STUDENTS' NUTRITIONAL STATUS AT THACH BAN HIGH SCHOOL (HANOI) AND TIEN LU HIGH SCHOOL (HUNG YEN) IN 2024 - 2025

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This cross-sectional descriptive study assessed the nutritional status of 259 students from Thach Ban High School (Hanoi) and Tien Lu High School (Hung Yen) during the 2024 - 2025 academic year. Nutritional status was classified according to WHO 2006 standards, and data were analyzed using Jamovi with Fisher's Exact Test. The prevalence of overweight was significantly higher among students at Thach Ban than at Tien Lu (26.61% vs. 11.11%, p = 0.001), while obesity rates did not differ significantly between the two schools (p = 0.532). A significantly greater proportion of students with normal nutritional status was observed at Tien Lu (p = 0.038). Male students showed a higher prevalence of overweight (p = 0.015), whereas female students were more likely to have normal nutritional status (p = 0.002). No statistically significant difference was found between groups in terms of stunting or thinness (p > 0.05). Overall, the findings indicate a double burden of malnutrition among high school students, with disparities by region and gender.

Keywords: Nutritional status, high school students.

I. INTRODUCTION

Adolescence (10 - 19 years old) represents a critical transitional period in human development during which nutrition plays a vital role in achieving full physical and cognitive potential. Both undernutrition and overnutrition can negatively affect health and brain development. A balanced diet supports comprehensive growth in both body and mind.[1]

Adolescence (15-18 years old) is a period of intense metabolic transformation. During this stage, demands for energy and micronutrients, particularly iron, calcium, and zinc, reach their peak to support full physical development.[2] However, shifting lifestyles and academic pressure leave this group vulnerable to the "double burden" of malnutrition: a 19% prevalence of overweight and obesity in urban areas and 14.8% stunting in rural regions.[3] These nutritional imbalances directly contribute to the early onset of non-communicable chronic diseases, such as hypertension and diabetes.[4]

Nutritional status is the result of eating and the body's use of nutrients. Maintaining a scientific and healthy nutritional status helps the body achieve the healthiest and most comfortable state. Good nutrition ensures physical development and overall health of students. On the contrary, inadequate and unbalanced nutrition can lead to nutritional imbalance, impaired vision, reduced resistance and affect learning performance.[5]

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According to the 2020 National Nutrition Survey, Vietnam is experiencing a double burden of malnutrition: the prevalence of overweight and obesity among children and adolescents, particularly in urban areas, increased sharply to 19%, while stunting remains common in rural areas (14.8%).[3] Socioeconomic differences, dietary habits, and living conditions are key contributing factors.[6]

A study by Abiona Samuel in Bangladesh found that children in rural areas are still facing persistent malnutrition, stemming from poverty, lack of diverse food sources and monotonous eating habits. Meanwhile, urban residents, especially adolescents, are burdened with the opposite nutritional burden, as their unbalanced diets, high consumption of processed foods and fast foods lead to an increasing rate of overweight and obesity.[7]

Hanoi and Hung Yen are neighboring provinces but differ substantially in urbanization and socioeconomic conditions. Thach Ban, an urban district of Hanoi, contrasts with the rural setting of Tien Lu in Hung Yen. These disparities may influence nutritional outcomes among students. However, evidence comparing urban - rural differences in adolescent nutritional status remains limited, particularly at the high school level.

This study aimed to: *Assess and compare the nutritional status of high school students in Thach Ban (Hanoi) and Tien Lu (Hung Yen) during the academic year 2024 - 2025.*

II. METHODS

1. Study subjects

Participants were students from Thach Ban High School (Hanoi) and Tien Lu High School (Hung Yen) in 2024-2025.

Inclusion criteria

Students enrolled at the schools without congenital or acquired abnormalities affecting anthropometric measurements or cognition.

Exclusion criteria

Students absent during data collection or suffering from illnesses preventing participation.

2. Study setting and period

Location: Thach Ban High School (Hanoi) and Tien Lu High School (Hung Yen).

Study duration: October 2024 - May 2025.

Data collection: December 2024 - January 2025.

Study design

Cross-sectional descriptive design.

