RESEARCH PAPER

Prevalence of Obesity Among College Students and Its Association with Physical Activity and Acute Sleep Problems in Urban area of Kancheepuram District

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ABSTRACT

Background: Obesity is an emerging public health concern among young adults in India, particularly college students, due to rapid urbanization and lifestyle changes. Low physical activity and sleep disturbances are increasingly recognized as important, modifiable risk factors. However, limited data are available from Tamil Nadu assessing their combined influence on obesity using WHO South Asian criteria. Hence we intend to estimate the prevalence of overweight and obesity among college students aged 18–25 years in Tamil Nadu, and to examine their association with physical activity levels and acute sleep problems.

Methods: A cross-sectional study was conducted from January to March 2026 among 330 college students selected through simple random sampling from medical and non-medical colleges. Data were collected using anthropometric measurements and standardized questionnaires. Body mass index (BMI) was classified using WHO South Asian cut-offs. Physical activity was assessed using the International Physical Activity Questionnaire–Short Form (IPAQ-SF), while sleep quality and daytime sleepiness were evaluated using the Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS). Statistical analysis was performed using SPSS version 25. Associations were assessed using chi-square tests and binary logistic regression, adjusting for age and gender.

Results: The prevalence of overweight and obesity was 57.6% (23.0% overweight and 34.5% obese). Low physical activity was observed in 57.4% of non-obese and 74.6% of obese participants, while 62.4% overall had acute sleep problems. In multivariate analysis, obesity was significantly associated with low physical activity (AOR 2.4; 95% CI: 1.5–10.9; p=0.005) and acute sleep problems (AOR 1.9; 95% CI: 1.1–3.3; p=0.020). Age and gender were not significantly associated with obesity

Conclusion: Overweight and obesity are common among college students in Tamil Nadu and are strongly associated with low physical activity and poor sleep. Campus-based interventions promoting regular physical activity and healthy sleep practices are urgently needed to reduce future obesity-related non-communicable diseases among young adults.

Keywords: Obesity; College students; Physical activity; Sleep disturbances; Body mass index

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Introduction

Obesity is one of the biggest public health problems in the world. Since 1975, the number of people affected has increased more than three times. Today, more than 1.9 billion adults are overweight and about 650 million are obese worldwide[1,2,4]. According to the World Health Organization (WHO), this rise is mainly due to rapid urbanization, unhealthy processed foods, reduced physical activity, and social and economic changes, especially in low and middle income countries. The World Obesity Atlas predicts that by 2035, over 1.5 billion adults may be obese, with young people being affected the most[1]. The rising rate of obesity among adolescents and young adults is especially worrying because weight gained at a young age greatly increases the risk of long term diseases such as type 2 diabetes, heart disease, high blood pressure, lipid disorders, and some cancers[2,6]. This highlights the need for preventive measures during early adulthood, when lifestyle habits can still be changed and long-term health can be improved.

In India, obesity is increasing in a pattern similar to the rest of the world, but the problem is made worse by fast economic growth and western- lifestyle. According to the National Family Health Survey-5 (2019-21), nearly one out of four urban adults aged 15-49 years is overweight or obese, showing a clear rise compared to earlier surveys. Urban youth form a large part of this group[4,7,]. In Tamil Nadu, about 28.2% of young adults are affected, mainly due to high-calorie diets, less physical work, and increased screen-based activities. College students aged 18-25 years are a particularly high-risk group for obesity. During this stage of life, many move from structured family environments to independent living, which often leads to academic stress, irregular meal timings, frequent intake of fast food, long hours of sitting for studies, and low levels of physical activity. Studies from Gujarat have reported overweight and obesity rates between 11% and 17.1% among college students, mainly linked to excessive screen use and high-calorie intake. In Kancheepuram district of Tamil Nadu, the prevalence was even higher at 33.2%, with lack of physical activity identified as a major cause. Similarly, among medical students in Bengaluru and Mysuru, nearly one in four was overweight or obese, largely due to exam stress and emotional eating.

A major study by Pengpid et al among 800 Indian university students at GITAM University found that 37.5% were overweight or obese based on WHO Asia-Pacific criteria. This included 26.8% who were overweight and 10.7% who were obese, with contributing factors such as tobacco use, depression, poor knowledge about healthy diet, and staying away from parents[6]. Together, these findings show that the college period increases the risk of obesity and may lead to a future rise in non-communicable diseases among young people in India. Two important and changeable risk factors mainly contribute to this vulnerability; low physical activity and sleep problems. According to the International Physical Activity Questionnaire-Short Form (IPAQ-SF), more than half of Indian college students are physically inactive[8,9].

