Article published online: 2022-10-06

Prevalence of Overweight and Obesity among Adolescents: A School-Based Preliminary Cross-Sectional Study

Shycil Mathew[1] Jenifer D'Souza[2] Prakash Saldanha[3]

[1] Department of Community Health Nursing, Yenepoya Nursing College, Yenepoya (Deemed to be) University, Mangaluru, Karnataka, India
[2] Department of Community Health Nursing, Laxmi Memorial College of Nursing, Mangaluru, Karnataka, India
[3] Department of Pediatrics, Yenepoya Medical College Hospital, Yenepoya (Deemed to be) University, Mangaluru, Karnataka, India

Address for correspondence Shycil Mathew, MSc Nursing, Department of Community Health Nursing, Yenepoya Nursing College, Yenepoya (Deemed to be) University, Mangaluru, Karnataka, 575018, India (e-mail: shycilplakkattu7070@gmail.com).

J Health Allied Sci[NU] 2023;13:354–359.

Abstract

Introduction Globally, the magnitude of overweight and obesity is alarmingly high. In recent years, there are increased opportunities for adolescents to become overweight due to their sedentary lifestyles. Obesity is a chronic, noncommunicable, and lifestyle diseases resulting from energy imbalance. On evidence, overweight and obesity are still preventable as primordial prevention. Thus, knowing the prevalence will help us to plan prevention strategies.

Objectives The objective of the study was to identify the prevalence of overweight and obesity among adolescents in selected urban high schools at Mangaluru, Dakshina Kannada, India.

Materials and Methods A quantitative descriptive cross-sectional study was performed in adolescents with the age group of 13 to 15 years. Data was collected by using a body mass index screening tool through Google Forms. A total of 1100 adolescents participated in the study.

Results Almost 82.2% of the total adolescents were in the age group of 13 years with a mean age of 13.95 ± 1.02 standard deviation. Most 70% of them were females and 98.1% of adolescents place of stay was at home. Magnitude of overweight and obesity among urban adolescents in this study was 237(21.6%). A significant positive association was found between body mass index with selected demographic variables such as age, family history of overweight and obesity, and screen time more than 2 hours per day among adolescents with a p less than 0.05 level of significance.

Keywords
- prevalence
- adolescents
- obesity
- overweight
- urban

Details of earlier presentation: date 27/11/2021 and NRSI Conference presentation (Webinar)
CTRI registration number for this trial is- CTRI/2021/05/033774.

article published online
October 6, 2022

DOI https://doi.org/10.1055/s-0042-1755587.
ISSN 2582-4287.

Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

Conclusion This study revealed that current magnitude of overweight and obesity among adolescents is growing high. Health promotion activities need to be planned and there is a need to identify the challenges to implement such activities. Irrespective of all the barriers, it is the responsibility of all stakeholders to help adolescents to adopt healthy lifestyle in all aspects to have a healthier nation. A self-reported anthropometric measurement in adolescents can be used to reach out to the target population.

Introduction

Adolescence is a Latin word "adolescentia" from "adolescere" meaning "to grow up."[1,2] One in every five people is an adolescent.[2] Today, 1.2 billion adolescents stand between the period of childhood and adulthood.[3] Out of 7.5 billion world population, 243 million adolescents' live in India.[1,4] Adolescent age is commonly thought of as a period of optimum health. However, now adolescents are considered vulnerable to their neighborhood environments.[5] Globally and nationally, adolescents suffer from various health problems like communicable and noncommunicable diseases (NCDs).[6] The global flow of NCDs has swept across all age groups, including children and adolescents. However, the younger age group affected by NCDs is often under recognized.[7] Global status report on NCDs-2014 by the World Health Organization (WHO) shows that NCDs are responsible for approximately 1.2 million deaths worldwide each year in the age group below 20 years, and around 60% of deaths happen in India due to NCDs.[8]

