as obesity and overweight, particularly in urban settings[3].There are an estimated 35 million overweight/obese children in developing countries, compared with 8 million in developed countries[4]. There is an urgent need to address the problem and efforts should be made to prevent the epidemic of overweight and obesity and its associated health hazards. Keeping this in mind, this study has being done so as to assess the prevalence of overweight and obesity amongst secondary school students so that healthy behaviors can be initiated before they reach adulthood to prevent the early onset of complications.

MATERIALS AND METHODS

Permission was obtained from the Block Education Officer of Mangalore to conduct the study. Six secondary schools are located in our field practice area. Written consent was taken from the Head of the Institution/Headmistress to permit the investigator to interview the students and to take the necessary anthropometric measurements. The purpose of the study was explained to the students and verbal consent taken. The study protocol was approved by the Institution Medical Ethics Committee. Initially a pilot study was done in one of the schools. A semi-structured questionnaire was prepared and distributed among 80 students. The questionnaire was filled by the students and then necessary anthropometric measurements taken. After doing alterations the final questionnaire was finalized in English and Kannada. For this cross-sectional school-based study, all students studying in these secondary schools and who consented to participate in the study were included in the study. Proformas were distributed depending on the medium of instruction of the school. Students not available for the study on two separate visits made to the school were excluded from the study. The total number of students studying in these six secondary schools in 8th,9th and 10th standard was found to be 1130.Out of this,105 students were not available for the study on two visits, and were taken as non-responders. Hence, a sample size of 1025 students was considered for the study. The proforma consisted of 2 parts: i) Pretested semi-structured questionnaire ii) Anthropometric measurements. The questionnaire was used to elicit the socio-demographic details of the student, parents education level and occupation, and family history of overweight and obesity. Food habits, mode of transport to school and time spent watching television were also included. After completion of questionnaire, anthropometric measurements comprising of height and weight were recorded using standardized procedures. The standing height was measured by asking the individual to stand bare-foot on flat surface against a straight wall with weight distributed evenly on both feet, heels together and the head positioned so that the line of vision was perpendicular to the body. The arms were made to hang freely by the sides, and the head, back, buttocks and heel were in contact with the wall behind. A flat card board was placed on top of head and the height was recorded in centimeters to the nearest 0.5cm with scale marked on the wall using measuring tape[5]. The weight was measured with the individuals wearing optimal clothing-only school uniform-using a bathroom scale, which was checked by calibration with standard weights. Individuals were asked to stand still, facing forward and arms on the side and waited until told to step off. Weight was recorded in kilograms. BMI was calculated using the formula

$$BMI = height (in metres)^2/weight (in kilograms)$$

The BMI so calculated was matched for the corresponding age in years and months in the BMI for age sex-specific percentile charts of WHO. The students were categorized as follows:

- Underweight ≤ 3rd percentile
- Normal weight 3rd - 85th percentile
- Overweight ≥ 85th – 97th percentile
- Obese ≥ 97th percentile[6]

The data was entered in a computer with (Microsoft Excel 2010) spreadsheet. Subsequently it was analyzed using SPSS. Descriptive statistics (means, percentages),chi-square test and t-test were the statistical methods employed to analyze the data. Prevalence rates of overweight and obesity were calculated in both sexes and presented as percentage. For statistical analysis, overweight and obesity were clubbed into one group and

Keerthi S Yalaburgi, Prashant M Naik, Oliver D'Souza, Krutarth R Brahmbhatt

compared with the normal weight students. While assessing the associated factors for overweight and obesity, the students who were underweight were excluded from the statistical analysis. Associations were assessed using Chi-square tests. For all statistical tests, $p < 0.05$ was taken as the significant level. The statistical significance of different variables in normal and overweight/obese groups was computed.