At the same time, sleep-related problems such as poor sleep quality, short sleep duration, and excessive daytime sleepiness are seen in nearly 60-70% of college students. These problems usually occur due to late-night studying, high caffeine intake, excessive use of mobile phones and laptops, and academic stress[10,11]. Studies from Chengalpattu have shown that daytime sleepiness in college students is linked to lifestyle habits that lead to weight gain. From a biological point of view, disturbed sleep affects hormones by increasing appetite (ghrelin), reducing fullness signals (leptin), raising stress hormones (cortisol), and reducing the body's ability to use insulin properly. Research also shows that lack of sleep can increase daily calorie intake by 300-500 calories, mainly from fatty foods[12,13,14].

Low physical activity and sleep problems often worsen each other, forming a cycle that speeds up weight gain. A sedentary lifestyle can disturb the body's internal clock and reduce sleep time, while poor sleep lowers energy and motivation to exercise. Many studies have shown that both low activity and poor sleep increase the risk of obesity, even after considering age and gender[15,16]. People who are inactive and sleep poorly tend to have more body fat, larger waist-hip ratios, and lower muscle and bone strength. Tiredness also leads to unhealthy snacking and longer screen time, which further increases inactivity.

Even though research on obesity is increasing in India, the available evidence is still scattered. While NFHS-5 gives overall population level data, it does not clearly show how physical inactivity and sleep problems together affect obesity among college students. In Tamil Nadu, there are very few studies that specifically assess obesity using WHO South Asian BMI cut-offs (overweight ≥23 kg/m² and obesity ≥25 kg/m²). Addressing these gaps is important for public health planning in Tamil Nadu, where increasing obesity among young people indicates a future rise in non-communicable diseases. Early action during the college years can help prevent up to 20–30% of future cases of diabetes and heart disease through healthy lifestyle changes[17,18].

Therefore, this study aims to find out how common overweight and obesity are among college students aged 18-25 years using WHO South Asian criteria, and to examine how obesity is related to physical activity levels (using IPAQ-SF) and sleep problems (using PSQI and ESS), after considering basic demographic factors[19]. By understanding these

relationships, the study hopes to support the development of effective campus-based programs such as regular exercise initiatives, sleep awareness sessions, and routine health screening to reduce obesity among young adults.

Methodology:

A cross-sectional study was conducted from January 2026 to March 2026 in selected colleges in Chrompet, Chengalpattu district, to assess the prevalence of overweight and obesity and their association with physical activity and sleep patterns. The study population comprised college students aged between18-25 years enrolled in medical and non-medical courses. This age group was selected due to increased vulnerability to lifestyle related weight gain during young adulthood.

Participants were selected using a simple random sampling technique from student lists obtained from the participating colleges, ensuring equal probability of selection. Clear inclusion and exclusion criteria were applied to minimize confounding from underlying medical conditions or medications affecting weight or sleep.

Ethical approval was obtained from the Institutional Ethics Committee prior to data collection. All participants were informed about the study objectives, and written informed consent was obtained to ensure voluntary participation and confidentiality.

Inclusion Criteria:

- College students pursuing medical or non-medical courses
- Age between 18 and 25 years

Exclusion Criteria:

- Those who do not give consent
- Pregnant or lactating female students

Sample Size:

The sample size for the present study was determined based on the estimation of a single population proportion. The standard formula used was:

$$\mathbf{n = Z^2pq / L^2}$$

where:

n = required sample size

Z = standard normal variate at 95% confidence level (1.96)

p = estimated prevalence of overweight/obesity

$q = 1 - p$

L = allowable margin of error

An expected prevalence (p) of 26.8% was adopted based on the findings of Pengpid et al (6). Accordingly, q was taken as 1 - 0.268, and the allowable error (L) was fixed at 5%. Substituting these values into the formula yielded a minimum sample size of approximately 302 students. To account for possible non-response and incomplete data, the sample size was increased by 10%, resulting in a final target sample size of **330 students**.

Data Collection

Data were collected using a combination of anthropometric measurements and standardized questionnaires through google forms.

Body Mass Index (BMI) was calculated using the World Health Organization (WHO) South Asian criteria, which are more appropriate for Indian populations. Students were categorized as normal (<23 kg/m²), overweight (23.0–27.4 kg/m²), and obese (≥27.5 kg/m²).