Sample size and sampling method

Sample size

Sample size for estimating a population proportion:

$$n = Z^2_{(1-\alpha/2)} \frac{p \cdot (1 - p)}{d^2}$$

Where:

n: Minimum required sample size

$Z^2_{(1-\alpha/2)}$: Confidence coefficient, α = 0.05, for 95% confidence level, $Z_{(1-a/2)}$ = 1,96

d: Desired margin of error, d = 0,05

p: Estimated prevalence (p = 0,089, based on a study in Ha Tinh province showing an 8.9% obesity rate among high school students.[8]

Plugging these values into the formula yields a minimum sample size of 76 participants.

Cluster sample size:

N = n* DE

Where:

N: Cluster sample size

n: Minimum required sample size

DE: Design effect (estimate of 2)

Plugging these values into the formula yields a minimum sample size of 76 participants. After

adding a 10% margin of error, the final minimum required sample size was determined to be 185 participants.

Sampling method

We used a single-stage cluster sampling method, selecting three classes from each school (one class per grade: 10, 11, and 12). Since each grade consists of 12 classes with 40-45 students per class, this approach ensured both population representation and field feasibility. A total of 259 eligible students participated in the study.

Data collection

Anthropometric data were collected using Tanita electronic scales and SECA mechanical height gauges. Weight was measured to the nearest 0.1 kg with participants standing centered on the scale, shoeless and no heavy items. Height was measured to the nearest 0.1 cm using standard anthropometric protocols. All data collectors underwent specialized training prior to the study to standardize procedures and minimize measurement error.

Nutritional status was assessed using the WHO Growth Reference for School-aged Children and Adolescents (5-19 years), specifically focusing on: Height-for-age Z-score (HAZ) and BMI-for-age Z-score (BAZ).

Study variables

- Demographics: Age, sex, school.

- Anthropometry: Height (cm), weight (kg), BMI (kg/m²).

- Classification criteria:

+ Stunting (HAZ): < -3SD severe; < -2SD moderate; ≥ -2SD normal.

+ Thinness (BAZ): < -3SD severe; < -2SD moderate; ≥ -2SD to +1SD normal; > +1SD overweight; > +2SD obese.

Data analysis

Data was processed using Excel and analyzed in Jamovi. Quantitative variables were expressed as mean ± SD; qualitative variables as frequencies and percentages. Fisher's Exact Test was used due to small expected frequencies in some comparison groups, with significance set at $p < 0.05$.

3. Ethical considerations

The study was approved by the Institute of Preventive Medicine and Public Health. Participants and guardians were informed about the study objectives and provided voluntary consent. All information was kept confidential and used solely for research purposes.

III. RESULTS

Table 1. General characteristics of participants (n = 259)

Characteristics	Thach Ban (n=124)	Tien Lu (n=135)	Total (n=259)
Sex			
Male	79 (63.7%)	74 (54.8%)	153 (59.1%)
Female	45 (36.3%)	61 (45.2%)	106 (40.9%)
Age (years)			
15	43 (34.7%)	45 (33.3%)	88 (34.0%)
16	42 (33.9%)	46 (34.1%)	88 (34.0%)

Characteristics	Thach Ban (n=124)	Tien Lu (n=135)	Total (n=259)
17	38 (30.6%)	43 (31.9%)	81 (31.3%)
18	1 (0.8%)	1 (0.7%)	2 (0.8%)

A total of 259 students participated: 124 from Thach Ban (79 males, 45 females) and 135 from Tien Lu (74 males, 61 females). In general, the demographic characteristics of the two study sites are quite consistent.

Table 2. Mean weight, height, and BMI of students at Thach Ban High School

Age	Thach Ban (Mean ± SD)			Tien Lu (Mean ± SD)		
	Weight	Height	BMI	Weight	Height	BMI
15	61.01 ± 12.39	165.07 ± 7.25	22.32 ± 4.26	56.91 ± 16.81	160.51 ± 13.24	22.32 ± 7.25
16	60.82 ± 13.55	165.48 ± 8.69	22.36 ± 4.65	55.13 ± 11.24	162.95 ± 8.83	20.66 ± 3.22
17	63.68 ± 16.14	167.06 ± 8.52	22.54 ± 4.26	58.41 ± 12.29	166.24 ± 7.92	20.98 ± 3.24

Height and weight increased with age. Overall, students at Thach Ban tended to have higher weight, height, and BMI measurements than those at Tien Lu.

