

ANTHROPOMETRIC PATTERN AND NUTRITIONAL STATUS OF UNDERGRADUATE STUDENTS AT DAI NAM UNIVERSITY IN THE ACADEMIC YEAR 2022-2023

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ABSTRACT

Aims: To investigate the nutritional status of Dai Nam University students.

Methods: A cross-sectional study was conducted on 418 undergraduate students in the academic year 2022-2023. Anthropometric indices were measured. The questionnaire was used to collect data on epidemiological characteristics, daily diet, and living conditions. Nutritional status was classified using body mass index (BMI) cut-offs proposed by the World Health Organization Western Pacific Region in 2000.

Results: The average height and weight were, respectively, 165.3 ± 9.7 cm and 64.0 ± 11.1 kg in boys, and 160.6 ± 7.8 cm and 48.5 ± 6.6 kg in girls. The average BMI (kg/m^2) was 23.6 ± 4.9 in boys and 18.9 ± 3.1 in girls. The rates of chronic energy deficiency, overweight, and obesity were respectively 36.4%, 7.7%, and 13.2% in the cohort (10.1%, 12.2%, 23.1% in boys and 49.5%, 5.4%, 3.22% in girls).

Conclusions: The study highlighted the high prevalence of chronic energy deficiency and overweight-obesity among students at Dai Nam University. The university and families need to pay more attention to the dietary regime and organize nutrition education sessions for students.

Keywords: *anthropometry, nutritional status, students, Dai Nam University.*

I. INTRODUCTION

Good nutrition is essential for a healthy life. The proper nutrition is particularly important for university students, who often face a multitude of challenges that can impact their overall well-being. In recent years, there has been growing concern about the nutritional status of university students, especially in developing countries where access to healthy food options can be limited.

A pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and

adults found that the prevalence of obesity has increased significantly in both developed and developing countries. In 2016, approximately 13% of the world's adult population was obese, while 18% were overweight. The prevalence of moderate and severe underweight has decreased globally since 1975. However, the prevalence of underweight remains high in some low- and middle-income countries, particularly in South Asia and Sub-Saharan Africa. In 2016, 8% of the

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world's population was underweight, with the majority being in South Asia [1]. Current studies consistently indicate that although there are variations in nutritional status among different countries and regions, students in general face various pressures and unhealthy eating habits during their academic journey, resulting in nutritional imbalances and nutrition-related health issues [2–6].

According to the 2013 report from the Asian Development Bank Institute, Vietnam had a 13.1% obesity rate; an increase of 125.9% compared to 1990, and was the country with the highest increase in Southeast Asia [7]. Regarding the student community, a research carried out at Can Tho University in 2016 revealed that the prevalence of overweight and obesity was 4.51%, of which 80.6% were evaluated as overweight [8]. A study on 374 first-year medical students at Hanoi Medical University in 2020 showed that 6.7% of the students were overweight-

obese (16.1% in boys and 2.3% in girls) and the prevalence of chronic energy deficiency (CED) was 31.0% (19.5% in boys and 36.3% in girls), mainly due to mild CED (68.9%) [9].

Dai Nam University is a multi-disciplinary university located in Hanoi, Viet Nam. In addition to a heavy academic workload, Dai Nam University students also participate in a variety of extracurricular activities and sports, which require higher energy needs. The nutritional status of university students has become a concern for many researchers in recent years. Research on the nutritional status of students at Dai Nam University will help provide appropriate recommendations to prevent the trend of overweight-obesity, improve nutritional status, and increase students' knowledge about nutrition. Therefore, this study aims to evaluate the nutritional status of the students at Dai Nam University in the academic year 2022-2023.

II. METHODS

2.1. Study design and subjects

The cross-sectional study was implemented among undergraduate students of Dai Nam University from October 2022 to March 2023. Selection criteria were regular students currently studying at the university during the research period, regardless of gender,

2.2. Sample size and selection

Sample size was calculated using the formula for estimating a proportion:

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

Where:

- $Z_{(1-\alpha/2)} = 1.96$ with $\alpha=0.05$;

major, and year of study. Students were excluded if they had one of the following criteria: physical disabilities, spinal deformities affecting anthropometric measurements, and those with acute illnesses at the time of the survey.

- $p = 16.6\%$, the rate of overweight and obesity in students at the Hanoi University of Pharmacy in a previous study [10];

- $\varepsilon = 0.25$, a relative precision.

