

Body Image Perception and Its Association with Overweight and Obesity Among Urban Adolescents in Chengalpattu District, Tamil Nadu: A School-Based Cross-Sectional Study

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ABSTRACT

Background: Overweight and obesity among urban adolescents represent a growing public health challenge in India, driven by rapid lifestyle transitions, poor dietary habits, and physical inactivity. A critically underexplored dimension of this epidemic is body image perception - an individual's multidimensional psychological experience of their own body - which plays a pivotal role in health behaviours, psychological wellbeing, and the risk of eating disorders. The present study aimed to assess the prevalence of overweight and obesity, and to describe the patterns of body image perception among urban adolescents in Chengalpattu district, Tamil Nadu.

Methods: A school-based cross-sectional study was conducted from April 2024 to March 2025 in the urban field practice area of the Urban Health Centre, Thiruporur, Chengalpattu district. A total of 335 adolescents aged 10–17 years were selected by multistage random sampling from two private schools. Anthropometric measurements (height, weight, waist circumference, and waist-hip ratio) were recorded using standard methods and BMI was calculated. Body image perception was assessed using the validated 14-item version of the Body Shape Questionnaire (BSQ-14). Ethical approval was obtained from the Institutional Ethics Committee prior to the study.

Results: The mean age of participants was 13.39 ± 1.55 years (range 10–17 years). Females constituted 57.1% of the sample. The mean BMI was 25.77 ± 3.75 kg/m². The prevalence of overweight was 46.87% and obesity 13.73%, with the highest combined prevalence observed at age 11 (87.5%). A family history of obesity, sleeping ≥ 8 hours per day, and low fruit consumption were the main factors significantly associated with overweight and obesity ($p < 0.05$). Non-vegetarian diet was significantly associated with higher overweight/obesity prevalence compared to vegetarians (58.13% vs controls, $p < 0.05$). Body image dissatisfaction, as measured by the BSQ-14, showed a significant correlation with elevated BMI.

Conclusions: There is a high and concerning prevalence of overweight and obesity among urban adolescents in Chengalpattu district, accompanied by significant body image dissatisfaction. School-based interventions targeting

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nutritional education, physical activity promotion, and psychosocial support are urgently needed. Including body image perception as a routine screening component in school health programmes is strongly recommended.

Keywords: *Body image; body image dissatisfaction; Body Mass Index; overweight; obesity; adolescents; Body Shape Questionnaire; urban; Tamil Nadu; school-based study*

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INTRODUCTION

Childhood and adolescent overweight and obesity have emerged as a global public health crisis of the 21st century. Globally, the prevalence of overweight and obesity among children and adolescents aged 5–19 years rose dramatically from 8% in 1990 to 20% in 2022, with over 390 million children and adolescents affected, including 160 million living with obesity.¹ A landmark 2024 pooled analysis by the NCD Risk Factor Collaboration (NCD-RisC), drawing on 3,663 population-representative studies across 222 million individuals, confirmed that this trend continues unabated and is now a significant burden even in low- and middle-income countries (LMICs) such as India.²

India faces a distinctive dual burden of malnutrition — undernutrition in children and women at one extreme, and rapidly rising overweight and obesity among urban adolescents at the other. A nationally representative analysis of the Comprehensive National Nutrition Survey (CNNS 2016–2018) data by Sethi et al. (2024) found overweight (including obesity) prevalence of 4.8% among adolescents aged 10–19 years nationally, with significantly higher rates in urban areas and higher wealth quintiles.³ A systematic meta-analysis of childhood obesity in India found pooled prevalence of overweight at 12.4% and obesity at 8.4%, with male children at higher risk.⁴

Urban Tamil Nadu presents some of the highest rates in the country. A school-based cross-sectional study conducted in Chennai in 2025 by Kumar and Lakshminarayanan found that the overall prevalence of overweight and obesity among adolescents aged 13–18 years was 21.7%, with female adolescents having significantly higher odds of being overweight or obese (OR = 6.11; 95% CI: 2.40–15.60). Excess screen time and frequent fast-food consumption were identified as the key independent predictors.⁵ The large-scale ORANGE project in Chennai schools (n = 18,955) similarly found that overweight/obesity prevalence was significantly higher in private schools (21.4%) compared to government schools (3.6%).⁶

While BMI-based classification captures the physical dimension of excess weight, a critical and often neglected aspect is body image perception. Body image is a multidimensional construct comprising an individual's perceptions, feelings, thoughts, and behaviours in relation to their physical appearance.⁷ Adolescence is a particularly vulnerable period for body image concerns because of

rapid physical changes, heightened peer influence, and exposure to media-driven ideals of thinness or muscularity. Body image dissatisfaction (BID) — the discrepancy between one's perceived and desired body — has been shown to predict disordered eating, reduced self-esteem, depression, and unhealthy weight-control behaviours.⁸

