International Journal of Community Medicine and Public Health
*Bhowmik S et al. Int J Community Med Public Health. 2025 Apr;12(4):1695-1699*
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20250913

**Original Research Article**

# Association of contributing factors of over-weight and obesity among urban school going adolescent girls of Cooch Behar district, West Bengal, India

**Sutapa Bhowmik, Argina Khatun***

Department of Anthropology, University of North Bengal, Raja Rammohunpur, Darjeeling, West Bengal, India

**Received:** 31 December 2024
**Revised:** 22 February 2025
**Accepted:** 01 March 2025

***Correspondence:**
Dr. Argina Khatun,
E-mail: argina.khatun@nbu.ac.in



## ABSTRACT

**Background:** Developing countries are experiencing changes in child and adolescent nutrition because of the nutritional changes, demographic and epidemiological conversion and these situation makes impact on changes in lifestyle patterns, food consumption pattern and economic changes. The objective of the study to survey current status of prevalence of overweight-obesity among urban Bengalee Hindu adolescent girls of Cooch Behar district, West Bengal, India.
**Methods:** A community based cross sectional study was conducted from April to October, 2023 among urban (n=232) Bengalee Hindu (15-18) years old adolescent school going girls of Urban municipal areas of Cooch Behar district, West Bengal, India. Data were collected after informing the purpose of the study school authorities, students and their parents and written consent was taken from school authorities before data collection. Anthropometric measurement height (cm), weight (kg) was recorded. BMI was calculated and the values of BMI were plotted on age specific WHO Charts for height and BMI. Age, diet, fast food consumption, having carbonated drink, duration of watching T.V., use of mobile, physical activity and transportation to school were included in the schedule. All statistical analysis was done using SPSS 20 and WHO Anthro Plus software.
**Results:** In the present study, prevalence of overweight-obesity among Bengalee Hindu girls was 26.72%. Contributing factors, like, diet, fast food consumption, having carbonated drink, use of mobile and physical inactivity was significantly associated overweight-obesity.
**Conclusions:** Obesity was a major problem among urban adolescents.

**Keywords:** Adolescent, Anthrpometry, BMI, Nutrition, Overweight-obesity

## INTRODUCTION

Developing countries are experiencing remarkable changes in child and adolescent nutrition because of the nutritional changes, demographic and epidemiological conversion during last two decades. These situation makes impact on changes in lifestyle patterns, food consumption pattern and economic changes.[1-4] In India, the probable cause of the nutritional changes are quick socio-economic changes, demographic and epidemiologic transformations, changes in nutritional habit and a more lazy and inactive lifestyle in Indian populations.[1,2,4.5] Infact, Some studies concluded that risk factors such as unhealthy eating habits, spending long hours watching TV, and high socio-economic status was associated with the prevalence of overweight-obesity.[6,7] So, monitoring the prevalence of overweight and obesity in children and adolescents is very much needed. Excess body adiposity deposited in Human body and causes overweight and obesity. Studies significantly found that prevalence of overweight-obesity elevated risk of several non-communicable lifestyle disorders such as hypertension,

metabolic syndrome, type-2 diabetes mellitus (T2DM), hypertension, insulin resistance, polycystic ovarian syndrome (PCOS) and coronary heart disease (CHD) and also social problems among both children and adolescents.[2-4,8-11]

After an exclusive literature review, no studies were found on adolescent Bengalee Hindu girls, in the present study area. Bengalee Hindu is the majority of West Bengal. The present study was an attempt to survey current status of prevalence of overweight-obesity among urban Bengalee Hindu adolescent girls of Cooch Behar district, West Bengal, India.

## METHODS

A community based cross sectional study was conducted from April to October, 2023 among urban (n=232) Bengalee Hindu (15-18) years old adolescent school going girls of Urban municipal areas of Cooch Behar district, West Bengal, India. Cooch Behar is situated in northern part of West Bengal. According to the census 2011, Bengalee Hindu population in Cooch Behar district is 74.05%. The studied population was selected using simple random sampling technique. For ethical consideration, Helsinki Declaration (2007) was followed.[12] Nature and purpose of the present study was explained to school authorities, students and their parents and written consent was taken from school authorities before data collection. Students were interviewed and measured during school hours. Total 232 Bengalee Hindu girls were joined and cooperated during data collection. Data was collected using pre-tested and pre designed schedule. Age was recorded on the basis of their birth certificates. Anthropometric measurement height (cm), weight (kg) was recorded by following standard procedures.[13]