RESULTS AND DISCUSSION

A total of 1025 students participated in this study. The distribution of the students was as follows:

Table 1: Sex distribution of the students according to BMI (n=1025)

	Underweight (%)	Normal (%)	Overweight (%)	Obese (%)	Total (%)
Boys	178(17.4)	316(30.8)	38(3.7)	26(2.5)	558(54.4)
Girls	106(10.3)	304(29.7)	43(4.2)	14(1.4)	467(45.6)
Total	**284(27.7)**	**620(60.5)**	**81(7.9)**	**40(3.9)**	**1025(100)**

Table 2: Associated factors of overweight/obesity

	Normal (%)	Obese/ overweight (%)	Total	p value
Gender (n=741)				
Boys	316 (83.2)	64 (16.8)	380	**p=0.698**
Girls	304 (84.2)	57 (15.8)	361	
Medium of instruction (n=741)				
English	297 (79)	79 (21)	376	**p=0.001**
Kannada	323 (88.5)	42 (11.5)	365	
Type of school(n=741)				
Government	98 (91.6)	9 (8.4)	107	
Private	203 (85.7)	34 (14.3)	237	**p=0.012**
Private aided	319 (80.4)	78 (19.6)	397	
Mothers education (n=654*)				
Diploma and above	82 (75.2)	27 (24.8)	109	
Literate upto high school	362 (83.6)	71 (16.4)	433	**p=0.007**
Illiterate	102 (91.1)	10 (8.9)	112	
Fathers education*(n=605*)				
Diploma and above	118 (79.7)	30 (20.3)	148	
Literate uptohigh school	339 (85.4)	58 (14.6)	397	**p=0.270**
Illiterate	51 (85)	9 (15)	60	
Student perception of mother being overweight/obese(n=741)				
Yes	48 (50)	48 (50)	96	
No	293 (86.9)	44 (13.1)	337	**p=0.001**
Do not know	279 (90.6)	29 (9.4)	308	
Student perception of father being overweight/obese(n=741)				
Yes	40 (45.5)	48 (54.5)	88	
No	288 (87)	43 (13)	331	**p=0.001**
Do not know	292 (90.7)	30 (9.3)	322	
Mother's occupation*(738)				
Working	321 (89.2)	39 (10.8)	**360**	**p=0.001**
Not working	296 (78.3)	82 (21.7)	378	
Consumption of fruits (n=741)				
Yes	569 (91.3)	54 (8.7)	623	**p=0.001**
No	51 (43.2)	67 (56.8)	118	
Mode of transport (n=741)				
Walk and cycle	566 (92)	49 (8)	615	**p=0.001**
Bus, 2 wheeler, car	54 (42.9)	72 (57.1)	126	
Duration of watching TV(n=718)**				
Up to 2 hours	382 (87.4)	55 (12.6)	437	**p=0.001**
More than 2 hours	217 (77.2)	64 (22.8)	281	

* Table excludes students who did not have parents and those whose parents' education and occupation was not known. **Table excludes students who do not watch television

558 (54.4%) were boys and 467 (45.6%) girls. The age of the students ranged from 12-17 years. 35%were from class 8 and 9 each and 30% from class 10. 14.4%students belonged to the Government school, 37% students from private schools and 48.6% from aided schools. The Government school, one private school and one aided school had Kannada as a medium of instruction and the rest of the schools had English as a medium of instruction. In this study, a total of 81(7.9%) students were overweight,40(3.9%) were obese,284 (27.7) were underweight and 620 (60.5%) were of normal weight. The prevalence of overweight and obesity among boys was 3.7% and 2.5% respectively. In girls, the corresponding figures were 4.2% and 1.4% respectively. Underweight was seen to be more in boys (17.4%) than girls (10.3%). Normal weight students were almost equal in both boys and girls. The mean BMI of the boys was 17.54± 3.12 and girls was 18.12 ± 3.25.This difference was statistically significant. Similar findings were seen in the study done by Kumari DJ *et al*[7], where the mean BMI of the adolescents was 19.21.