The minimum sample size required 309 students.

The study sample was selected using a convenience sampling method. All students at Dai Nam University were invited to participate in the study until

the desired sample size was achieved. As a result, a total of 418 students were recruited in the study and analyzed.

2.3. Data collection

Common characteristics and related factors of the students were collected using the self-administered structured questionnaire. Biometric data were collected from the regular health check-up records of Dai Nam University. Weight was measured using a Tanita electronic scale from Japan with an accuracy of 0.1 kg; height was measured using a Microtoise ruler from France with an accuracy of 0.1 cm. Body mass index (BMI) was calculated according to the following formula:

$$\text{BMI} = \frac{\text{Weight (kg)}}{[\text{Standing Height (m)}]^2}$$

The nutritional status was assessed according to BMI (kg/m^2) cut-offs proposed by the World Health Organization Western Pacific Region in 2000 [11], which includes: CED III ($\text{BMI} < 16.0$); CED II ($16 \leq \text{BMI} < 17$); CED I ($17 \leq \text{BMI} < 18.5$); normal ($18.5 \leq \text{BMI} < 23$); overweight ($23 \leq \text{BMI} < 25$); obese I ($25 \leq \text{BMI} < 30$); and obese II ($\text{BMI} \geq 30$).

2.4. Statistical analysis

Data analysis was performed using SPSS 25.0 software. Quantitative variables were presented as mean \pm standard deviation (SD), and categorical variables were presented as frequencies and percentages. The chi-squared test was

used to compare the proportions among categorical variables. The one-way analysis of variance (ANOVA) was used to compare quantitative variables among age groups in boys or girls.

2.5. Ethical issues

The study was approved by the Research Proposal Evaluation Committee of Dai Nam University and authorized by the University's Board of Directors. Participants were fully informed of the purpose and significance of the study and provided voluntary informed

consent. Participants had the right to refuse to participate and to request the termination and deletion of their data at any time. All personal information of the participants was kept confidential and used only for research purposes.

III. RESULTS

Among the 418 students, the majority were girls (66.7%) and the age group of 20–22 year old (65.3%). The proportion of students from the Social Sciences group participating in the study was the highest (35.6%), followed by the Health

Sciences group (32.5%) and the Economics group (24.4%), while the lowest was students from the Engineering and Technology group (7.4%).

Table 1. Distribution of the students by current living and eating place (n=418)

Characteristics		Frequency	Percentage %
Current living	Dormitories	77	18.4
	Boarding house	243	58.1
	With parents	98	23.4
Eating places	Self-cooking	226	54.1
	With families	90	21.5
	Canteen	61	14.6
	Takeaway/street food	41	9.8

Table 1 shows that the majority of study participants were currently living in a boarding house (58.1%), with 77 students currently living in dormitories (18.4%) and 98 students living at home with their parents (23.4%). Accordingly, the proportion of students who cooked for themselves was the highest (54.1%). Next were students who ate with their

families (21.5%) and those who ate at the school's cafeteria (14.6%), while the proportion of students who ate takeaway or street food was the lowest (9.8%).

Table 2 shows that average values of height, weight, and BMI were significantly higher in boys compared to girls ($p < 0.001$).

Table 2. Gender-specific anthropometric characteristics of the students

Characteristics	Boys(n=139)	Girls(n=279)	Total(n=418)	p -(t-test)
Height (cm)	165.3 ± 9.7	160.6 ± 7.8	162.1 ± 8.9	< 0.001
Weight (kg)	64.0 ± 11.1	48.5 ± 6.6	53.6 ± 11.1	< 0.001
BMI (kg/m ²)	23.6 ± 4.9	18.9 ± 3.1	20.5 ± 4.4	< 0.001

* compared between girls vs. Boys

Table 3. Age group-specific anthropometric characteristics of the students (n=418)

Age group (years)	Gender	n	Height (cm)	Weight (kg)	BMI (kg/m ²)
≤ 19	Boys	36	166.5 ± 8.5	67.1 ± 13.6	24.5 ± 6.4
	Girls	92	159.7 ± 7.0	49.0 ± 6.8	19.3 ± 2.9
20-22	Boys	95	164.9 ± 10.1	62.6 ± 10.1	23.2 ± 4.3
	Girls	178	160.9 ± 8.2	47.9 ± 6.1	18.6 ± 3.0
23-26	Boys	8	163.9 ± 11.2	66.1 ± 5.1	24.8 ± 2.9
	Girls	9	161.8 ± 8.2	54.3 ± 11.4	21.0 ± 5.4
Total	Boys	139	165.3 ± 9.7	64.0 ± 11.1	23.6 ± 4.9
	Girls	279	160.6 ± 7.8	48.5 ± 6.6	18.9 ± 3.1

Data are means ± SD; $p > 0.05$ (ANOVA test among age groups in boys or girls)

Table 3 shows no significant difference ($p>0.05$) in height, weight, and BMI between age groups for the same sex.