Derived variable, Body Mass Index (BMI) were calculated using following formula: BMI=Weight (kg)/Height$^2$($m^2$). The values of body mass index were plotted on age specific WHO Charts for height and BMI.[14,15] The BMI values were classified on the basis of the position of the plot, between the major standard deviation lines and named as, -3SD, -2SD, -1SD, 1SD, 2SD, 3SD. In the purpose of calculating BMI-for –age z-score, 2SD and above were categorized as overweight-obese, between -1SD to 2SD were categorized as normal, between -2SD to -3SD were categorized ad moderate thinness and values below -3SD were categorized as severe thinness.[14-17] All statistical analysis was done using Statistical package for social science (SPSS Inc., Chicago, IL, version 20.0) and WHO Anthro Plus software. Descriptive statistics of anthropometric variable height, weight and BMI was done in terms of mean and standard deviation (±SD). One-way ANOVA was used to assess age specific mean differences of anthropometric variables. Statistical analysis was done using Chi-square ($\chi 2$) test to find out categorical association. The p value <0.05 was considered as significant.

## RESULTS

Table 1, showing mean±standard deviation of Anthropometric variables. The mean height (cm), weight (kg) and BMI (kg/$m^2$) among the studied population were 151.97 cm, 57.10cm and 24.61kg/$m^2$ respectively. One-Way ANOVA were done and values showed statistically insignificant differences between age and anthropometric variables.

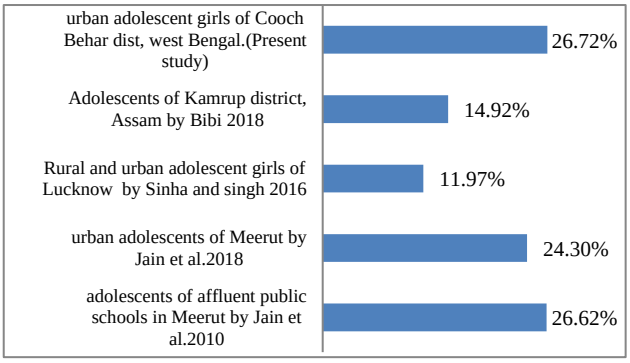


**Figure 1: showing comparison of Indian studies of prevalence of overweight-obesity among adolescents with present study.**

**Table 1: Descriptive statistics (mean±standard deviation) of the anthropometric variables.**

| Age in years | Sample size | Height | Weight | BMI |
|---|---|---|---|---|
| **15** | 62 | 150.84±8.70 | 55.90±18.32 | 24.29±6.81 |
| **16** | 58 | 151.20±9.27 | 56.35±17.15 | 24.15±5.48 |
| **17** | 64 | 151.60±9.34 | 58.20±13.96 | 25.46±5.77 |
| **18** | 48 | 152.97±8.81 | 58.07±18.55 | 24.44±6.12 |
| **Total** | 232 | 151.97±9.02 | 57.10±16.79 | 24.61±6.05 |
| **F-value** | | 0.558$^{ns}$ | 0.282$^{ns}$ | 0.602$^{ns}$ |

ns-Non-significant

Table 2, showing prevalence of overweight-obesity in the studied urban population. Prevalence of overweight-obesity among 15years, 16years, 17 years and 18 years were 33.9%, 18.9%, 21.9% and 33.9% respectively. Higher prevalence of overweight-obesity was found among 18years girls. However, prevalence of severe thinness and moderate thinness among the studied population were 0.86% and 3.4% respectively. Overall 68.96% girls found normal in the present study. However, only 0.86% girls found severely thin and 3.4% girls found moderately thin.

**Table 2: Prevalence of overweight-obesity among the studied population.**

| Age in years | Severe thinness (values below-3SD | Moderate thinness (values between -2SD to -3SD) | Normal (values between -1SD to 2SD) | Overweight-obese (values from 2SD and above) | Chi-square |
|---|---|---|---|---|---|
| **15** | - | 2 (3.2) | 39 (62.9) | 21 (33.4) | 12.31$^{ns}$ |
| **16** | 2 (3.4) | 2 (3.4) | 43 (74.1) | 11 (18.9) | |
| **17** | - | 2 (3.1) | 48 (75.0) | 14 (21.9) | |
| **18** | - | 2 (4.2) | 30 (62.5) | 16 (33.9) | |
| **Total** | 2 (0.86) | 8 (3.4) | 160 (68.96) | 62 (26.72) | |

