# ASSESSING THE NUTRITIONAL STATUS AND ASSOCIATED FACTORS AMONG SECONDARY SCHOOL STUDENTS IN CHU SE DISTRICT, GIA LAI PROVINCE, VIETNAM: A CROSS-SECTIONAL STUDY

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## ABSTRACT

Undernutrition and obesity are prevalent nutritional issues among adolescents. This cross-sectional study aimed to evaluate the nutritional status and associated factors among secondary school students in Chu Se district, Gia Lai province. Participants were selected using a stratified random sampling method. Data collection included using a structured questionnaire based on the Global School-based Student Health Survey and Physical Activity Questionnaire for Older Children questionnaire, and students' height and weight were measured directly using a tape measure and a digital scale. Undernutrition and obesity were determined using the WHO AnthroPlus software. Multivariable logistic regression analysis was employed to explore associations, with statistical significance set at p<.05. A total of 404 students were included in the study, with the prevalence of stunting, wasting, and overweight/obesity being 2.9%, 8.6%, and 19.6%, respectively. Gender (p<.001), age, and sleep duration were significantly associated with overweight/obesity (p<.05). Although the rate of stunting among students is low, the prevalence of wasting and overweight/obesity is significantly high. These findings highlight the importance of promoting school-based and family-centered interventions to improve students' nutritional status.

***Keywords:*** Stunting, wasting, overweight, obesity, adolescent.

## 1. INTRODUCTION

Proper nutrition is an important factor for comprehensive physical and mental development, especially in adolescents (10-19 years old), when the body undergoes dramatic changes in height, weight, and psychology. In recent years, although the prevalence of malnutrition among adolescents has been reduced, the rate of overweight has alarmingly increased [1].

According to the World Health Organization (WHO), in 2022, approximately 390 million children and adolescents aged 5 to 19 were classified as overweight, while 190 million were underweight [2]. In Vietnam, stunting malnutrition among students (5 - 19 years old) decreased from 23,4% in 2010 to 14,8% in 2020, but remains high [1]. In particular, stunting in adolescent girls can lead to underweight, affecting reproductive health. On the other hand, the rate of overweight and obesity in school children increased from 8.5% in 2010 to 19% in 2020, highest in urban areas (26,8%), rural areas (18,3%), and mountainous areas (6,9%) [1]. It is predicted that by 2030, Vietnam may have 1,9 million obese children aged 5–19 years old. The main causes are an unhealthy diet, lack of exercise, and the effect of environmental factors [3].

Chu Se district, Gia Lai province, is one of the mountainous areas with many socio-economic difficulties. Previous studies have shown that the nutritional status of adolescents varies depending on factors such as eating habits, living habits, family, gender, and changes based on culture and research location [4-6]. There was less data on students' nutrition in Chu Se, Gia Lai. Therefore, studying the nutritional status of secondary school students in this area is necessary. The research aimed to assess the nutritional status and identify associated factors among secondary school students in Chu Van An Secondary School, Chu Se district, Gia Lai province. The results will provide valuable data to guide targeted interventions, ultimately improving the nutritional health of local students.

## 2. METHODS

**2.1. Study design:** Cross-sectional study

**2.2. Place and time:** Chu Van An Secondary School, Chu Se District, Gia Lai Province, from March to April 2023.

**2.3. Study population:** Secondary students.

**2.4. Sample Size and sampling method**

The current investigation used the single population proportion formula with a 95% confidence interval and a 5% margin of error (d). The estimated obesity rate (p)

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is based on a study conducted by author Nguyen Tham Nhu in Hanoi in 2018 [6], which found that 36,3% of secondary students are overweight. After substituting the values into the formula and accounting for an estimated loss rate of 20%, the required sample size was determined to be 427 students.

Chu Van An Secondary School has a total student population of 1,251. A random stratification method was employed to select participants for the study. Initially, the students were stratified by grade level (grades 6, 7, 8, and 9) in proportion to their respective population sizes. The number of students selected from each grade was determined based on this stratification ratio, resulting in 108 students from grade 6, 101 from grade 7, 117 from grade 8, and 102 from grade 9. After organizing the student list in ascending order by grade, the required number of students from each grade was then randomly chosen.

**2.5. Variables:** This study's dependent variables were wasting, stunting, and overweight/obesity. The independent variables encompassed socio-demographic characteristics (such as gender, age, grade level, self-perceived family economic status, and parental occupations), activity levels, dietary habits, and lifestyle behaviors.