A theoretical framework that strongly underlies body image research is self-discrepancy theory, which posits that psychological distress arises from a gap between one's actual self-concept and one's 'ideal' self-concept.⁹ This framework has informed the development of validated instruments such as the Body Shape Questionnaire (BSQ), the Figure Rating Scale, and the Multidimensional Body-Self Relations Questionnaire (MBSRQ), each of which has been extensively used in Indian adolescent populations.¹⁰

A cross-sectional study by Paria et al. (2023) in urban and rural Kolkata found that 60.95% of adolescent girls were dissatisfied with their body image, with urban girls reporting significantly higher dissatisfaction.¹¹ Lewis-Smith et al. (2023), in a randomised controlled trial, presented the first evidence-based school-level body image intervention efficacious in improving urban Indian adolescents' body image and disordered eating outcomes.¹²

Social media has emerged as an additional critical driver of body image concerns in Indian adolescents. Shukla and Thakur (2023) found a significant positive association between social media use and body image dissatisfaction among urban Indian adolescents.¹³ A qualitative study by Khosla (2024) similarly documented how social media platforms amplify thin-ideal internalisation among adolescent girls.¹⁴

Despite substantial data on the physical dimensions of the obesity epidemic, there is a relative paucity of studies from Tamil Nadu and specifically Chengalpattu district that simultaneously examine BMI-based weight status alongside body image perception. This study was therefore designed to address this gap — to determine the prevalence of overweight and obesity and to explore body image perception patterns and their correlates among urban adolescents in this region.

MATERIALS AND METHODS

A school-based cross-sectional study was conducted from April 2024 to March 2025 in the urban field practice area of the Urban Health Centre, Thiruporur, Chengalpattu district, Tamil Nadu. Thiruporur is a rapidly urbanising town with a mix of socioeconomic strata, making it

representative of peri-urban Tamil Nadu. Ethical clearance was obtained from the Institutional Ethics Committee (IEC) of Shri Sathya Sai Medical College & Research Institute (IEC Ref. No.: [insert number]) prior to commencement of the study. Written informed consent was obtained from the parents or guardians of all participants, and written assent was additionally obtained from adolescents aged 12 years and above. Participation was entirely voluntary, and data confidentiality and anonymity were strictly maintained throughout.

The sample size was calculated using the formula $n = Z^2 \times p(1-p) / d^2$. Using an expected prevalence of overweight and obesity of 30% based on prior regional literature ($p = 0.30$), a 95% confidence level ($Z = 1.96$), and a margin of error of 5% ($d = 0.05$), the minimum required sample size was calculated as 323. Accounting for a 5% non-response rate, a final sample of 335 participants was recruited. The study population comprised adolescents aged 10–17 years enrolled in private schools within the Thirupurur urban field practice area. Two private schools were selected by purposive sampling. From the total eligible student list in each school, participants were selected using a multistage random sampling method, whereby classes were selected first, followed by systematic random sampling of students from each selected class. Adolescents aged 10–17 years who were studying in the selected schools and present on the day of data collection were included. Students with known metabolic or endocrine disorders and those whose parents declined consent were excluded from the study.

Data were collected by trained medical personnel using a structured, pre-tested questionnaire that was developed in English, translated into Tamil by a bilingual expert, back-translated to verify conceptual accuracy, and pre-tested on 20 students from a neighbouring school not included in the main study. The questionnaire comprised four sections. The first section captured socio-demographic details including age, gender, religion, socioeconomic status (Kuppuswamy scale), and family history of obesity. The second section assessed dietary and lifestyle parameters including dietary pattern (vegetarian, non-vegetarian, or egg vegetarian), frequency of junk food consumption, hours of sleep, screen time, and physical activity. The third section recorded anthropometric measurements: height was measured to the nearest 0.1 cm using a stadiometer, weight

to the nearest 0.1 kg using a calibrated weighing scale, and waist circumference was measured at the midpoint between the lower rib and iliac crest; hip circumference was also recorded to calculate the waist-hip ratio. BMI was calculated as weight in kilograms divided by height in metres squared and classified using WHO BMI-for-age Z-scores for the 5–19 year age group. The fourth section assessed body image perception using the validated 14-item short form of the Body Shape Questionnaire (BSQ-14), in which each item is rated on a 6-point Likert scale ranging from 1 ('Never') to 6 ('Always'), with total scores interpreted as no concern (<17), mild concern (17–25), moderate concern (26–33), and marked concern (≥ 34); the BSQ-14 has been widely validated in Indian adolescent populations.¹⁰

Data were entered into Microsoft Excel 2019 and analysed using IBM SPSS Statistics Version 25.0. Descriptive statistics including mean, standard deviation, median, minimum, maximum, and 95% confidence intervals were computed for continuous variables, while frequencies and percentages were reported for categorical variables. The Chi-square test was used to assess associations between categorical variables, and a p-value of less than 0.05 was considered statistically significant.

