NUTRITIONAL STATUS AND SOME RELATED FACTORS IN MEDICAL STUDENTS

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ABSTRACT

Background: Today, the global challenge of malnutrition encompasses both undernutrition and overweight, particularly prevalent in low and middle-income nations. Excessive body fat accumulation poses health risks for overweight and obese individuals. Objectives: To assess nutritional status and identify related factors among Can Tho University of Medicine and Pharmacy (CTUMP) medical students. Materials and methods: A cross-sectional study was conducted on 137 first-year medical students at CTUMP to evaluate their body fat percentage using the Harpenden Skinfold Caliper. Skinfold measurements were taken from the bicipital, tricipital, subscapular, and suprailiac sites. Furthermore, physical activity levels were classified using the World Health Organization (WHO) Global Physical Activity Questionnaire (GPAQ) consisting of 16 questions on 4 domains. The research was carried out at CTUMP from December 2022 to June 2023. Results: Compared to urban areas, a higher percentage of male students engage in physical activity in rural areas; however, this trend is not observed among female students. Additionally, female students exhibited thicker skin folds in four areas (biceps, triceps, suprailiac, and subscapular) compared to male students. Conversely, the fold thickness in the suprailiac region was greater in female students. The mean body fat percentage was 20.40±4.61% in male students

and 30.48±4.32% in female students. Non-obese students comprised the majority in this study, with 84.3% of male students being non-obese. Among female students, 53.7% were classified as obese and 46.3% as non-obese. There was insufficient evidence to indicate differences between residential student groups and physical activity levels. **Conclusions:** *The study reveals that the majority of participating students are non-obese. Furthermore, the average body fat percentage among women is found to be higher compared to both men and the general population. However, there is inadequate evidence to show variances among student groups residing in diverse areas or partaking in varying levels of physical activity.*
Keywords: Body fat percentage; obesity; nutrition; medical student; Harpenden Skinfold Caliper.

I. INTRODUCTION

Today, the world faces a double burden of malnutrition that includes both undernutrition and overweight, especially in low and middle-income countries. 3.3% of adult women (18 years and older) and 2.2% of adult men are living with obesity. The obesity rate in Vietnam was lower than the regional average of 10.3% for women and 7.5% for men and was among the lowest in the world. At the same time, diabetes was estimated to affect 5.5% of adult women and 6.5% of adult men [1]. A study at Pham Ngoc Thach University of Medicine found that the rate of overweight and obesity among students was 20.3% [2]. Many factors influence nutritional status. Medical students, especially first-year students, have just changed their learning environment, so nutrition is always a concern. In Vietnam, the Government has issued a decision approving the Project to ensure proper nutrition and increase physical activity for children, pupils, and students in educational and training establishments and to prevent diseases non-communicable diseases [3]. According to author Hoang Thi Linh Ngoc, she noted the relationship between nutrition and physical activity status in medical students [4]. Young people in general, especially students, often do not pay attention to physical activity, which negatively affects their health.

Many nutritional assessment methods have been implemented. However, the assessment method through body fat percentage using a skin fold measuring device is highly reliable, with low error, thereby accurately reflecting the body's nutritional status. There are still no studies on body fat percentage using the Harpenden Skinfold Caliper in Vietnamese medical students, especially in the Mekong Delta region. Based on the above, we conducted this study to evaluate the nutritional status and some related factors of medical students at Can Tho University of Medicine and Pharmacy.

II. MATERIALS AND METHODS

2.1. Research subjects

2.1.1. Selection criteria

The study enrolled first-year full-time medical students at Can Tho University of Medicine and Pharmacy born in 2004.

2.1.2. Exclusion criteria

Students who were deferring their studies had limb disabilities, or declined to participate were excluded.

2.1.3. Study site and time

The research was carried out at CTUMP from December 2022 to June 2023.

2.2. Research methods

2.2.1. Study design

The study adopted an analytical cross-sectional descriptive approach.

2.2.2. Sample size

The sample size estimation formula is based on estimating a proportion, with absolute precision:

$$n \geq z^2_{1-\frac{\alpha}{2}} \times \frac{f(1-f)}{\varepsilon^2} \geq 1.96^2 \times \frac{0.203(1-0.203)}{0.05^2} \geq 126.84$$

In this formula, n represents the estimated sample size for the study, and f stands for the rate of overweight and obese students, which was determined as 0.203 based on research conducted at Pham Ngoc Thach University of Medicine [2]. Moreover, ε was set to 0.05 to establish the desired margin of error between the research sample ratio and the exploration sample ratio. Using the calculated formula, the minimum sample size required was determined to be 127 research subjects. Ultimately, we collected data from 137 samples.

2.2.3. Sampling method

All eligible subjects were invited to participate in the study using convenient sampling until the desired sample size was reached.