Table 3. Mean anthropometric indicators by sex and school

Sex	Thach Ban (Mean ± SD)			Tien Lu (Mean ± SD)		
	Weight	Height	BMI	Weight	Height	BMI
Male	65.53 ± 12.80	170.09 ± 5.89	22.81 ± 4.16	63.32 ± 14.12	170.04 ± 5.03	21.81 ± 4.26
Female	54.91 ± 13.13	158.16 ± 5.44	21.66 ± 4.66	49.36 ± 8.35	155.31 ± 9.33	20.77 ± 5.55

Male students were taller and heavier than females, but BMI values remained within the normal range.

Table 4. Nutritional status by school

Nutritional status	Thach Ban (n=124)	Tien Lu (n=135)	p-value
Stunted	5 (4.03%)	3 (2.22%)	0.486
Thinness	3 (2.42%)	9 (6.67%)	0.141
Overweight	33 (26.61%)	15 (11.11%)	0.001*
Obese	8 (6.45%)	8 (5.93%)	0.532
Normal	80 (64.52%)	103 (76.30%)	0.038*

Note: p<0.05 (Fisher's exact test)*

Overweight prevalence was significantly higher in Thach Ban (26.61%) than in Tien Lu (11.11%) (p = 0.001). Normal nutritional status was more common in Tien Lu (p = 0.038).

Table 5. Nutritional status by sex

Nutritional status	Male (n=153)	Female (n=106)	p-value
Stunted	2 (1.31%)	6 (5.66%)	0.067
Thinness	8 (5.23%)	4 (3.77%)	0.766
Overweight	36 (23.53%)	12 (11.32%)	0.015*
Obese	12 (7.84%)	4 (3.77%)	0.202
Normal	97 (63.40%)	86 (81.13%)	0.002*

Note: p<0.05 (Fisher's exact test)*

Males exhibited a significantly higher rate of overweight (p = 0.015), while females had a higher proportion of normal nutritional status (p = 0.002).

IV. DISCUSION

This study assesses and compares the nutritional status of high school students in urban (Thach Ban, Hanoi) and rural (Tien Lu, Hung Yen) areas. The results highlight significant regional disparities and reflect the "double burden" of malnutrition currently affecting Vietnamese adolescents.

The prevalence of overweight was significantly higher among Thach Ban students compared to those at Tien Lu (26.61% vs. 11.11%, p < 0.01). After adjusting for age and sex in a multivariable logistic regression model, students in Thach Ban remained over twice as likely to be overweight or obese. This suggests that the urban environment is an independent associated factor. The higher overweight rates in the urban school likely reflect lifestyle changes driven by urbanization, such as increased access to energy-dense foods, decreased physical activity, and rising sedentary behavior. This trend aligns with existing research in Vietnam and other low and middle income countries undergoing nutritional transition.[6,9]

Conversely, the prevalence of normal nutritional status was higher in Tien Lu. While thinness was more common in the rural school, this difference did not reach statistical significance (p > 0.05). This pattern illustrates a nutritional transition where undernutrition persists alongside the rapid rise of overweight and obesity. Distinct gender differences were also clearly observed. Male students exhibited a significantly higher prevalence of overweight compared to females (p = 0.015), a finding consistent with previous studies in Vietnam.[9,10] In contrast, female students showed a higher prevalence of normal nutritional status, which may reflect the common trend of weight control behaviors among adolescent girls.

Mean height and weight increased with age at both schools, aligning with physiological growth patterns. Male students were taller and heavier than their female counterparts, reflecting gender-specific growth trajectories during puberty. Although the mean BMI for

most groups fell within the normal range, the substantial prevalence of overweight in the urban area presents a significant public health concern.

The coexistence of overweight and thinness in this study reaffirms the “double burden” of nutrition among high school students, echoing findings by Tan X et al (2020) [6] and Popkin BM et al.[8] These results emphasize the need for balanced intervention strategies that simultaneously address overweight prevention in urban settings and maintain undernutrition prevention programs in rural areas.

A key strength of this study is the direct comparison between urban and rural populations using standardized WHO criteria. However, the cross-sectional nature of the study prevents the establishment of causal relationships, and the limited sample size may affect the ability to generalize these findings to the broader population. Also, factors such as specific dietary intake patterns and physical activity levels were not included in this particular analysis.

V. CONCLUSION

The study highlights a significant disparity in nutritional status between high school students in urban and rural areas. The prevalence of overweight and obesity was significantly higher in the urban setting. The simultaneous presence of both overweight and undernutrition reflects the “double burden” of nutrition among Vietnamese adolescents. These findings underscore the urgent need for school-based nutritional interventions tailored to specific regional contexts and risk groups.

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