

# Prevalence and determinants of overweight and obesity among school-going adolescents in Mysuru district, southern India

Srinivas Nagaraj<sup>1</sup>, Prashantha Bettapa<sup>2</sup>, Prakash B<sup>1</sup>, Vishma Kaverappa<sup>3</sup>, Usha Rani<sup>4</sup>, Ashok NC<sup>1</sup>

<sup>1</sup>Department of Community Medicine, JSS Medical College, Mysuru, Karnataka, India.

<sup>2</sup>Department of Community Medicine, Mysore Medical College & Research Institute, Mysuru, Karnataka, India.

<sup>3</sup>Department of Community Medicine, Adichunchanagiri Institute of Medical Sciences, Mandya, Karnataka, India.

<sup>4</sup>Department of Community Medicine, Sri Siddhartha Institute of Medical Sciences, Tumkur, Karnataka, India.

Correspondence to: Srinivas Nagaraj, E-mail: srinivasnraj@gmail.com

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## Abstract

**Background:** Adolescent obesity is a growing concern with the proportion of adolescents in the general population who are overweight and obese has doubled over the past two decades in developed and developing countries including India. It increases the risk of adult obesity as well as chronic health problems.

**Objective:** To estimate the prevalence of overweight and obesity using IOTF guidelines 2012, and to describe the determinants of adolescent overweight and obesity among school-going adolescents.

**Materials and Methods:** A cross-sectional study was conducted in the rural and urban schools of Mysuru district, Karnataka, India. The schools were selected using simple random sampling and 467 students participated in the study. Data were collected through a self-administered pretested structured questionnaire.

**Result:** The prevalence of overweight and obesity among school-going adolescents in Mysuru district was 64(13.7%) and 28(5.9%) respectively. A female preponderance for both overweight 49(18.7%) and obesity 16(6.1%) was seen as compared to males. Determinants such as age, sex, history of obesity among parents, religion, and physical activity were found to be significantly associated with overweight and obesity.

**Conclusion:** Prevalence of overweight and obesity among school-going adolescents was found to be higher.

**KEY WORDS:** Adolescent, overweight and obesity, prevalence, southern India

## Introduction

Worldwide, disease profiles are transforming at a rapid pace attracting the attention of medical professionals and policy-makers alike. This is particularly true in low- and

middle-income countries that form the major chunk of global population. The emerging epidemics of obesity, cardiovascular disease, 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.<sup>[1]</sup>

The World Health Organization (WHO) has declared overweight as one of the top 10 health risks in the world and one of the top 5 in developed nations.<sup>[2]</sup> Existing WHO standards and data from 79 developing countries including a number of industrialized countries suggest that about 22 million children aged 5 years are overweight worldwide.<sup>[3]</sup>

The WHO has described obesity as one of today's most neglected public health problems. Following the increase

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in adult obesity, the proportion of children and adolescents who are overweight and obese have also been increasing.<sup>[4]</sup> Obesity can be seen as the first wave of a defined cluster of noncommunicable diseases called “New World Syndrome” creating an enormous socioeconomic and public health burden in poorer countries.<sup>[5]</sup>

Once considered a problem of affluence, obesity is fast growing in many developing countries also.<sup>[6]</sup> In countries such as India, which are typically known for a high prevalence of undernutrition, a significant proportion of overweight and obese children now coexist with those who are undernourished.<sup>[7]</sup> This study was undertaken to estimate the magnitude of overweight/obesity and to know the factors influencing the magnitude among adolescent schoolchildren in Mysuru district, southern India.

### Objective

1. To estimate the prevalence of overweight and obesity among school-going adolescents.
2. To describe the determinants of adolescent overweight and obesity among school-going adolescents.

## Materials and Methods

### Study Design and Setting

A cross-sectional study was carried out during September and December 2013, in middle schools (5th to 7th standard), high schools (8th to 10th standard), and preuniversity colleges (11th and 12<sup>th</sup> standard) of Mysuru district. All school-going adolescents from 5th to 12th standard from the selected schools were the study participants.

### Sample Size and Sampling Design

The prevalence of obesity was 10% in a study by Subramanya et al.,<sup>[8]</sup> the sample size was calculated using the following formula:  $n = Z^2pq/L^2$ , where  $Z$  is the standard normal variate for 95% confidence interval = 1.96;  $p$  is the prevalence of obesity = 0.1;  $q = (1 - p) = 1 - 0.1 = 0.9$ ;  $L$  is the allowable error. Considering an absolute allowable error of 3%,  $n \approx 390$ , and considering 15% of the study participants as nonrespondents, a total sample size of  $\approx 450$  was calculated.