The various study variables were assessed using the following tools and methods:

Demographic Profile: Basic information such as age, gender, and course of study was collected using a structured proforma.

Anthropometry (BMI)20: Height was measured using a stadiometer and weight using a calibrated digital weighing scale. BMI was calculated using the formula: weight (kg) divided by height (m²).

Physical Activity20: Physical activity levels were assessed using the International Physical Activity Questionnaire-Short Form (IPAQ-SF), which evaluates activity across multiple domains. Based on total MET-minutes per week, participants were categorized as having low (<600 MET-min/week), moderate (600-3000 MET-min/week), or high (>3000 MET-min/week) physical activity (5).

Sleep Assessment22: Sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI), where a global score greater than 5 indicated poor sleep quality. Excessive daytime sleepiness was assessed using the Epworth Sleepiness Scale (ESS), with scores above 10 denoting significant daytime sleepiness.

All tools were administered by trained investigators in either English or Tamil, ensuring clarity of understanding and maintaining the validity and reliability of the collected data.

Statistical Analysis

The collected data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 25, statistical software. Descriptive statistics were used to summarize the data, including frequencies, percentages, means, and standard deviations. Inferential analysis was performed using the Chi-square test to assess associations between categorical variables. Binary logistic regression analysis was employed to estimate odds ratios (OR) with 95% confidence intervals, adjusting for potential confounders such as age and gender. A p-value of less than 0.05 was considered statistically significant.

Results

Among the 330 participants, 54.5% (n=180) belonged to the 18-20 year age group and 45.5% (n=150) were aged 21-25 years; 54% (n=178) were males and 46% (n=152) females as depicted in Figure 1. The distribution of body mass index

among the 330 students revealed that 27% were underweight (<18.5 kg/m², n=26), 63.6% had normal BMI (18.5–22.9 kg/m², n=190), 17.9% were overweight (23–24.9 kg/m², n=69), and 10.6% were obese (≥25 kg/m², n=45) using WHO South Asian criteria (Figure 2). The combined prevalence of overweight and obesity was 28.5% (n=114), which is in line with regional estimates. Although the majority had normal weight, the presence of both extremes underscores a considerable nutritional burden.

Assessment of physical activity using IPAQ-SF showed that 57.7% (n=205) of participants had low activity levels, 30.8% (n=91) reported moderate activity, and only 11.5% (n=34) achieved high activity levels. Regarding sleep duration, 37.6% (n=124) reported short sleep of less than seven hours per night, whereas 62.4% (n=206) achieved adequate sleep. The Epworth Sleepiness Scale indicated excessive daytime sleepiness (ESS ≥10) in 31.5% (n=104), with the remaining 68.5% (n=226) falling within normal limits, thereby defining the burden of acute sleep problems. Overall, 62.4% were affected by acute sleep issues, reflecting a high prevalence likely related to academic and lifestyle demands.

Among the 114 participants classified as obese, the majority (74.6%, n = 85) reported low physical activity, compared to 57.4% (n = 124) among the 216 non-obese participants. In contrast, high physical activity was observed in only 8.8% (n = 10) of obese individuals and 11.6% (n = 25) of non-obese individuals, and was taken as the reference category. Participants with low physical activity had higher odds of being obese compared to those with high physical activity (OR = 1.71, 95% CI: 0.78–3.75); however, this association did not reach statistical significance (p = 0.18). Similarly, moderate physical activity was not significantly associated with obesity (OR = 0.71, 95% CI: 0.29–1.73; p = 0.45). Despite the lack of statistical significance for individual odds ratios, the overall Chi-square test demonstrated a significant association between physical activity level and obesity status (χ^2 = 9.92, df = 2, p = 0.007), indicating a graded relationship, with lower levels of physical activity being more prevalent among obese participants (Table 1).