Associated factors for overweight/obesity: In the present study, the prevalence of overweight/obesity among boys was found to be 16.8% and among girls 15.8%. This difference between boys and girls was not found to be statistically significant. Similar findings were seen in the study done by Goyal RK[8], wherein the prevalence of overweight was found to be 14.3% among boys and 9.2% among girls and the prevalence of obesity was 2.9% in boys and 1.5% in girls. However, as opposed to our study, Ramesh K.[9] in his study found that the prevalence of overweight/obesity is high among girls (20%) compared to boys (16.4%).It was seen in our study that the prevalence of overweight/obesity among students in the English medium schools was more (21%) than the students in the Kannada medium schools(11.5%).This difference was found to be statistically highly significant. These findings were similar to the findings found in the study done by Bharati *et al*[10], wherein the risk of overweight/obesity was significantly higher in children studying in English medium school than in non-English medium school (OR=2.769;95% CI=1.778-4.397).It was also seen that the prevalence of overweight/obesity was more in the students from private aided school (19.6%)and private schools (14.3%) as compared to the government school (8.4%).The same was found to be statistically significant. Ramesh K[9] also found the prevalence was high among private unaided school students (22.2%) and private aided (17.5%) school students compared to government school (17%) students. Similarly, the prevalence of overweight among the adolescents studying in private schools (9.6%; 95% CI: 7.1, 12.1) was significantly higher (p <0.05) than among

those studying in government schools (3.2%) in the study done in Hyderabad by Laxmiah A *et al*[11]. In our study, it was seen that mothers who had an education level of diploma and above had a higher proportion of overweight and obese children (24.8%) as compared to illiterate mothers(8.9%).It was also seen that 20.3% of the overweight/obese students belonged to fathers who were educated beyond diploma, followed by 14.6% of the students whose fathers had studied up to high school. The prevalence of overweight/obesity increased as the fathers' education level increased. However the same was not statistically significant. In the study done by Ramesh K[9], both fathers and mothers educational qualification showed a difference in the prevalence of overweight/obesity. The prevalence was high among those study subjects whose mothers and fathers were post-graduates and above (22.9 and 21% respectively) compared to those who has studied up to 10th standard(17.5% 16.8% respectively).In the study done by Bharati *et al*[10], the risk of overweight/obesity was significantly higher in children whose father and/or mother had education > 6th standard(OR=3.705;95% CI=1.617-8.490).In our study it was also seen that the prevalence of overweight/obesity was more than 50% in students who perceived their parents to be overweight/obese as compared to 13.1% in mothers who were not perceived to be overweight/obese. This difference was also found to statistically highly significant. In the study done by Ramesh K[9], the prevalence of overweight / obesity was high among study subjects with family history of overweight/ obesity (36.7%)compared to those without family history of overweight/obesity (8.9%) and was also statistically significant. In the study done by Singh AK *et al*[12], 22.9% boys and 29.9% girls stated that they had a family history of obesity (including parents, either one or both).Our study found that the prevalence of overweight/obesity was more in mothers who did not work outside their homes (21.7%) as compared to mothers who worked outside (10.8%).This difference was statistically highly significant. The possible reason could be that the stay-at home mothers had more time to prepare food of different varieties and at regular intervals as per the demand of the family as compared to working mothers. However, the study done by Ramesh K[9] showed that the prevalence of overweight/ obesity was more among students when both parents are working. The possible explanation given in that study was that having a job meant better socio-economic status and also better spending capacity for the family as a whole and the children in particular. In this study, it was seen that overweight/obesity was seen more in students who did not eat fruits (56.8%) as compared **to** students who did eat fruits (8.7%).This difference was

found to be statistically highly significant. This is consistent with the study done by Singh AK *et al*[12], wherein overall there was an extremely low consumption of fruits and vegetables across all age-groups. Only 39.4% of the children were having fruits daily. The importance of a balanced diet and the need to consume fruits and vegetables can be emphasized at a young age by the teachers, so that the students inculcate these habits lifelong. Higher prevalence of overweight/obesity(57.1%) was found in those students who used vehicles as a mode of transport to school as compared to those who walked or cycled to school(8%).This difference was statistically highly significant. Similar finding were seen in the studies done by Goyal JP *et al*[13] and Ramesh K[9]. Goyal JP *et al* showed that transport to school by bus or auto was also associated with 2.81 times (OR: 2.81; 95% CI=1.41–5.61) increased risk of overweight and obesity. In the study by Ramesh K, the prevalence of overweight/obesity was found to be high among those who used vehicles as a mode of conveyance to school (19.3%) compared to those whose mode of conveyance was bicycle/walking (16.3%).The prevalence of overweight/obesity was more in the group of students who watched TV for more than 2 hours/ day (22.8%) as compared to students who watched for 2 hours or less(12.6%).The difference was also found to be statistically highly significant. In the study done by Goyal JP *et al*[13], watching TV or playing computer games for 1–3 hours and more than 3 hours increased the risk of overweight and obesity 1.84 (OR: 1.84; 95% CI=1.19–2.84)and 5.4 times (OR: 5.4; 95% CI=2.77–10.54), respectively. The possible explanation could be that because children spend more time in sedentary activities like television viewing, there is more likelihood of the child being overweight or obese.