Globally, the magnitude of overweight and obesity and its impact have increased.[2] An unhealthy lifestyle can contribute to the development of risk factors for NCDs.[9] Currently, lifestyle of the adolescents is a major issue; lifestyle choices adopted during adolescent time continue into adulthood.[10] The WHO estimates 2 million deaths/year are caused by physical inactivity and unhealthy eating habits.[11] Lifestyle has long been associated with the development of many chronic diseases and NCDs.[10] Obesity is an important risk factor for NCDs.[11] Many studies in India have reported that hypertension caused cardiovascular diseases beginning in the age group of children and adolescents.[8] A study results showed that prevalence of hypertension was 11% among school children in the age group of 13 to 19 years in the five schools of Udaipur city of Rajasthan.[8,9] In India, approximately 18.3% of female adolescents aged between 2 and 17 years are either in the category of overweight or obese.[11,12] According to the 2015–2016 National Family Health Survey (NFHS-4), the prevalence of obesity among women was 20.6%, and for men it was 18.9% of the 15 to 49-year age group, which is slightly higher than the NFHS-3 study (2005–2006).[12,13] Morbidity from cardiovascular disease, diabetes, cancers, and arthritis because of obesity was 50 to 100% higher among obese individuals suffering from childhood or teenage obesity.[14] Childhood obesity can profoundly affect children's physical health, social, and emotional well-being, and self-esteem.[15] It is also associated with poor academic performance and a lower quality of life experienced by the child.[16] Early identification of overweight and obesity in early life is very important due to its short- and long-term association with morbid outcomes and its influence on young people's psychosocial development.[15] The current upward trend in overweight and obesity among adolescents' populations is a consequence of inadequate lifestyle habits.[17] Declining physical activity, excess screen time, availability of junk food, and varying parenting styles are the major reasons for adolescent overweight and obesity.[18,19] Therefore, the identification and monitoring of overweight or obese children and adolescents are major concerns in public health. Moreover, a research gap also was identified that research studies have been not conducted on the prevalence of overweight and obesity among adolescents in Mangalore, India Thus, this study was undertaken to identify the magnitude of overweight and obesity among adolescents in selected urban high schools at Mangaluru, Dakshina Kannada, India.

Materials and Methods

A descriptive cross-sectional study was conducted among adolescents at selected urban high schools of Mangaluru, Dakshina Kannada, India. Samples of the study were in the age group of 13 to 15 years and who were enrolled in 8th standard to 9th standards for the academic year of 2021 to 2022. In the screening phase, a total of 10 schools were selected through a cluster random sampling technique. A demographic proforma with nine items including self-reported home-measured height and weight measurements tool was used to gather data. (weight in kg and height in cm). Experts in the field did the tool validation. Pre-testing and reliability were done with 12 samples through online mode and found that the tool was understandable and simple. The instrument was reliable enough to use as a body mass index (BMI) identification screening tool. Respondents could measure height and weight with the help of instructions given in the Google Forms, which were confirmed through telephonic communication by the researcher. Administrative permission was obtained from school authorities priorly after explaining the aims and objectives of this study. From each school, information on the number of sections for each class and the number of students in each division was collected. Ethical clearance was obtained from the institutional ethical committee. An informed written consent was obtained from the parents and assent from adolescents. The participants were assured of the confidentiality of their responses. Demographic proforma including self-reported home-

measured (parents/guardians assisted) height and weight measurements were collected through Google Forms. BMI based on self-reported weight and height data is a quick, cheap, and easy-to-implement measure to identify overweight and obesity, even though such studies are not much conducted in Indian setup. Many studies have been undertaken at the international level to discuss the accuracy and validity of its measurements. Literature supported that self-reported and measured BMI was good measurements for identifying adolescents with overweight or obesity with some caution.[20] Instructions to measure height and weight were provided in the Google Forms and notified not to respond to the Google Forms if they do not have tools like measuring tape and weight machine to measure height and weight. The Google Forms link was shared with the students by school headteachers/headmasters. A total of 1,100 adolescents responded to the screening phase through Google Forms. BMI was computed by using the formula, BMI = weight (kg)/height (m^2). The categorization of the adolescents was done based on the WHO-revised consensus guidelines for BMI classification for the Asian population; adolescents were classified as underweight, normal weight, overweight, and obese.[1,2]

Sample Size Estimation

The minimum sample size was determined based on available literature indicating that overweight or obesity affects approximately 17.7% of adolescents Mangaluru, Dakshina Kannada.[2] Assuming a population proportion of z for a 95% confidence level is 1.96 and a margin of error of 3%, the estimated sample size was 1,077 adolescents and rounded off with 1,100 subjects.

Statistical Analysis

The statistical calculations were performed using computer-based statistical software Statistical Package for the Social Sciences (SPSS) version 21. The data were analyzed in terms of objectives of the study using both descriptive and inferential statistics.

Results

Section 1: Description of Demographic Characteristics of Adolescents

►**Table 1** shows that most (910; 82.7%) of the subjects were in the age group of 13 years with mean age of 13.94 with ± 1.02 standard deviation (SD); highest percentage (770; 70%) of subjects were females; more than half of the subjects (632; 57.4%) belonged to the nuclear family; maximum percentage of the adolescents (1,083; 98.5%) were not having family history of overweight and obesity; most 1088 (99%) of the subjects consumed mixed diet; more than half 737 (67%) of the subjects had regularly junk foods. Majority (973; 88.4%) adolescents spend screen time more than 2 hours per day; more than half 710 (64.5%) of the adolescents do physical exercise only sometimes; and the majority 1,079 (98.1%) of the subjects stayed at their home.