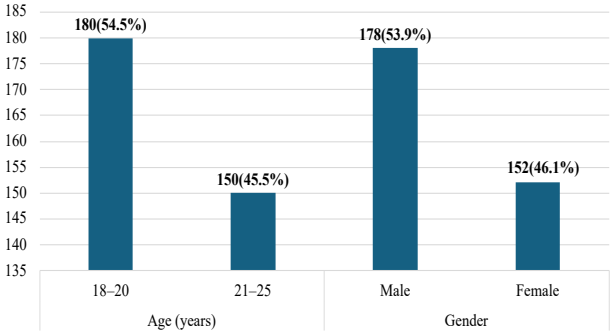
Among the 114 obese participants, 71.1% (n = 81) reported experiencing acute sleep problems, compared to 61.6% (n = 133) among the 216 non-obese participants. The presence of acute sleep problems was associated with higher odds of obesity (OR = 1.53, 95% CI: 0.94–2.50); however, this association did not reach statistical significance (p = 0.09). Conversely, participants without sleep problems constituted a greater proportion of the non-obese group (38.4%) compared to the obese group (28.9%). Although the trend suggests a positive association between sleep disturbances and obesity, the relationship was not statistically significant in univariate analysis (Table 2).

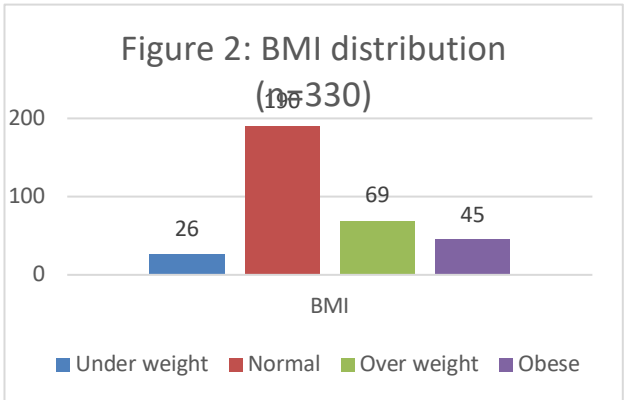
Binary logistic regression analysis was performed to identify independent predictors of obesity (BMI ≥23 kg/m²) after adjusting for age and gender (Table 3). Low physical activity emerged as the strongest independent predictor, with an adjusted odds ratio (AOR) of 2.4 (95% CI: 1.5–10.9, p = 0.005), indicating that participants with low physical activity had more than two-fold higher odds of obesity compared to those with high physical activity, independent of confounding variables.

Acute sleep problems also remained a statistically significant predictor of obesity (AOR = 1.9, 95% CI: 1.1–3.3, p = 0.020), suggesting an approximately 90% increased likelihood of obesity among participants reporting sleep disturbances. In contrast, moderate physical activity did not show a significant association with obesity (AOR = 1.3, 95% CI: 0.3–6.0, p = 0.70). Similarly, age group (21–25 vs 18–20 years) and female gender were not significantly associated with obesity in the adjusted model. Overall, the regression model demonstrated an adequate goodness of fit, as indicated by a non-significant Hosmer-Lemeshow test (p > 0.05).

Table 1: Association Between Obesity and Physical Activity (N = 330

Fig 1 : Demographic and Background Variables (N = 330)





Physical activity level	Obese n=114 (%)	Non-obese n=216 (%)	Odds ratio (95% CI)	p-value

High	10 (8.8%)	25 (11.6%)	1.00	—
Moderate	19 (16.7%)	67 (31.0%)	0.71 (0.29–1.73)	0.45
Low	85 (74.6%)	124 (57.4%)	1.71 (0.78–3.75)	0.18

$\chi^2 = 9.92$, df = 2, p = 0.007

Table 2 : Association Between Obesity and Acute Sleep Problems (N = 330)

Sleep Pattern	Obese n=114 (%)	Non-Obese n=216 (%)	Odds Ratio (95% CI)	p-value
Acute Sleep Problems	81 (71.1%)	133 (61.6%)	1.53 (0.94–2.50)	0.09
No Sleep Problems	33 (28.9%)	83 (38.4%)	1.0	—

$\chi^2 = 2.94$, df = 1, p = 0.09

Table 3 : Multivariate Logistic Regression – Predictors of Obesity (N = 330)

Predictor Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Low Physical Activity	2.4	1.5 – 10.9	0.005*
Moderate Physical Activity	1.3	0.3 – 6.0	0.7
Acute Sleep Problems	1.9	1.1 – 3.3	0.020*
Age (21–25 vs 18–20)	1.1	0.6 – 2.1	0.71
Female Gender	0.8	0.4 – 1.5	0.45

Discussions:

The present cross-sectional study demonstrates a considerable burden of overweight and obesity among college students, with low physical activity and acute sleep problems emerging as independent predictors[1]. These findings reflect the growing burden of non-communicable diseases among urban Indian youth, largely driven by rapid lifestyle transitions characterized by sedentary behaviour, academic stress, irregular routines, and increased reliance on digital devices[2]. The convergence of academic pressures and urban living appears to play a critical role in shaping these unhealthy behavioural patterns.