2.2.4. Study contents

Nutritional status of students

The nutritional status of students was assessed by measuring skin folds using the Harpenden Skinfold Caliper. Four measurement locations were used: triceps, biceps, subscapular, and suprailiac. Body density (BD) was calculated using the formula: BD = C - [M(log10(Total 4 skin folds))], where C and M differ for males and females aged 17-19 years [5].

Body fat percentage (PBF %) was then determined using Siri's linear regression equation [6]: PBF % = [(4.95/BD) - 4.5] x 100

Obesity was classified based on body fat percentage, with values ≥25.0% for men and ≥30.0% for women considered obese, and values <25.0% for men and <30.0% for women considered non-obese, following the research of author Catherine L. Carpenter [7].

Factors related to nutritional status

Residential Area: Interviewed directly, the residential area was determined based on the permanent residence registered in the household registration book. Urban areas encompass districts, wards, and towns, while rural areas include all remaining administrative units (communes).

Exercise Habits: Assessed using the WHO Global Physical Activity Questionnaire (GPAQ), which comprises 16 questions across 4 aspects. Subjects' physical activity levels are classified according to WHO recommendations: low (<600 MET-minute/week), moderate (600-3000 MET-minute/week), and high (≥3000 MET-minute/week) [8].

2.2.5. Statistical analysis

Data entry and analysis were performed using SPSS 20.0 software, employing biomedical statistical methods. The Kolmogorov-Smirnov test was utilized to test variables for normal distribution. Quantitative variables are presented as mean ± standard deviation if normally distributed. Group differences in mean values were compared using the Chi-Square test and independent sample T-test, with statistical significance set at $p \leq 0.05$.

2.2.6. Ethics approval

This study received approval from the Medical Ethics Committee of CTUMP for medical research, with informed consent obtained (Approval No. 22.153.SV/PCT-HDDD) on November 30th, 2022.

III. RESULTS

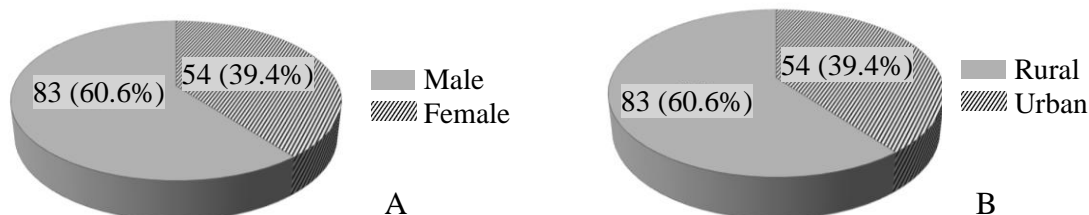## 3.1. General characteristics of students

Figure 1. Student gender distribution (A) and the percentage of students by region (B)

The number of male students (60.6%) was more than the number of female students (39.4%). Moreover, the student population was mainly from rural areas (60.6%).

Table 1. Physical activity status of male and female students across urban and rural regions

Physical activity	Male			Female		
	Urban n (%)	Rural n (%)	Total	Urban n (%)	Rural n (%)	Total
Low level	6 (33.3)	12 (66.7)	18 (100.0)	14 (51.9)	13 (48.1)	27 (100.0)
Average level	11 (44.0)	14 (56.0)	25 (100.0)	11 (52.4)	10 (47.6)	21 (100.0)
High level	10 (25.0)	30 (75.0)	40 (100.0)	2 (33.3)	4 (66.7)	6 (100.0)

The proportion of students with high levels of physical activity habits in rural areas was higher than in urban areas, with 75% in men and 66.7% in women.

3.2. Nutritional status of students

Table 2. Characteristics of 4 skin fold positions

Skin folds / Research subjects	Bicipital skinfold (mm)	Tricipital skinfold (mm)	Subscapular skinfold (mm)	Suprailiac skinfold (mm)
Both 2 genders	16.0±6.12	8.0±4.55	16.0±6.22	22.0±7.29
Male	14.0±5.0	6.0±3.81	16.0±6.09	22.0±8.14
Female	18.0±6.59	9.0±4.99	18.0±6.15	20.0±5.76
p*	0.001	0.002	0.082	<0.001

*An independent sample T-test was performed to analyze the differences in skin folds between men and female students.

The thickness of skin folds in the biceps, triceps, and subscapular locations was greater in female students than in male students. However, in the suprailiac region, skin fold thickness in male students was higher than in female students.

Table 3. Current status of obesity and body fat percentage among students

Research subjects	Current status of obesity		The body fat percentage (%)
	Obesity n (%)	Non-obese n (%)	
Both 2 genders	60 (43.8)	77 (56.2)	24.37±6.67
Male	31 (37.3)	52 (62.7)	20.40±4.61
Female	29 (53.7)	25 (46.3)	30.48±4.32
p*	0.044	0.001	<0.001

*The Chi-square test was conducted to analyze the differences in obesity rates and the percentages of body fat between male and female students.

The study revealed that the majority of participating students were classified as non-obese (56.2%). Furthermore, the average body fat percentage among women (30.48%) was found to be higher compared to both men (20.4%) and the general population (24.37%).