Section 2: Prevalence of Overweight and Obesity among Urban Adolescents

►**Table 2** depicts that magnitude of overweight and obesity among 1,100 adolescents. One-hundred twenty-six (11.5%) of adolescents were overweight and 111 (10.1%) of them were obese according to their BMI status. Unfortunately, the prevalence of underweight was also recognized (377; 34.3%).

Section 3: Association of Overweight and Obesity among Adolescents with Selected Demographic Variables

Hypothesis testing:

The following null hypothesis stated

$H_{0:}$ There is no significant association of BMI scores of adolescents with selected demographic variables.

►**Table 3** reveals that there was a significant association found among adolescents with age, family history of overweight and obesity, and screen time more than 2 hours per day with a *p*-value less than 0.044, 0.002, and 0.004, respectively.

Discussion(s)

This cross-sectional study conducted in high schools situated in an urban area of Mangaluru City Corporation Limit, Dakshina Kannada, India, regarding overweight and obesity among adolescents, had given current status. Of the total 1,100 adolescents, 82.2% of the total adolescents were in the age group of 13 years with a mean age of 13.95 ± 1.02 SD, and most 70% of them were females. This study result was consistent with a similar study result that showed that approximately 52.7% of children belonged to the age group of 13 to 15 years. Another study results also depicted that nearly half of the participants (47.5%) were 14 years old and their mean age was 13.9 years.[6]

In case of prevalence of overweight and obesity among adolescents, this study revealed the magnitude as 237 (21.6%). According to their BMI status, 11.5% of adolescents were overweight and 10.1% of them were obese. A similar study results show that prevalence of obesity among boys was 9.3% higher than among girls (3.5%). The prevalence for boys was consistently higher than that for girls at each age and across years. The prevalence of overweight and obesity was highest at 11 years: 37.3% for boys and 19.8% for girls.[18] A similar study showed that based on the IOTF/WHO criteria, the overall prevalence of weight categories among young adolescents in low- and middle-income countries was 13.4%/4.7% for underweight, 15.4%/17.3 overweight, and 5.6%/8.6% for obesity.[21] Another similar study results showed that the overall prevalence of overweight and obesity was 13.4 (14.2% for girls and 12% for boys; $p = 0.02$) and 18.2% (18% for girls and 18.4% for boys; $p = 0.73$), respectively. When compared with the WHO-based national prevalence rate of obesity reported in 2004 (~9.3%), the obesity rate has doubled over a 10-year period. There was a significantly higher prevalence of obesity in adolescents (>11 years) than in children (20.2 vs. 15.7%; $p < 0.01$).[22]

Table 1 Distribution of baseline characteristics of adolescents, $n = 1100$

SI. No.	Demographic variables	Mean ± SD	Frequency (*f*)	Percentage (%)
1.	Age (years) a. 13 b. 14 c. 15	13.95 ± 1.02	910 157 33	82.7 14.3 3
2.	Gender a. Male b. Female		330 770	30 70
3.	Type of family a. Nuclear b. Joint c. Extended		632 465 3	57.5 42.2 0.3
4.	Family history of overweight /obesity a. Yes b. No		17 1083	1.5 98.5
5.	Dietary habits a. Vegetarian b. Mixed (both veg and nonvegetarian)		12 1088	1 99
6.	Regular junk food intake a. Yes b. No		737 363	67 33
7.	Screen time per day a. <2 hours b. >2 hours		127 973	11.6 88.4
8.	Physical exercise a. Regularly b. Sometimes c. Never		318 710 72	30 64.5 6.5
9.	Place of stay a. Home b. Hostel c. PG d. Relative's house		1079 6 5 10	98.1 0.55 0.45 0.90

The data presented is frequency (*n*) with percentage in parenthesis (%). Continuous variables presented in mean and (SD) standard deviations.