JSS educational institutions constitute around 30% of schools in Mysuru district. The complete list of all schools under JSS Mahavidyapeetha was obtained, of which three schools and one preuniversity college were selected by simple random sampling. The consent of the school authorities was obtained after explaining the objectives as well as the method of study. All adolescents from 5th to 12th standard from the selected schools who were willing to participate were included in the study until saturation was attained.

### Study Instruments

A self-administered, pretested structured questionnaire was used to elicit information on their sociodemographic

profile such as education, diet, residence, religion, type of family, history of obesity in the family, and information on individual characteristics such as age, sex, eating habits, and time spent in viewing television and frequency of junk food consumption, physical activity, and exercise of the study participants. Anthropometric measurements such as weight and height were recorded after standardizing the instruments. Body weight was measured (to the nearest 1 kg) with the subject standing motionless on the weighing scale with feet 15 cm apart. Height was measured (to the nearest 1 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 square. International (IOTF) 2012 guidelines for BMI cutoffs were used to classify the participants into normal, overweight, and obese categories.

### Statistical Analysis

Data were analyzed using SPSS software, version 22.0. The prevalence of overweight and obesity is presented as proportions.  $\chi^2$ -Test was applied at 95% confidence interval (95% CI). The  $p$ -value of  $<0.05$  was considered as statistically significant.

## Results

Among 467 adolescents in the age group of 10–18 years who participated in the study, 206 (44.2%) were males and 261 (55.8%) were females, of which prevalence of overweight and obesity was found to be 64 (13.7%) and 28 (5.9%), respectively. The sex-wise distribution showed a female preponderance for both overweight (49, 18.7%) and obesity (16, 6.1%) as compared to males. The proportion of overweight/obese was higher among late adolescents (17.5%/14.8%). Those consuming mixed diet had a higher preponderance for overweight (30, 18.9%) and obesity (11, 6.9%); and those residing in urban area had a higher prevalence of overweight (19, 16.6%) and obesity (8, 7.0%) as compared to rural and was higher in those with a family income above 5000 per month (10, 11.1%) for overweight and than for obesity (8, 8.8%). The prevalence of overweight (18, 13.6%) and obesity (18, 13.6%) was more among those with a history of obesity in the family. A history of watching television more than an hour daily showed a higher prevalence for overweight (20, 16.2%) and obesity (7, 5.6%) [Table 1].

The age-wise prevalence of overweight/obesity was higher among late adolescents (24, 32.4%), and it was found to be statistically significant. Similarly, sex, history of obesity among parents, religion, and physical activity were found to be statistically significant, whereas birth order, residence, number of members in the family, daily exercise, number of hours spent in watching television, and junk food consumption were statistically not significant [Table 2].

**Table 1:** Sociodemographic profile of study participants as per body mass index criteria (IOTF classification)

Character	Category	Normal weight	Overweight	Obese
Age group (years)	10–13	113 (85.5)	17 (12.7)	3 (2.2)
	14–16	212 (81.5)	34 (13.0)	14 (5.3)
	17–18	50 (67.6)	13 (17.5)	11 (14.8)
	Total	375 (80.3)	64 (13.7)	28 (5.9)
Sex	Male	179 (86.9)	15 (7.1)	12 (5.68)
	Female	197 (75.1)	49 (18.7)	16 (6.1)
	Total	375 (80.3)	64 (13.7)	28 (5.9)
Diet	Veg diet	198 (79.5)	34 (13.6)	17 (6.8)
	Mixed diet	117 (81.2)	30 (18.9)	11 (6.9)
	Total	375 (80.3)	64 (13.7)	28 (5.9)
Residence	Urban	87 (77.7)	19 (16.6)	8 (7.0)
	Rural	288 (81.1)	47 (13.2)	20 (5.6)
	Total	375 (80.3)	64 (13.7)	28 (5.9)
Family Income (per month)	<5000	294 (86.9)	26 (7.6)	18 (5.3)
	>5000	72 (80.0)	10 (11.1)	8 (8.8)
	Total	366 (85.5)	36 (8.4)	26 (6.1)
History of obesity in the family	Present	94 (72.7)	18 (13.6)	18 (13.6)
	Absent	276 (83.8)	44 (13.3)	9 (2.7)
	Total	370 (80.6)	62 (13.5)	27 (5.8)
Number of hours spent in watching television daily	<1	265 (80.5)	44 (13.3)	20 (6.1)
	>1	96 (78.0)	20 (16.2)	7 (5.6)
	Total	361 (79.8)	64 (14.1)	27 (5.9)

Note: Figures in parenthesis indicate percentages.