3.3. Factors related to nutritional status

Table 4. The relationship between residential areas, physical activity

Factors related to nutritional status		Male		p*	Female		p*
		Obesity n (%)	Non-obese n (%)		Obesity n (%)	Non-obese n (%)	
Residential area	Urban	12 (44.4)	15 (55.6)	0.353	16 (59.3)	11 (40.7)	0.413
	Rural	19 (33.9)	37 (66.1)		13 (48.1)	14 (51.9)	
Physical activity	Low	26 (40.0)	39 (60.0)	0.343	15 (55.5)	12 (44.4)	0.785
	Average-high	5 (27.8)	13 (72.2)		14 (51.9)	13 (48.1)	

The Chi-square test was conducted.

There was a difference in obesity between different residential areas and physical activities, but the difference was not statistically significant (p>0.05).

IV. DISCUSSION

4.1. General characteristics of students

Our study involved 137 medical students in Can Tho City. In our study, men accounted for 60.6% and women accounted for 39.4%, while in Hoang Thi Linh Ngoc study, men accounted for 31.5% and women accounted for 68.5% [4]. This difference may reflect differences in gender distribution between different sample groups. To ensure that gender differences did not influence the overall results, we conducted separate analyses for each gender and compared the results between the male and female groups. In our study, 60.6% of students came from rural areas, while 39.4% came from urban areas. This difference in proportion may have been due to the unique population distribution in the Mekong Delta region, where the number of urban areas was limited and most areas were classified as districts and communes. Regarding physical activity, 67.2% of students in our study reached the recommended level, compared to 51.8% in Phung Chi Ninh's study at Hanoi Medical University [9]. There were differences in physical activity levels among medical students from different regions, but the exact cause had not been determined due to insufficient data.

4.2. Nutritional status of students

According to the Harpenden Skinfold Caliper's user manual, the measuring position was for both male and female students. The results recorded the average skin fold thickness in the biceps as 14.0±5.0 mm in male students and 18.0±6.59 mm in female students. The triceps measured 6.0±3.81 mm in males and 9.0±4.99 mm in females. The subscapular skinfold measurements for male and female students were 16.0±6.09 mm and 18.0±6.15 mm, respectively. It can be seen that at these three measurement locations, the skin fold thickness in female students is greater than in male students. However, in suprailiac, skin fold thickness in male students was higher than in female students, specifically 22.0±8.14 mm for males and 20.0±5.76 mm for females. Our results recorded a larger skin fold

thickness than the study by author Fatih Çatıkkaş in Türkiye [10]. The difference between our study and this one may be due to differences in sample size and race. The author's research subjects were male students majoring in physical education. Women focus on losing weight and prefer dieting rather than exercising, while men want to gain weight and like to exercise. exercise rather than diet.

The study found that male students had a body fat percentage of 20.40±4.61% while female students had a percentage of 30.48±4.32%. The proportion of non-obese male students was the majority at 84.3%, while 13.7% were classified as obese. Female students had non-obese and obesity body fat percentages of 46.3% and 53.7%, respectively. In her research, author Vu Thi Nhung also showed that the average body fat index was 23.9±3.5%, and 63.3% of the participating students had a nutritional status within normal limits [11]. The proportion of non-obese female students in our study was lower and the percentage of body fat was higher than in previous studies. In contrast, the proportion of male students who were non-obese was higher and their body fat percentage was lower. At the time, there was no accepted cut-off point for body fat percentage, so we used the body fat percentage cut-off point determined by Catherine L. Carpenter et al. The difference came from using different evaluation methods [7]. Nutritional status was accurately reflected based on body fat percentage, and our findings could be used to raise awareness about obesity.

4.3. Factors related to nutritional status

Similar to the studies of Nguyen Thi Hai Yen and Nguyen Thi Phap, there was insufficient evidence to determine differences in obesity rates among students in different residential areas [12], [13]. It was widely accepted that urbanization had an impact on obesity, with factors such as the urban food environment, built environment, and technological advances contributing to poor diets and reduced physical activity.

Although our study results showed no correlation between physical activity and nutritional status, a study conducted by Nguyen Le Anh Hong in 2023 revealed a significant correlation. According to their findings, students who exercised less than 30 minutes per day were 1.73 times more likely to be overweight or obese than students who exercised more than 30 minutes per day [14]. This suggested that regular exercise acted as a protective factor against weight gain. Excessive accumulation of fat in the body was linked to various health problems in obese people. Physical activity helps burn calories, improve metabolic function, and balance hormones.

V. CONCLUSIONS

The study revealed that the majority of participating students were non-obese. The average body fat percentage among women was found to be higher compared to both men and the general population. Nonetheless, there were no significant variances observed among student cohorts based on residential regions and levels of physical activity. Further investigation is warranted to gain deeper insights into the correlation between these factors and nutritional status.

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