*Values are parenthesis indicates percentage, ns-Non-significant

Table 3 showing association between overweight-obesity and contributing factors. In the present study, only 3.44% girls were vegetarian while, 96.56% girls liked mixed diet. No vegetarian girl found overweight-obese in the present study and the difference was statistically significant (p<0.05). 52.59% girls consumed fast food less than three times per week and 39.65% girls consumed fast foods 3-7 times. Only 7.76% girls never consume fast foods. overweight-obesity increased with the frequency of fast foods consumption and the difference was statistically significant (p<0.05). 53.02% girls have carbonated drink less than 3 times per week and 36.21% girls have carbonated drink 3 to 7 times per week. The prevalence of overweight-obesity increased with the frequency of having carbonated drink and the difference was statistically significant (p<0.05). 21.55% girls used mobile up to two hours per day while majority were used mobile for two or more hours per day. The prevalence of overweight-obesity increased with the frequency mobile uses and the difference was statistically significant (p<0.05). 90.51% girls watched T.V. up to one hours per day. Only 9.49% girls watched T.V. more than one hours per day. The difference was statistically insignificant (p=0.010). 37.93% girls participated daily physical activities in school or home. While, 62.07% girls were almost inactive and not interested in physical activities. The prevalence of overweight-obesity increased with physical inactivity and the difference was statistically significant (p<0.05). 39.22% girls came school either walking or cycling. 60.78% girls used motorized vehicles for transportation to school. The difference was statistically insignificant (p=0.024).

**Table 3: Association between some contributing factors and overweight-obesity among studied population.**

| Variables | Overweight-obesity | | Total | Chi-square ($\chi2$), degree of freedom and p value |
|---|---|---|---|---|
| | Present | Absent | | |
| **Food habit** | | | | |
| Vegetarian | 0 (0.00) | 8 (100.00) | 8 (3.44) | $\chi2=3.02,df=1,p<0.05$ |
| Mixed | 62 (27.67) | 162 (72.32) | 224 (96.56) | |
| **Fast food consumption** | | | | |
| Never eaten | 0 (0.00) | 18 (100.00) | 18 (7.76) | $\chi2=55.73,df=2,p<0.05$ |
| Less than 3 times per week | 13 (10.66) | 109 (89.34) | 122 (52.59) | |
| 3-7times per week | 49 (53.26) | 43 (46.74) | 92 (39.65) | |
| **Having carbonated drink** | | | | |
| Never | 3 (12.0) | 22 (88.0) | 25 (10.77) | $\chi2=48.47,df=2,p<0.05$ |
| Less than 3 times per week | 14 (11.38) | 109 (88.62) | 123 (53.02) | |
| 3-7times per week | 45 (53.57) | 39 (46.43) | 84 (36.21) | |
| **Use of mobile per day** | | | | |
| Up to two hours | 4 (8.00) | 46 (92.0) | 50 (21.55) | $\chi2=11.41,df=1,p<0.05$ |
| Two or more hours | 58 (31.86) | 124 (68.13) | 182 (78.45) | |
| **T.V. hours per day** | | | | |
| Up to one hours | 51 (24.28) | 159 (75.71) | 210 (90.51) | $\chi2=6.72,df=1,p=.010$ |
| More than one hours | 11 (50.0) | 11 (50.0) | 22 (9.49) | |
| **Physical activity in school/home** | | | | |
| Yes | 8 (9.09) | 80 (90.91) | 88 (37.93) | $\chi2=21.34,df=1,p<0.05$ |
| No | 52 (36.61) | 90 (63.38) | 142 (62.07) | |
| **Transport to school** | | | | |
| Walking/cycling | 17 (18.68) | 74 (81.32) | 91 (39.22) | $\chi2=5.09,df=1,p=.024$ |
| Motorized vehicles | 45 (32.14) | 95 (67.86) | 140 (60.78) | |

*Values are parenthesis indicates percentage

## DISCUSSION

The adolescence period i.e. 10years-19years, generally, denoted by prompt growth, development and conversion from childhood to adulthood.[18-20] That's why, adolescents require right and perfect nutrition for growth. Generally, adolescent can achieve 15% of their adult height and half of the adult weight during these phase.[21,22,4] While rural India is fighting with the prevalence of undernutrition, urban India are tussling with prevalence of overweight-obesity because of switching sedentary life style and earning much more than rural population.[2,3,9,10,23-25]