In this study, 28.5% of college students were found to be overweight or obese (17.9% overweight and 10.6% obese using WHO South Asian criteria). This proportion is higher than the 24% reported for urban youth in the NFHS-5 survey, but is similar to the prevalence reported in recent college-based studies[3,4]. The higher prevalence observed in this study compared to NFHS-5 may be due to differences in the study population. NFHS-5 includes a wide range of urban adults with varied occupations and activity levels, whereas college-based studies mainly involve students who spend long hours sitting, use screens frequently, and often follow irregular eating habits. Ganesh et al. reported a slightly higher prevalence of 32.4% among North Indian college students[5,21], which may be related to regional dietary practices and lifestyle changes linked to urban affluence. In contrast, the lower prevalence reported by Khaparde et al. among medical students (25.8%) could be attributed to better health awareness, more structured daily schedules, and greater exposure to preventive health education as part of medical training [6,7,8,].

The prevalence of 26.8% reported by Pengpid and Peltzer among university students in Andhra Pradesh supports the validity of our findings and indicates that obesity is a common concern among college students across southern India[7,9]. Lower prevalence rates reported in some medical colleges, such as 21.5% in Kancheepuram, may be due to selection bias and higher health awareness among medical students. In contrast, our mixed academic sample, including arts, science, and commerce students, may better reflect the sedentary lifestyle common among the general urban student population[8,10,11]. The simultaneous presence of obesity and a high proportion of underweight students (27%) highlights the dual burden of malnutrition, a characteristic feature of populations undergoing nutritional transition, as also reported in Tamil Nadu NFHS-5 data[3,14,].

Low physical activity was strongly associated with obesity in the present study, with a crude odds ratio of 3.9 and an adjusted odds ratio of 2.4. This finding is consistent with Srirangaramasamy et al., who reported a significant association between physical inactivity and higher BMI among South Indian students[9,21]. Similarly, Ganesh et al. observed an increased risk of obesity linked to excessive screen time and reduced physical activity (OR 2.1)[5,8]. The higher crude odds seen in our study may be explained by local factors such as peri-urban commuting, limited pedestrian infrastructure, fewer organized sports facilities, and restricted opportunities for recreation among students in Tamilnadu, compared with those in residential or tertiary care campuses, as also noted by Khaparde et al. (OR 1.8) (6) Physiologically, physical activity below 600 MET-min/week, as defined by IPAQ guidelines, reduces energy expenditure and creates a positive energy balance, leading to fat accumulation and gradual weight gain[10,12,13].

Sleep disturbances were common in the study

population, with 62.4% of students experiencing acute sleep problems. A significant association was observed between sleep disturbances and obesity (OR 1.53; AOR 1.9), supporting the findings of Narayanan et al. among college students in Chengalpattu, where excessive daytime sleepiness was linked to higher BMI[4,5]. Similar results were reported by Padmavathi et al., who observed an increased risk of obesity among students with poor sleep quality (OR 2.2)[11,12]. The relatively higher prevalence of sleep problems in the present study may be attributed to the combined use of PSQI and ESS, which enables more comprehensive identification of sleep disturbances than studies assessing sleep duration or quality alone.

The independent association of both low physical activity and sleep problems with obesity in multivariate analysis highlights their key role in obesity development among young adults, in line with previous findings from South India[9,17]. The lack of significant association with age and gender is consistent with reports by Pengpid and Peltzer[7], suggesting that modifiable lifestyle factors may have a greater influence on obesity risk than demographic characteristics within this narrow age range.

The strengths of this study include random sampling, use of standardized and validated tools to assess physical activity and sleep, and application of South Asian BMI cut-offs, which improve the relevance of the findings for the Indian population. However, the cross-sectional design limits causal interpretation, reliance on self-reported data may introduce recall and reporting bias, and the focus on a single urban locality may limit generalizability to rural or semi-urban settings.

Conclusion:

Overweight and obesity are common among college students in Tamil Nadu, largely driven by low physical activity and poor sleep quality. These modifiable lifestyle factors play an important role in increasing obesity risk during early adulthood and may contribute to the future burden of non-communicable diseases. Targeted, campus-based interventions that encourage regular physical activity and healthy sleep habits are urgently needed. Early preventive efforts during the college years can help reduce long-term obesity and related metabolic health problems among Indian youth.

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