**2.6. Data collection:** The researchers contacted the school board and the homeroom teachers of the selected students to distribute consent forms to the parents for their signatures, arranging for collection the following day. Data collection was conducted using a self-administered questionnaire, adapted from the Global School-based Student Health Survey (GSHS) and PAQ_C (Physical Activity Questionnaire for Older children) which have been used in previous studies in Vietnam. Additionally, students' height and weight were measured directly using a tape measure and a digital scale.

**2.7. Data analysis:** Data entry and analysis were conducted using Epidata 3.1 and STATA 14 software. Descriptive statistics, including frequency (n), proportion (%), mean, and median, were employed. The nutritional status of the children was assessed using the WHO AnthroPlus software to calculate Z-scores. Based on these Z-scores and following WHO guidelines, the children were then categorized into four groups: normal, overweight/obesity, stunting, and wasting. Univariate analysis was performed using the chi-square test, Fisher's exact test, and univariate logistic regression to identify variables for multivariable analysis. Variables with a p-value of less than 0,2 were considered for further analysis. Multivariable analysis was conducted using logistic regression, reporting odds ratios (OR) with 95% confidence intervals (CI). An association was deemed statistically significant when the p-value was less than 0,05.

**2.8. Ethical Approval:** The study was approved by the Ethics Council in Biomedical Research, University of Medicine and Pharmacy, Ho Chi Minh City No. 165/HDDD-DHYD dated February 14, 2023.

## 3. Results

### 3.1. Socio-demographic characteristics of students

**Table 1. Socio-demographic Characteristics of Participants (n=404)**

| Characteristics | n | % |
|---|---|---|
| **Gender** | | |
| Female | 213 | 52.7 |
| Male | 191 | 47.3 |
| **Characteristics** | **n** | **%** |
| Age* | 14 (13 – 15) | |
| **Grade** | | |
| 6 | 99 | 24.5 |
| 7 | 98 | 24.3 |
| 8 | 106 | 26.2 |
| 9 | 101 | 25.0 |
| **Perceived family's economic** | | |
| Well off | 124 | 30.7 |
| Enough to live | 256 | 63.4 |
| Not enough to live | 24 | 5.9 |
| PAQ-C activity score ** | 2,46 ± 0,62 | 1.1 - 4.4 |
| **PAQ_C Activity Level** | | |
| Low (1,00 – 2,33) | 187 | 46.3 |
| Medium (2,34 – 3,66) | 199 | 49.3 |
| High (3,67 – 5,00) | 18 | 4.4 |
| **Eating fruit:** | | |
| ≤ 1 time/day | 174 | 43.1 |
| > 1 time/day | 230 | 56.9 |
| **Time of sleep a day** | | |
| ≥ 8 hours/day | 293 | 72.5 |
| < 8 hours/day | 111 | 27.5 |
| **Screen time a day** | | |
| < 2 hours/day | 151 | 37.4 |
| ≥ 2 hours/day | 253 | 62.6 |

**: Median (IQR); **: Mean ± Standard Deviation (max-min)*

### 3.2. Students' nutrition status

**Table 2. Students' nutrition status (n=404)**

| Nutritional status | n | % |
|---|---|---|
| **Nutritional status according to BAZ** | | |
| Severe wasting (Zscore < -3) | 4 | 1.0 |
| Wasting (-3 ≤ Zscore < -2) | 31 | 7.6 |
| Normal (-2 ≤ Z ≤ +1) | 290 | 71.8 |
| Overweight (1 < Zscore ≤ 2) | 57 | 14.1 |
| Obesity (Zscore > 2) | 22 | 5.5 |
| **Nutritional status according to HAZ** | | |
| Severe stunting (Zscore < -3) | 1 | 0.3 |
| Stunting (-3 ≤ Zscore < -2) | 11 | 2.7 |
| Normal (Zscore ≥ -2) | 392 | 97.0 |

*BAZ: BMI for age z-score; HAZ: height for age z-score*

### 3.3. Associated factors to students' nutrition status

**Table 3. Univariate analysis examines the association factors with students' nutritional status (n = 404)**

| Characteristics (p_value) | Stunting (yes=12) | Overweight and obesity (yes=79) | Wasting (yes=35) |
|---|---|---|---|
| **Sociodemographic** | | | |
| Age | .727** | .006** | .386** |
| Gender | .031 | <.001 | .846 |
| Grade | .888* | .006 | .719 |
| Father's occupation | .233* | .183 | .355 |
| Mom's occupation | .321* | .167 | .489 |
| Perceived family's economic | .436* | .816* | .772* |
| Physical activity Level | .072 | .442 | .039 |
| **Eating habits** | | | |
| Eating fruit | .004 | .444 | .741 |
| Eating vegetable | .741* | .122 | .981 |
| Eating fast food | 1.000* | .012 | .686 |
| **Living habits** | | | |
| Time of sleep a day | 1.000* | .519 | .879 |
| Screen time a day | 1.000* | .368 | .976 |