**Table 2:** Association of determinants contributing to overweight/obesity among adolescents

Character	Category	Normal weight	Overweight/obesity	Total	p*-value
Age group (years)	10–13	113 (85.0)	20 (15.0)	133 (100)	0.008
	14–16	212 (81.5)	48 (18.5)	260 (100)	
	17–18	50 (67.6)	24 (32.4)	74 (100)	
Sex	Male	179 (86.9)	27 (13.1)	206 (100)	0.001
	Female	196 (75.1)	65 (24.9)	261 (100)	
History of parental obesity	Present	98 (69.0)	44 (31.0)	142 (100)	0.001
	Absent	276 (85.2)	48 (14.8)	324 (100)	
Residence	Urban	87 (77.7)	25 (22.3)	112 (100)	0.424
	Rural	288 (81.1)	67 (18.9)	355 (100)	
Religion	Hindu	368 (81.2)	85 (18.8)	453 (100)	0.004
	Others	7 (50)	7 (50)	14 (100)	
Birth order	First child	167 (80.3)	41 (19.7)	208 (100)	1.000
	Second child	155 (80.3)	38 (19.7)	193 (100)	
	Third and more	53 (80.3)	13 (19.7)	66 (100)	
No. of family members	>5	277 (81.2)	64 (18.8)	341 (100)	0.361
	<5	96 (77.4)	28 (22.6)	124 (100)	
Physical activity (hours)	>1	342 (83.2)	69 (16.8)	411 (100)	0.001
	<1	33 (58.9)	23 (41.1)	56 (100)	
Daily exercise	Present	182 (78.8)	49 (21.1)	231 (100)	0.416
	Absent	193 (81.8)	43 (18.2)	236 (100)	
Number of hours spent in watching television	<1	265 (80.5)	64 (19.5)	329 (100)	0.556
	>1	96 (78.0)	27 (22.0)	123 (100)	
Junk food consumption	>3 times per week	314 (79.3)	82 (20.7)	396 (100)	0.252
	<3 times per week	58 (85.3)	10 (14.7)	68 (100)	

Note: Figures in parenthesis indicate percentages.

\* $\chi^2$ -test.

## Discussion

This study was conceived to estimate the prevalence of overweight and obesity among school-going adolescents and to describe the factors contributing to overweight and obesity among them. The prevalence of overweight and obesity was found to be 13.7 % and 6.0%, respectively, in the study. The combined prevalence was found to be 19.7% in this study.

A study by Prentice and Jebb<sup>[9]</sup> reported the prevalence of overweight and obesity to be 8.5% and 3.5%, respectively. Another study on schoolchildren by Chhatwal *et al.*<sup>[10]</sup> showed the prevalence of overweight and obesity to be 11.1% and 14.2%, respectively. The results of the above-stated studies are comparable to those of this study. Another study conducted by MDRF at Chennai reported the combined prevalence of overweight/obesity as 21.4% in private schools and 3.6% in government schools.<sup>[11]</sup> A study conducted in Pune documented the prevalence of obesity as 5.7% and overweight as 19.9%.<sup>[12]</sup> The prevalence of overweight and obesity in the above-mentioned studies is higher compared to that of this study.

In this study, the prevalence of overweight and obesity was higher among female subjects as compared to male subjects. In contrast, a study by Goyal *et al.*<sup>[13]</sup> reported a male preponderance for both overweight and obesity (15.% vs 13.3%; 6.7% vs 6.4%), and a study by Chhatwal *et al.*<sup>[10]</sup> reported that the prevalence of obesity and overweight was higher in boys as compared to that in girls (12.4% vs 9.9%; 15.7% vs 12.9).