In this study, there was a significant association found adolescents overweight and obesity with age, family history of overweight and obesity, and screen time more than 2 hours per day with *p*-value less than 0.044, 0.002, 0.004, respectively. A similar study showed a significant association of gender, socioeconomic status, dietary habits, chocolate eating habits, mode of transportation to school, sports participants, physical activity, and screen time. The teens who watched more than 2 hour of screen time were more obese.[6] Similar study results indicate that the screen time ranged between 2.6 and 2.9 hours per day.[18] Another study results demonstrated that associations between screen time, sleep duration, and physical activity level with health-related quality of life in children and adolescents.[23] In India, National Health Policy 2017, whose major focus area is school health programs, laid emphasis on the health challenges faced by the adolescents.[24]

Conclusion(s)

There is plenty of prevalence of overweight and obesity studies conducted worldwide among adolescents

Table 2 Categorization of urban adolescents based on the BMI according to World Health Organization scale, $n = 1,100$

SI. No.	BMI kg/m^2	Categories	Frequency (*f*)	Percentage (%)
1.	<18.5	Under weight	377	34.3
2.	18.5–22.9	Normal weight/lean	486	44.2
3.	23 to 24.9	Over weight	126	11.5
4.	> 25	Obese	111	10.1

Abbreviation: BMI, body mass index.

Table 3 Association of overweight and obesity among adolescents with selected demographic variables, $n = 1,100$

Sl. no.	Variables	X^2	*p*-Value
1.	Age (years) a. 13 b. 14 c. 15	12.96	0.044*
2.	Gender a. Male b. Female	6.39	0.09
3.	Type of family a. Nuclear b. Joint c. Extended	8.46	0.06
4.	Family history of overweight /obesity a. Yes b. No	6.126	0.002*
5.	Dietary habits a. Vegetarian b. Mixed (both veg & nonvegetarian)	5.627	0.08
6.	Regular junk food intake a. Yes b. No	1.414	0.238
7.	Screen time per day a. <2 hours b. >2 hours	4.464	0.004*
8.	Physical exercise a. Regularly b. Sometimes c. Never	3.43	0.615
9.	Place of stay a. Home b. Hostel c. PG d. Relative's house	4.64	0.591

*significant $p < 0.05$.

irrespective of developed or developing or underdeveloped countries. All such study results showed that overweight and obesity became a global challenge and alarmingly increasing. Still, its burden can be preventable by providing a healthful school environment with a live intervention program. Health promotion activities need to be planned, and there is a need to identify the challenges of implementing such activities. Irrespective of all the barriers, it is the responsibility of all stakeholders to help our adolescents to adopt a healthy lifestyle in all aspects to have a healthier nation. Health promotion strategies need to be initiated by the school or government because in a day the majority of the time an adolescent spends their time is at school. Ensure students have access to healthier food and beverages like school breakfast and lunch programs. A local school wellness policy with nutrition and physical activity goals for all schools needs to be implemented. Weight reduction strategies need to be supported by parents, school authorities, physical educators, peer groups, and a dietitian post can be created under school health policy. A self-reported anthropometric measurement in adolescents can be used to calculate BMI for weight classification and reach out to the target population.

Limitation of the Study

This study has limitations. First, data are based on self-reported information, including body weight and height. This policy was implemented to avoid the difficulties of persuading adolescents to participate in weight measurements and to reach out to the target population. And accuracy of self-reported data was only ensured in terms of parent assisted/guardian-assisted measurements. Moreover, machine calibration was not ensured directly by the researcher.

Ethics Approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the institutional Ethics Committee-1 dated 5.7.2021.

Authors' Contributions

All authors contributed to the study conception and design and material preparation. Shycil Mathew was involved in data collection and analysis. The first draft of the manuscript was written by Shycil Mathew. All authors read and approved the final manuscript.

Conflict of Interest
None declared.

Acknowledgments
The investigator sincerely acknowledges the support given by the school principal and other office staffs for their cooperation.