**: Fisher's exact test; **: Logistic Regression*

**Table 4. Multivariable analysis examines the association factors with student's nutritional status (n = 404)**

| Characteristics | Overweight and obesity (yes=79) | | Wasting (yes=35) | |
|---|---|---|---|---|
| | OR | 95% CI | OR | 95% CI |
| **Age** | 0.66* | 0.52 – 0.85 | 0.92 | 0.66 – 1.26 |
| **Gender** | | | | |
| Female | 0.27** | 0.15 – 0.48 | 1.48 | 0.69 – 3.15 |
| Male | *ref* | | *ref* | |
| **Physical activity Level** | | | | |
| Low | 1.05 | 0.60 – 1.82 | 0.51 | 0.23 – 1.12 |
| Medium | *ref* | | *ref* | |
| High | 0.51 | 0.13 – 1.92 | 2.89 | 0.82 – 10.21 |
| **Time of sleep a day** | | | | |
| ≥ 8 hours/day | *ref* | | - | - |
| < 8 hours/day | 1.89* | 1.03 – 3.46 | - | - |

**: p-value < 0.05; **: <0.001; a: Chi-Square for Trend; ref: reference groups*

A total of 404 students were included in the study. The prevalence of stunting, wasting, and overweight/obesity was 2.9%, 8.6%, and 19.6%, respectively. Multivariable logistic regression analysis identified several significant associations. Each additional year of age was associated with a 34% reduction in the odds of overweight/obesity (OR = 0.66, p = .001). Female students had significantly lower odds of overweight/obesity compared with male students (OR = 0.27, p < .001). In addition, students who slept less than 8 hours per night had significantly higher odds of overweight/obesity than those who slept at least 8 hours (OR = 1.89, p = .039). (Table 4).

## 4. DISCUSSION

The study found that the rate of overweight/obesity among students in Chu Se district was 19,56%, significantly lower than in larger urban areas like Ho Chi Minh City (30.4%) [7], Ha Noi (36.3%) [6] and Thai Nguyen (25.3%) [4]. This disparity is likely due to differences in economic development and urbanization. In highly urbanized cities, higher living standards often contribute to sedentary lifestyles and energy-dense diets, increasing the risk of overweight/obesity. In contrast, Chu Se, a less developed district, has not been as heavily influenced by urbanization, which may explain its lower overweight and obesity rate.

The rate of wasting malnutrition in Chu Se (8.62%) was significantly higher than in urban areas such as Ho Chi Minh City (3.3%) [6]. This finding underscores the persistent disparity in children's nutritional status based on geographical differences. Therefore, nutrition programs in Vietnam should prioritize reducing the overweight and obesity rate in urban areas while addressing malnutrition in rural regions.

A significant finding was that the overweight/obesity rate decreased with age, consistent with previous studies in Nepal [8]. As children grow older, they may adopt healthier lifestyle behaviors and nutrition, leading to healthier eating and lifestyle habits that reduce the risk of overweight/obesity.

The results also indicated that students who slept less than 8 hours per night had a higher overweight/obesity rate compared to those who slept longer. Sleep deprivation disrupts hormonal balance by increasing ghrelin (which stimulates hunger) and reducing leptin (which suppresses appetite), leading to increased consumption of calorie-dense foods [9]. Therefore, it is crucial to promote proper sleep schedules and implement school-based programs that emphasize the importance of rest and nutrition.

Another important finding of this study was that female students had a lower prevalence of overweight/obesity than male students. This difference may be partially explained by gender-related variations in dietary habits, physical activity patterns, and sociocultural norms. Previous studies have suggested that differences in levels and types of physical activity between males and females may influence body composition and nutritional status [10]. Therefore, interventions aimed at improving students' nutritional status should incorporate gender-specific strategies that address distinct behavioral and lifestyle factors.

A key strength of this study is its ability to provide valuable insights into the prevalence of malnutrition and overweight/obesity, as well as factors associated with these conditions among secondary school students. Data were collected using standardized and reliable measurement tools, which enhances the validity of the findings. Nevertheless, several limitations should be

acknowledged. First, the small number of students identified with stunting limited the statistical power to explore factors associated with this outcome and precluded robust multivariable analysis. Second, as the study was conducted in a single school, the findings may not be fully generalizable to the broader student population.

## 5. CONCLUSION

Although the rate of stunting among students is low, the prevalence of wasting and overweight/obesity is significantly high. Key factors such as age, gender, and sleep duration were linked to the rates of overweight/obesity students. These findings highlight the importance of promoting school-based and family-centered interventions to improve students' nutritional status.

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