In the present study, prevalence of overweight-obesity among the studied population was 26.72%. Similar result was reported by Jain et al, Jain et al in Meerut.[26,27] Another study reported that 7.60% urban adolescents found overweight-obese in Madhya Pradesh.[28] A study conducted on diet and nutritional status among adolescents and revealed that 11.97% adolescents found overweight-obese in Lucknow[2.9] Bibi et al revealed that 14.92% adolescent found overweight –obese in Kamrup district, Assam.[30]

Sedentary life style is the contributing factor for overweight-obesity. In the present study, diet, fast food consumption, having carbonated drink, use of mobile and physical inactivity was significantly associated overweight-obesity ($p<0.05$) (Table 3).

78.97% girls used mobile for more than two or more hours in the present study. Among them, 31.86% girls were overweight- obese. 90% girls were watching T.V. up to one hour or less. Infact, girls revealed that they were more interested in mobile rather watching T.V. (Table 3).

Less physical activity or completely inactive life style could increase the risk of overweight obesity. 62.07% girls did not participate any physical activity in school or home. Few studies were reported that less physical activity responsible for high adiposity and subcutaneous fat.[32,7,31] Fast food consumption and having carbonated drink increases the prevalence of overweight-obesity. More than 50% girls consume fast food and have carbonated drink for 3-7 times per week, found obese. Several studies significantly found that consumption of high calorie carbohydrate rich food, inactive life style causes weight gaining.[2,9,10,3,4]

One of the major limitation of the present study was, it was a cross sectional study with limited sample size. Longitudinal study with more sample size can describe the impacts of some determinants of overweight-obesity well. Moreover, only urban adolescent girls were included in this study. If the rural adolescent girls were also included, then, this study properly described that the determinants of overweight-obesity, impacts on urban adolescent girls, were responsible for rural adolescent population or not.

## CONCLUSION

Present study assessed prevalence of overweight-obesity using WHO growth reference 2007.In the present study, prevalence of overweight-obesity among Bengalee Hindu girls was 26.72%. Sedentary life style is found as the leading factor for overweight-obesity. Contributing factors, like, diet, fast food consumption, having carbonated drink, use of mobile and physical inactivity was significantly associated overweight-obesity.

## ACKNOWLEDGEMENTS

We would like to thank the school authorities, participants and the University of North Bengal for their help and support.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. Popkin BM. The shift in stages of the nutrition transition in the developing world differs from past experiences! Public Health Nutr. 2002;5(1A):205-14.
2. Subramanian, SV, Kawachi I, Smith GD. Income inequality and the double burden of under and over-nutrition in India. J Epidemiol Comm Health. 2007;61(9):802-9.
3. Mondal N, Bose K, Sen J. The Paradox of 'Double Burden' of Malnutrition in India. In: Mondal N, Bose K, Sen J editors. Malnutrition: A Double Burden. B. R. Publishing Corporation; 2018:267-278.
4. Debnath S, Mondal N, Sen J. Double burden of malnutrition among adolescents of India: A review. Human Biol Revi. 2019:155-178.
5. Kapil U, Sachdev HP. Urgent need to orient public health response to rapid nutrition transition. Indian J Community Med. 2012;37(4):207-210.
6. Akac H, Babaoglu K, Hatun S, Aydogan M, Turker G, Gokalp AS. Obesity and risk factors in school-age children in Kocaeli region. Child J. 2002;2(1):29-32.
7. Ercan S, Dallar YB, Önen S, Engiz Ö. prevalence of obesity and associated risk factors among adolescents in Ankara, Turkey. J Clin Res Pediatr Endocrinol. 2002;4(4):204-7.
8. Bhardwaj S, Misra A, Khurana L, Gulati S, Shah P, Vikram NK. Childhood obesity in Asian Indians: a burgeoning cause of insulin resistance, diabetes and sub-clinical inflammation. Asia Pac J Clin Nutr. 2008;17:172-5.
9. Wang Y, Chen HJ, Shaikh S, Mathur P. Is obesity becoming a public health problem in India? Examine the shift from under- to over-nutrition problems over time. Obes Rev. 2009;10(4):456-74.