RESULTS

Socio-demographic Profile

A total of 335 adolescents participated in the study. The mean age of the study population was 13.39 ± 1.55 years (range 10–17 years). Among the participants, 57.1% ($n=191$) were female and 42.9% ($n=144$) were male. The majority were Hindu (61.19%), followed by Christian and Muslim. In terms of socioeconomic status (Kuppuswamy classification), the majority belonged to lower middle class (42.3%), followed by upper lower (28.4%), and upper middle (19.1%). All participants were students of private schools.

Anthropometric Profile

The anthropometric parameters of the study population are presented in Table 1. The mean height was 152.13 ± 8.98 cm, mean weight was 59.39 ± 8.28 kg, and the mean BMI was 25.77 ± 3.75 kg/m². The mean waist circumference was 69.57 ± 13.6 cm.

Table 1: Descriptive statistics for anthropometric parameters in the study population ($n = 335$)

Parameter	Mean $\pm$ SD	Median	Min	Max	95% CI Lower	95% CI Upper
Height (cm)	152.13 ± 8.98	153.00	132.00	172.00	151.16	153.09
Weight (kg)	59.39 ± 8.28	59.00	40.00	84.00	58.50	60.28
BMI (kg/m ²)	25.77 ± 3.75	25.97	17.01	36.76	25.37	26.18
Waist Circumference (cm)	69.57 ± 13.60	72.00	32.00	102.00	68.11	71.03

Prevalence of Overweight and Obesity

The BMI-based classification of the study population is presented in Table 2. The prevalence of overweight was

46.87% (n=157) and obesity was 13.73% (n=46), giving a combined overweight/obesity prevalence of 60.60%. Normal weight was present in 38.21% (n=128), and 1.19% (n=4) were underweight.

The combined overweight/obesity prevalence was highest at age 11 years (87.5%) and lowest at age 15 years (49.8%). There was a statistically significant difference in the proportion of overweight/obese participants across age groups ($p=0.001$). Females had a slightly higher

proportion of overweight and obesity (59.69%) compared to males (61.81%); however, this difference was not statistically significant ($p=0.694$). Family history of obesity ($p<0.001$), sleeping 8 or more hours per day ($p=0.013$), and low fruit consumption ($p=0.028$) were the main factors significantly associated with overweight/obesity. Non-vegetarians had a significantly higher prevalence of overweight/obesity (58.13%) compared to vegetarians and egg-eaters ($p<0.05$).

Table 2: BMI-based nutritional status of the study population (n = 335)

BMI Category (WHO criteria)	Frequency (n)	Percentage (%)	p-value
Underweight	4	1.19	0.001
Normal Weight	128	38.21	
Overweight	157	46.87	
Obese	46	13.73	
Total	335	100.00	—

Body Image Perception (BSQ-14 Findings)

Body image perception assessed using the BSQ-14 is summarised in Table 3. Approximately 38.5% of participants showed no body image concern, while 29.9% reported mild concern, 18.5% moderate concern, and 13.1% marked concern. There was a statistically significant association between higher BMI category and higher BSQ-14 scores — participants with obesity had significantly higher rates of marked body image

dissatisfaction compared to their normal-weight or underweight counterparts ($p<0.001$).

Females reported higher mean BSQ-14 scores than males across all BMI categories, consistent with the established literature on gender differences in body image dissatisfaction among Indian adolescents. Non-vegetarians and those with a positive family history of obesity also showed higher dissatisfaction scores.

Table 3: Body image perception (BSQ-14 scores) in the study population (n = 335)

BSQ-14 Category	Score Range	Frequency (n)	Percentage (%)	p
No concern (No BID)	< 17	129	38.5	<0.001
Mild concern	17 – 25	100	29.9	
Moderate concern	26 – 33	62	18.5	
Marked concern (Severe BID)	≥ 34	44	13.1	

BID = Body Image Dissatisfaction; BSQ-14 = Body Shape Questionnaire 14-item version

DISCUSSION

This school-based cross-sectional study from urban Chengalpattu district documents a high and concerning burden of overweight and obesity among private school adolescents, with a combined prevalence of 60.60% — substantially higher than national estimates and in line with other urban South Indian studies. A recent school-based study from Chennai reported a combined prevalence of 21.7%,⁵ while the ORANGE project in Chennai's private schools reported 21.4%.⁶ The higher figure in our study (conducted exclusively in private schools) is consistent with the well-documented relationship between

private school enrolment, higher socioeconomic status, and obesity risk in India.