However, the male height tends to be highest in younger groups, while female height tends to be higher in older age groups.

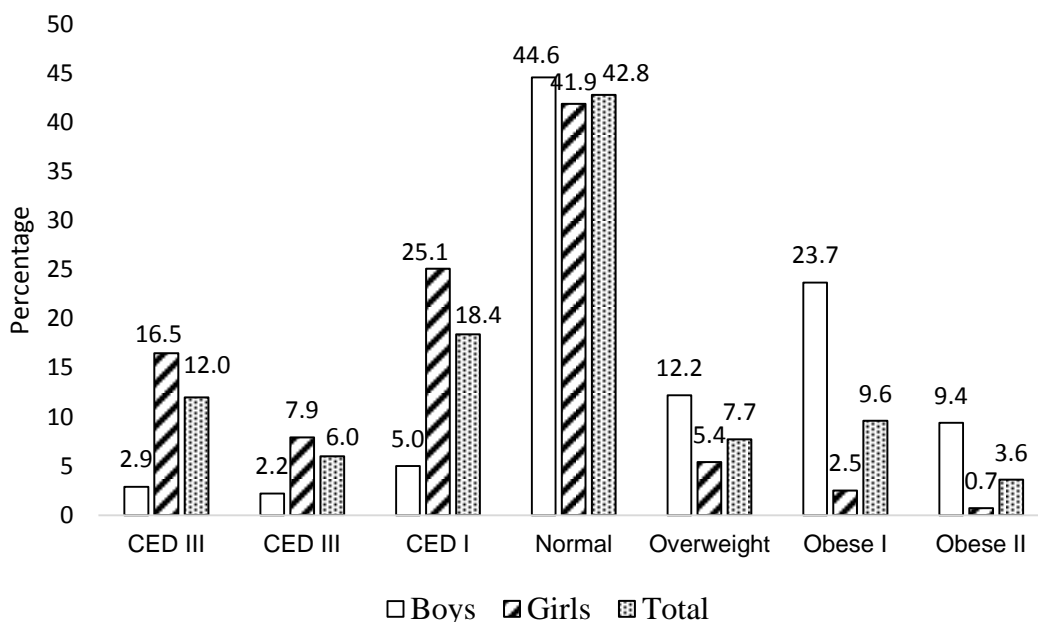


Figure 1. Nutritional status of the students by gender (n=418)

Figure 1 shows that 36.4% subject were chronic energy deficiency, higher in female compared with male (female 49.5%, $p<0.05$ vs. male 10.1%); Meanwhile, the rate of overweight and

obesity was 20.9% , higher in male (45.5% in male, $p<0.05$ vs. 8.8% in female); and the rate in normale range was 42.8% in general.

IV. DISCUSSION

In our study, the average height of male students at Dai Nam University (165.3 ± 9.7 cm) and 160.6 ± 7.8 for female. The rate of choronic energy deficiency was 36.4%, rate of over weight and obesity were 20.9%, belong to high level in general.

The height of male student of Dainam University was lower than the average height of male youth in Vietnam today (168.1cm); however, the height of female students (160.6 ± 7.8 cm) was higher than the average height of female

youth in Vietnam today (155.6 cm) [12]. These results are higher than some other studies such as Hoang Thu Soan's study on second-year students studying at Thai Nguyen Medical University aged 18-21 in 2007 showed that the average height of boys and girls was 163.9 ± 10.2 cm and 152.7 ± 9.9 cm, respectively [13]; According to Nguyen Thi Mai's study on students at Hai Duong Medical Technical University in 2011, the average height for boys was 165.4 ± 5.6 cm and for girls was 154.5 ± 5.1 cm [14]. In some other studies, there also are

differences in the average height between men and women: a study on regular students at two universities and a college in Nam Dinh in 2012 showed that the average height for men was 166.7 ± 5.5 cm, and women was 156.0 ± 5.0 cm [15]. According to Nguyen Hoang Long's (2014) study on first-year students at Hanoi National University, the average height for boys was 166.27 ± 6.9 cm, and girls was 155.85 ± 5.12 cm [16]. A survey on the nutritional status, eating habits and lifestyles of Laos students at Tay Bac University in 2020 by Pham Thi Thanh Tu and colleagues showed that the average height of boys was 165.3 ± 6.6 cm, and that of girls was 154.6 ± 5.6 cm [17].