10. Popkin BM, Adair LS, Ng SW. Global nutrition transition and the pandemic of obesity in developing countries. Nutr Rev. 2012;70(1):3-21.
11. Kelishadi R, Mirmoghtadaee P, Najafi H, Keikha M. Systematic review on the association of abdominal obesity in children and adolescents with cardio-metabolic risk factors. J Res Med Sci. 2015;20(3):294.
12. Goodyear MDE, Krleza-Jeric K, Lummet T. The declaration of Helsinki. BMJ. 2007;335:624-5.
13. Lohman TG, Roche AF, Martorell R. (eds). Anthropometric Standardization Reference Manual. Chicago, Human Kinetics Books; 1988.
14. Abraham RJ, Rehna R. Prevalence of stunting and thinness among school going early and mid-adolescents of Idukki Diatrict in rural Kerala:A cross sectional study. J Clin Diagnos Res. 2022;16(3):11-5.
15. Bhowmik S, Khatun A. Nutritional status of rural adolescent girls of Cooch Behar District, India. Human Biol Revi. 2024;13(2):97-108.
16. DeOnis M, Dasgupta P, Saha S, Sengupta D, Blossner M. The National Center for Health Statistics reference and the growth of Indian adolescent boys. Am J Clin Nutr. 2001;74(2):248-53.
17. World Health Organization. WHO AnthroPlus for personal computers: software for assessing growth of the world's children and adolescents. Geneva: WHO; 2009 [Internet]. 2015
18. WHO Expert Committee. Physical status: the use and interpretation of anthropometry. World Health Organ Tech Rep Ser.. 1995;854:312-44.
19. Bogin B. Patterns of Human Growth. 2nd ed. Cambridge: Cambridge University Press; 1999.
20. Parasuraman S, Kishor S, Singh SK, VaidehiY. A Profile of Youth in India. National Family Health Survey (NFHS-3), India. 2009:2005-06.
21. Johannsson E, Arngrimsson SA, Thorsdottir I, Sveinsson T. Tracking of overweight from early childhood to adolescence in cohorts born 1988 and 1994: Overweight in a high birth weight population. Int J Obes (Lond). 2006;30(8):1265-71.
22. Campisi S, Carducci B, Söder O, Bhutta Z. The Intricate Relationship between Chronic Undernutrition, Impaired Linear Growth and Delayed Puberty: Is 'catch-up' growth possible during adolescence? Unicef. 2018.
23. Gupta A, Sharma D, Thakur D, Thakur A, Mazta SR. Prevalence and predictors of the dual burden of malnutrition among adolescents in North India. Saudi J Obes. 2014;2(2):63-7.
24. Rengma MS, Sen J, Mondal N. Socio-economic, demographic and lifestyle determinants of overweight and obesity among adults of Northeast India. Ethiop J Health Sci. 2015;25(3):199-208.
25. Pozza C, Isidori AM. What's Behind the Obesity Epidemic. In Imaging in Bariatric Surgery. Springer, Cham. 2018:1-8.
26. Jain B, Jain S, Garg SK, Chopra H, Singh G, Mittal C. Impact of Sociodemographic factors on prevalence of overweight and obesity among adolescents of urban Meerut. Ind J Comm Heal. 2018;30(1):90-5.
27. Jain S, Pant B, Chopra H, Tiwari R. Obesity among adolescents of affluent public schools in Meerut. Ind J Publ Heal. 2010;54(3):158-160.
28. Tomar SP, Kasar PK, Tiwari R. Study of life style determinants of overweight and obesity among school going adolescents in urban Jabalpur, Madhya Pradesh, India. Int J Comm Med Pub Heal. 2018;4(2):554-9.
29. Sinha S, Singh RB. A study on diet and nutritional status among adolescent girls in Lucknow district, India. Int J Comm Med Pub Health. 2016;3(8):2019-2025.
30. Bibi B. A study on nutritional problems in an adolescent population of Kamrup District, Assam. Indian J App Res. 2018;7(8).
31. Khatun A, Mukhopadhyay A, Bose K. Adiposity and body composition in relation to physical activity status among Muslim adolescents of North 24 Parganas, West Bengal. J Indian Anthp. 2016;51(1):168-176.
32. Agazzi H, Armstrong K, Bradley-Klug KL. BMI and physical activity among at-risk sixth- and ninth-grade students, Hillsborough County, Florida, 2005-2006. Prev Chronic Dis. 2010;7(3):48.

**Cite this article as:** Bhowmik S, Khatun A. Association of contributing factors of over-weight and obesity among urban school going adolescent girls of Cooch Behar district, West Bengal, India. Int J Community Med Public Health 2025;12:1695-9.