The finding that overweight/obesity was highest at age 11 years (87.5%) is noteworthy and suggests that early adolescence is a critical intervention window. This parallels the findings of the CNNS 2016–2018 data analysis, which documented that adolescent overweight/obesity increases with age and wealth quintile.³ Malhotra et al. have also highlighted how obesity tracks rapidly from adolescence into early adulthood, underscoring the need for early preventive interventions.

Family history of obesity was the strongest predictor of overweight and obesity in our study ($p<0.001$), reflecting

the combined contribution of shared genetic susceptibility and familial dietary and physical activity patterns. This is consistent with the large-scale global meta-analysis by Ng et al. (2014) and subsequent Indian studies emphasising familial clustering of obesity.¹⁵ Excessive sleep duration (≥ 8 hours) was also associated with obesity, a finding corroborated by a body image and lifestyle study by Chaddha et al. (2023) which linked poor sleep quality to body size dissatisfaction and weight gain.¹⁶

The dominance of non-vegetarian diet as a predictor of overweight/obesity (58.13%) aligns with findings from a western India adolescent KAP study, which noted higher energy density of non-vegetarian diets as contributing to excess weight gain. Cultural dietary transitions in semi-urban Tamil Nadu — including increasing fast-food consumption and declining traditional cooking practices — further compound this risk.

A key strength of this study is the simultaneous assessment of body image perception alongside objective anthropometric data. The BSQ-14 scores revealed that 61.5% of participants had some degree of body image concern, with 13.1% reporting marked dissatisfaction. This is consistent with Paria et al. (2023) who found 60.95% BID prevalence among urban adolescent girls in Kolkata,¹¹ and with Sharma et al. (2022), who documented significant BID among adolescents in Punjab and Ujjain, particularly in those with overweight or obesity.¹⁷

The significant positive association between elevated BMI and higher BSQ-14 scores in our study echoes the findings of the MBSRQ-based study from western India (2024) in 2,089 school adolescents, which found that boys with normal BMI were significantly more satisfied with their appearance compared to those who were overweight or obese.¹⁸ Girls in our study consistently showed higher dissatisfaction across all BMI categories, consistent with the global and Indian literature on gender differences in body image.¹⁹

The role of social media in amplifying body image dissatisfaction is increasingly recognised. Shukla and Thakur (2023) documented a significant association between social media use and BID among urban Indian adolescents,¹³ while Gupta et al. (2023) found that perceived sociocultural pressure mediated the relationship between social media use and disordered eating attitudes among female adolescents in Delhi.²⁰ Our study did not separately quantify social media use, which is a recognised limitation.

The first school-based randomised controlled trial of a body image intervention in India — conducted by Lewis-Smith et al. (2023) — demonstrated that a mixed-gender, evidence-based school programme significantly improved body image, disordered eating, and psychosocial outcomes among urban Indian adolescents.¹² This supports the feasibility and effectiveness of school-based psychosocial programming as a complement to purely nutritional interventions.

LIMITATIONS

This study has several limitations. First, the cross-sectional design precludes causal inference. Second, the study was limited to private schools in one urban area, reducing generalisability to government school students or rural adolescents. Third, the BSQ-14, while validated, relies on self-report and may be susceptible to social desirability bias. Fourth, social media use, screen time, and physical activity were not quantitatively measured using standardised instruments. Fifth, the study included only two private schools; inclusion of government schools in future studies would provide a more socioeconomically representative sample. Longitudinal studies and mixed-methods approaches are recommended to explore the causal pathways between overweight, body image dissatisfaction, and psychosocial outcomes in this population.

CONCLUSIONS AND RECOMMENDATIONS

This study documents a high prevalence of overweight and obesity (60.60%) among urban adolescents in Chengalpattu district, alongside significant body image dissatisfaction in over 61.5% of the study population. These findings have important public health implications. The following recommendations are made:

1. School-based multicomponent interventions that integrate nutritional education, structured physical activity, and body image awareness programmes should be implemented in all private and government schools in the district. Evidence from Lewis-Smith et al. (2023) confirms the efficacy of such mixed-gender interventions in Indian urban adolescents.
2. Routine anthropometric surveillance (height, weight, BMI, waist circumference) should be integrated into the annual school health examination programme, with standardised referral protocols for overweight/obese adolescents to paediatric nutrition and mental health services.
3. BSQ-based body image screening should be incorporated into school mental health programmes, especially given the strong association between elevated BMI and marked body image dissatisfaction observed in this study.
4. Dietary counselling should specifically target non-vegetarian diet quality, fast-food frequency, and fruit/vegetable intake, with family-level education addressing parental dietary practices and the familial clustering of obesity risk.
5. Media literacy programmes should be introduced in schools to build resilience among adolescents against social media-driven thin-ideal internalisation and unrealistic body standards.
6. Future research should include government school students, adopt longitudinal designs, and use standardised instruments to measure social media use, screen time, and physical activity alongside body image outcomes.

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