CONCLUSION

From the study it was found that the prevalence of overweight and obesity is high among the students of our urban field practice area. There is a strong association of this prevalence with medium of instruction of school, type of school, parents' literacy status, family history, use of vehicles as a means of transport, dietary pattern and TV viewing. Many of these factors are modifiable. Hence there is an urgent need to address this problem so that the consequences of obesity can be prevented before reaching adulthood.

LIMITATIONS OF THE STUDY

1. Since this study was done using a self-administered questionnaire, many of the answers given by the students may not be accurate.

2. A chance of recall bias is possible regarding food habits/frequency of eating certain foods.
3. Questions regarding salt-intake and oil use at home was not asked as the student may not be able to quantify them.
4. The puberty growth spurt may have been a confounding factor in this study as the age group considered was 12-17years.

REFERENCES

1. World Health Organization. Obesity: Preventing and managing the global epidemic, Report of a WHO consultation. WHO Technical Report Series, No. 894: Geneva; 2000
2. WHO SEARO factsheet. Overweight and obesity (online)http://www.searo.who.int/entity /non-communicable diseases/media/non communicable diseases obesity fs.pdf accessed on 11.09.2013.
3. Ramachandra P. The double burden of malnutrition. Case studies from six developing countries. Food and nutrition paper 84.Food and agriculture organization of the United Nations Rome;2006. The Double Burden of malnutrition in India; 99-160.
4. World Health Organization. Population-based prevention strategies for childhood obesity: report of a WHO forum and technical meeting, Geneva;2009.
5. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. World Health Organisation Tech Rep Ser 1995; 854:161-262.
6. De OnisM, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. Bulletin of the World Health Organization 2007; 85 (9):660-7.
7. Kumari DJ, Krishna BSH. Prevalence and risk factors for adolescents (13–17 years): overweight and obesity. Current Science 2011; 100(3):373-7.
8. Goyal RK,Shah VN, Saboo BD, Phatak SR, Shah NS, Gohel MC et al .Prevalence of Overweight and Obesity in Indian Adolescent School Going Children : Its Relationship with Socioeconomic Status and Associated Lifestyle Factors. JAPI 2010;58:151-8
9. Ramesh K. Prevalence of overweight and obesity among high school students of Thiruvananthapuram City Corporation, Kerala, India. Australasian Medical Journal 2010;3(10):650-61.
10. Bharati DR, Deshmukh PR, Garg BS. Correlates of overweight and obesity among school going children of Wardha city, Central India. Indian J Med Res. 2008; 127(6):539-43.
11. Laxmaiah A,Nagalla B, Vijayaraghavan K, Nair M. Factors Affecting Prevalence of Overweight Among 12-

to 17-year-old Urban Adolescents in Hyderabad, India. Obesity. 2007;15(6):1384-90.

12. Singh AK, Maheshwari A, Sharma N, Anand K. Lifestyle Associated Risk Factors in Adolescents. Indian Journal of Pediatrics 2006; 73:901-6.

13. Goyal JP, Kumar N, Parmar I, Shah VB, Patel B. Determinants of Overweight and Obesity in Affluent Adolescent in Surat City, South Gujarat region, India. Indian journal of Community Medicine 2011; 36(4):296-00.

Source of Support: None Declared
Conflict of Interest: None Declared