References

1 World Health Organization. Facts and Figures on Childhood Obesity. Accessed Aug 2, 2022, at: http://www.who.int/end-childhood-obesity/facts/en/
2 Mathew S, D. Souza J, Saldanha P. Lifestyle practices and knowledge on prevention and control of overweight and obesity among adolescents: a cross-sectional study. J Clin Diagn Res 2021;15(9)
3 Hosseinpanah F, Seyedhoseinpour A, Barzin M, et al. Comparison analysis of childhood body mass index cut-offs in predicting adulthood carotid intima media thickness: Tehran lipid and glucose study. BMC Pediatr 2021;21(01):494
4 Dereń K, Wyszyńska J, Nyankovskyy S, et al. Assessment of body mass index in a pediatric population aged 7-17 from Ukraine according to various international criteria—a cross-sectional study. PLoS One 2020;15(12):e0244300
5 Worku M, Gizaw Z, Kassahun Belew A, Wagnew A, Hunegnaw MT. Prevalence and associated factors of overweight and obesity among high school adolescents in Bahir Dar City, Northwest, Ethiopia: a cross-sectional study. J Obes 2021;2021(02): 8846723. Doi: 10.12944/CRNFSJ.1.1.03
6 Grace GA, Edward S, Gopalakrishnan S. Dietary habits and obesity among adolescent school children: a case control study in an urban area of Kancheepuram district. Indian J Community Med 2021;46(04):637–640
7 Singh S, Singh N, Kshatriya GK. Assessment of Agreement between the National (Indian Academy of Pediatrics) and International (Centers for Disease Control and World Health Organization) growth references among Tibetan adolescent girls of Kangra District, Himachal Pradesh. Med J Dr. DY Patil Vidyapeeth 2020;13(06): 624. Doi: 10.4103/mjdrdypu.mjdrdypu_22_20
8 Seema S, Rohilla KK, Kalyani VC, Babbar P. Prevalence and contributing factors for adolescent obesity in present era: cross-sectional Study. J Family Med Prim Care 2021;10(05): 1890–1894
9 Ibrahim S, Akram Z, Sheikh S, et al. Overweight and obesity prevalence among adults and adolescents in Gulshan-E-Iqbal, Karachi, 2018–2020. Ann Rom Soc Cell Biol 2021;25(07):631–640
10 Cavalcanti LMLG, Lima RA, Silva CRM, Barros MVG, Soares FC. Constructs of poor sleep quality in adolescents: associated factors. Cad Saude Publica 2021;37(08):e00207420. Doi: 10.1590/0102-311×00207420
11 Arlinghaus KR, O'Connor DP, Ledoux TA, Hughes SO, Johnston CA. A staged approach to address youth unresponsive to initial obesity intervention: a randomized clinical trial. Int J Obes 2021;45(12):2585–2590
12 Obesity | National Health Portal of India 2020. Accessed August 2, 2022, at: https://www.nhp.gov.in/disease/non_communicable_disease/obesity
13 Chandra N, Anne B, Venkatesh K, Teja GD, Katkam SK. Prevalence of childhood obesity in an affluent school in Telangana using the recent IAP growth chart: a pilot study. Indian J Endocrinol Metab 2019;23(04):428–432
14 Abdelaal M, le Roux CW, Docherty NG. Morbidity and mortality associated with obesity. Ann Transl Med 2017;5(07):161
15 Brambila-Paz C, Hernandez-Angeles DF, Silverio-Murillo A, Rodriguez-Tirado A. Family factors affecting the transition of children from normal weight to obesity in Mexico. Child Obes 2022;18 (02):112–11
16 Loviani SD, Saputra YM, Kusmaedi N, Ray HR, Nur L. Effects of health-related fitness model to improve physical fitness and physical activity in vocational high school students. Int J Hum Move Sports Sci 2021;9(04):654–660
17 Portella GC, Portella DL, de Oliveira Siqueira J, Iuamoto LR, Tess BH. Encouraging physical fitness in Brazilian adolescents with excess weight: can they outperform their eutrophic peers in some activities? Int J Adolesc Med Health 2021;34(02):41–48
18 Praveen Kumar S. Level of physical activity among university students in urban Chidambaram, Tamil Nadu–a cross sectional study. Saudi jMed 2021;6(08):23340. Doi: 10.36348/sjm.2021.v06i08.002
19 Duan R, Kou C, Jie J, et al. Prevalence and correlates of overweight and obesity among adolescents in northeastern China: a cross-sectional study. BMJ Open 2020;10(07):e036820
20 Karchynskaya V, Kopcakova J, Klein D, et al. Is BMI a valid indicator of overweight and obesity for adolescents? Int J Environ Res Public Health 2020;17(13):4815–4825
21 Zhang J, Li X, Hawley N, et al. Trends in the prevalence of overweight and obesity among Chinese school-age children and adolescents from 2010 to 2015. Child Obes 2018;14(03):182–188
22 Yang L, Bovet P, Ma C, Zhao M, Liang Y, Xi B. Prevalence of underweight and overweight among young adolescents aged 12-15 years in 58 low-income and middle-income countries. Pediatr Obes 2019;14(03):e12468
23 Wong CKH, Wong RS, Cheung JPY, et al. Impact of sleep duration, physical activity, and screen time on health-related quality of life in children and adolescents. Health Qual Life Outcomes 2021;19 (01):145. Doi: 10.1186/s12955-021-01776-y
24 Government of India. National Health Policy 2017. New Delhi: Ministry of Health & Family Welfare, Government of India; 2017