The differences in the results of studies can be attributed to variations in the age of the respondents, the location of the study, and the timing of the study. In our study, the age range of the subjects was 18–26 years old, while other studies focused on younger age groups or only on a specific age group. The location of the study also had an impact on the study results. Individuals living in cities with better living conditions and higher quality of life may have a higher chance of developing a taller body frame compared to those living in rural or less developed areas. The timing of the study also somewhat affected the survey results. On average, height and weight in studies increased over the years, possibly due to the country's economic development and improved living standards leading to changes in physical fitness. According to

Chronic energy deficiency

A study of 418 student subjects found that 36.4% of students suffered from CED, with 18.4% at grade 1, 6.0% at grade 2, and 12.0% at grade 3. According to gender, the proportion of CED in male students (10.1%) is

the conclusion from the National Nutrition Survey 2019, the body height of young people has developed faster than the general rule in the last 20 years, with a speed nearly double that of the previous decade [12].

The average weight of students at Dai Nam University (boys: 64.0 ± 11.1 kg; girls: 48.5 ± 6.6 kg) is higher than the results of the 2000 national nutrition survey (weight for the 18–25 age group: boys 51.5 kg; girls 45.7 kg) [18]. The evaluation of physical condition of Vietnamese youth aged 17–26 in 2019 showed that the average weight of males was 56.1 kg, and for females it was 45.8 kg [12]. This result is also higher than some other studies: In Nguyen Hoang Long's study (2014) of first-year students at Hanoi National University, the average weight for boys was 55.12 ± 9.00 kg, and for girls it was 47.14 ± 6.28 kg [16]. According to Le Thi Hien (2019), the average weight of young people in Dong Da and Nam Tu Liem districts, Hanoi was 60.2 ± 8.6 kg for boys and 50.1 ± 6.0 kg for girls [19]. Hoang Thi Linh Ngoc's study (2020) on first-year students at Hanoi Medical University showed that the average weight for male students was 60.5 ± 11.3 kg, and for female students it was 47.9 ± 6.1 kg [3].

The difference may be explained by the development of the social and economic system, which has led to changes in the physical condition due to an increased standard of living.

significantly lower ($p < 0.05$) than that in female students (49.5%). The eating habits of male and female students may differ. For girls, it could be due to body image consciousness, and beauty concerns, as they tend to control their

weight and engage in more dieting practices. On the other hand, male students may consume more calories from food, which can affect the prevalence of CED among the two groups. Additionally, the physiological factor should not be overlooked. Female students often have higher energy needs due to reproductive processes and menstrual cycles. They may require more calories to maintain their menstrual cycle and provide energy for their body. As a result, female students have a lower prevalence of overweight and obesity compared to males, but a higher incidence of CED.

According to Nguyen Ai Chau et al. (1997), a study on the nutritional status of 1070 students from medical universities in Hanoi, Thai Binh, and Bac Thai showed that the prevalence of CED in males was 39.2% and in females was 47.9% [20]. A study on the nutritional status of first-year students at Can Tho Medical College in 2019 by Truong Thi Ngoc Duong showed a CED prevalence of 38.8% among students [21]. Therefore, the previous research results had higher rates of CED than our study. This could be explained by the differences in the study period. In the past, the country's economy faced many difficulties, so the quantity and quality of nutrition were still lacking for the general population. With the economic transformation, Vietnam has entered a new period of development and achieved significant achievements, especially in agriculture. People's lives are improving, and this has a significant impact on young people, whose nutrition is noticeably improved. Therefore, the prevalence of CED tends to decrease over the years.

Compared to some other studies, the prevalence of CED among students at Dai Nam University is higher. In a study of physical and nutrient characteristics of

second-year students at Thai Nguyen Medical University, 16% of students were found to have CED [13]. In Nguyen Hoang Long's (2014) study of first-year students at the National University of Hanoi, 35.8% of students had CED [16]. Nguyen Le Quynh Nhu's (2020) study of 400 third-year medical students showed a CED prevalence of 11.3% [22]. Hoang Thi Linh Ngoc's (2020) study of first-year medical students at Hanoi Medical University showed a CED prevalence of 31.0% [3].