The prevalence of overweight/obesity is higher among urban residents in this study, which is similar to the findings of the study by Saraswathi *et al.*<sup>[14]</sup>

In this study, the prevalence of overweight/obesity was higher among those consuming a mixed diet, with increased frequency of junk food consumption, decreased physical activity, and in those with a higher family income. In a study by Siddiqui and Bose<sup>[15]</sup> showed the highest prevalence rate of obesity among children belonging to higher socioeconomic class. This new trend can be attributed to an increase in sedentary lifestyle, a decrease in levels of physical activity, and an increase in the consumption of energy-dense junk foods.

The prevalence of overweight/obesity was more among those with a history of obesity in the family and a history of watching television more than an hour daily.

The age-wise prevalence of overweight/obesity was higher among late adolescents and it was found to be statistically significant. Similarly, sex, history of obesity among parents, religion, and physical activity were found to be statistically significant. Similar findings for physical activity were found in a study by Brahmhatt and Oza.<sup>[16]</sup>

It was observed from this study that the prevalence of overweight/obesity was higher in Mysuru district compared to those reported previously, which might be attributed to lifestyle changes and the various risk factors contributing to it.

## Conclusion

The prevalence of overweight and obesity among school-going adolescents was found to be higher. Awareness-creating programs for schoolchildren and teachers regarding obesity and its impact on health are required. Increase in physical activities such as exercise, sports, and outdoor activities at schools and home should be emphasized upon. Emphasis should also be given for prevention and control of obesity in school health program by training the school teachers in detection of obesity among adolescents using feasible scales such as BMI at school level.

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## References

1. World Health Organization. Preventing Chronic Diseases: A Vital Investment. World Global Report. Geneva, Switzerland: World Health Organization, 2005.
2. World Health Organization. The World Health Report: Reducing Risks, Promoting Healthy Life. Geneva, Switzerland: World Health Organization, 2002.
3. World Health Organization. Obesity: Preventing and Managing the Global Epidemic. Report of WHO Consultation on Obesity. Geneva, Switzerland: World Health Organization, 1998.
4. Wong JP, Ho SY, Lai MK, Leung GM, Stewart SM, Lam TH. Overweight, obesity, weight-related concerns and behaviours in Hong Kong Chinese Children and adolescents. *Acta Paediatr* 2005;94:595–601.
5. World Health Organization. Obesity: Preventing and Managing the Global Epidemic. Technical Report Series No. 894. Geneva, Switzerland: World Health Organization, 2000.
6. World Health Organization (WHO), International Association for the Study of Obesity (IASO), and International Obesity task Force (IOTF). The Asia-Pacific Perspective: Redefining Obesity and Its Treatment. Geneva, Switzerland: World Health Organization, 2000.
7. Popkin BM, Horton S, Kim S, Mahal A, Shuigao J. Trends in diet nutritional status and diet related non communicable diseases in China and India: the economic costs of the nutritional transition. *Nutr Rev* 2001;59:379–90.
8. Subramanyam V, Jayashree R, Rafi M. Prevalence of overweight and obesity in affluent adolescent girls in Chennai in 1981 and 1998. *Indian Pediatr* 2003;40:332–6
9. Prentice AM, Jebb SA. Beyond body mass index. *Obese Rev* 2001;2:141–7.
10. Chhatwal J, Verma M, Riar SK. Obesity among preadolescents of a developing country (India). *Asia Pac J Clin Nutr* 2004;13:231–5.
11. Jagadeesan S, Harish R, Miranda P, Unnikrishnan R, Anjana RM, Mohan V. Prevalence of overweight and obesity among

- school children and adolescents in Chennai. *Indian Pediatr* 2014;51:544–9.
12. Khadilkar VV, Khadilkar AA. Prevalence of obesity in affluent school boys in Pune. *Indian Pediatr* 2004;41:857–8.
  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. *India J Community Med* 2011;36(4):296–300.
  14. Saraswathi YS, Najafi M, Gangadhar MR, Malini SS. Prevalence of childhood obesity in school children from rural and urban areas in Mysore, Karnataka, India *J Life Sci* 2011; 3(1):51–5.
  15. Siddiqui NI, Bose S. Prevalence and trends of obesity in Indian school children of different socioeconomic class. *Indian J Basic Appl Med Res* 2012;2(5):393–8.
  16. Brahmabhatt KR, Oza UN. Obesity among adolescents of Ahmedabad city, Gujarat, India: a community based cross-sectional study. *Int J Biol Med Res* 2012;3(2):1554–7.

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