Therefore, compared to the results of other authors' studies, the problem of energy deficiency syndrome among students at Dai Nam University is quite high. Biological, cultural, and social factors can be the reasons for these differences. With the intensity of studying, participating in extracurricular activities, and having high workloads, students require an adequate supply of energy and necessary nutrients to meet their daily living needs and enhance physical activities. Insufficient calorie and nutrient intake can lead to fatigue and energy deficiency. Additionally, students may lack knowledge about nutrition and may not have the time or financial resources to maintain a balanced and adequate diet, leading to unhealthy habits such as fast food consumption, alcohol consumption, smoking, lack of regular exercise, and insufficient sleep. These factors can affect health and contribute to energy deficiency. Social and psychological factors, such as pressure from family, friends, or society, can influence students' food choices and body weight. Social pressure, along with beauty standards and the influence of beauty trends and weight loss trends, with the belief that "thin is beautiful," can make adolescents, especially female students, focus on weight control and engage in imbalanced dieting practices, leading to energy deficiency.

This study shows that CED is an urgent issue among students, although most cases are in the mild form of CED, which is easier to recover from than other forms. Students should be informed to pay attention to their nutritional status because CED can lead

to a higher risk of developing other diseases and affect academic performance. Furthermore, it is necessary to build a comprehensive nutrition education program and guidance for holistic health care for students.

Overweight and obesity

The increasing prevalence of overweight and obesity worldwide, in both adults and children, is a looming threat for the future. In Vietnam, the economic renovation has brought significant improvements to the standard of living for the population, but social polarization has also emerged. The coexistence of overweight-obesity and chronic and energy deficiency is on the rise [23]. In addition to a high prevalence of CED, overweight and obesity also account for a significant proportion (20.9%) of the nutrition burden. The prevalence of overweight among students was 7.7%, obesity I and II was 9.6% and 3.6%, respectively. The prevalence of overweight and obesity was higher in boys (45.5%) than girls (8.6%). This result is much higher than in previous studies. In the study of Nguyen Ai Chau *et al.* (1997), they found no students who were overweight or obese [20]. According to the national nutrition survey in 2000, the prevalence of overweight was 1.8% in the 20–24

age group [18]. According to the results of the national nutrition survey in 2019–2020, the prevalence of overweight-obesity is rapidly increasing at all ages in both urban and rural areas [12]. The research of Nguyen T.P. Lan *et al.* (2020) showed that the rate of overweight and obesity in their sample was 16.6% [10]. This may be accompanied by an increasing prevalence of metabolic and nutritional disorders and non-communicable diseases in adults. Therefore, this is a serious issue that needs to be addressed, and students need to be informed of the necessary measures to prevent and control overweight and obesity in order to prevent the prevalence from increasing.

The study shows that there is a dual burden of malnutrition among undergraduate students, where in addition to high prevalence of CED, there is also a significant proportion of overweight and obese students.

Limitations of the study

The study provides updated information on the nutritional status of the students at Dai Nam University. However, the study still had some limitations. Firstly, the study was only conducted on 418 students at Dai Nam University in 2023, which does not reflect changes in the nutritional status of the study population and is not representative enough for Vietnamese students. Secondly, the study used BMI classification to assess the nutritional status of students, which is a commonly used and easy-to-use tool, but it cannot accurately and

comprehensively reflect the nutritional status of the students, nor identify micronutrient deficiencies in the study population. Therefore, in subsequent studies, other methods of assessing nutritional status such as measuring other anthropometric index, investigating dietary intake, and combining with some biochemical tests should be used to accurately assess the nutritional status of the study subjects.

V. CONCLUSION

The prevalence of CED among students at Dai Nam University was high (36.4%) according to the World Health Organization's threshold for evaluating the community prevalence of CED. Additionally, there was a notable rate of overweight (7.7%) and obesity (13.2%), leading to a dual burden of malnutrition, including CED, overweight, and obesity,

among the students. Further in-depth investigation with longitudinal studies is needed to monitor changes in the nutritional status of students. In addition, schools and families should pay more attention to students' nutrition and organize educational communication sessions for them.

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