STUDY ON SOME ANTHROPOMETRIC CHARACTERISTICS AND LEARNING OUTCOMES OF THE SECOND YEAR MEDICAL STUDENTS WITH OBSTRUCTIVE SLEEP APNEA RISK AT CAN THO UNIVERSITY OF MEDICINE AND PHARMACY

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ABSTRACT

Background*: Obstructive sleep apnea (OSA) is a condition characterized by repeated pauses in breathing during sleep, which is frequently accompanied by snoring, daytime sleepiness, and decreased concentration. Several scales, including the STOP-BANG and EPWORTH scores, have been developed to screen people at high risk for OSA. There have been few studies on both OSA risk and anthropometric characteristics, academic performance in student populations, particularly medical students.* ***Objectives:*** *(1) Determine the proportion of medical students at risk of OSA based on STOP-BANG score, EPWORTH score, and their academic performance; and (2) Survey the association between some anthropometric characteristics, STOP-BANG score, daytime sleepiness, and poor academic performance of second-year medical students.* ***Materials and method****: A descriptive cross-sectional study was conducted on 565 second-year medical students at Can Tho University of Medicine and Pharmacy.* ***Results****: Our study included 565 students, 44.4% of whom were male. The average BMI was 21.0 kg/m2, the mean neck circumference was 32.9 cm, the mean waist circumference was 73.2 cm, the mean waist/hip ratio was 0.80, the mean systolic blood pressure was 116.2 mmHg, the mean diastolic blood pressure was 67.8 mmHg. The percentage of students at risk of OSA based on STOP-BANG scores was 13.5%, and 58.4% based on EPWORTH scores. Smoking affects 0.9% of students, hypertension affects 2.7%, snoring affects 16.6%, average sleep time is 6.59 hours, and poor academic performance affects 4.4%. According to the STOP-BANG transcript, the percentage of students with poor academic performance (<2.5) in the group at risk of OSA was higher than in the group without the risk of OSA (10.5% versus 3.5%, $\chi 2=7.730$, p=0.012). According to the EPWORTH score, the proportion of students with poor academic performance (<2.5) in the group at risk of OSA was lower than in the group without the risk of OSA ($\chi 2=5.406$, p=0.02). In multivariable logistic regression analysis, BMI ≥ 23kg/m^2 was a risk factor for poor academic results (OR=2.5, p=0.043), while daytime sleepiness was a*

protective factor for poor academic results (OR = 0.384, p = 0.024). ***Conclusions****: The percentage of students at risk of OSA based on STOP-BANG scores was 13.5%, and 58.4% based on EPWORTH scores. Second-year medical students at Can Tho University of Medicine and Pharmacy who are at risk of OSA according to STOP-BANG score have lower academic performance. Poor academic results were associated with BMI ≥ 23kg/m^2.*

Keywords: *OSA risk, anthropometric characteristics, poor academic performance, STOP-BANG score, EPWORTH score.*

I. INTRODUCTION

Obstructive sleep apnea (OSA) is a condition in which breathing repeatedly stops during sleep, resulting in cardiovascular disease, metabolic disease, poor sleep quality, and somnolence. Excessive daytime leads to a lower quality of life. OSA was diagnosed using polysomnography or respiratory polygraphy with an apnea-hypopnea index greater than 5/hour [1]. The STOP-BANG scoreboard includes the following factors: snoring, daytime fatigue, sleep apnea, high blood pressure, BMI>35 kg/m^2, age >50, neck circumference >40 cm, male; and is an appropriate screening tool for the community in OSA risk assessment [2]. The sensitivity of the STOP-BANG score of 3 or higher with AHI >5/hour, >15/hour, and >30/hour, respectively, was 83.6%; 92.9% and 100% [3]. Age, gender, neck circumference, hip/waist ratio, smoking, hypertension, snoring, and excessive daytime sleepiness are all risk factors for OSA [4]. According to Khassawneh B.Y et al (2018); 5.4% of students at high risk for OSA have symptoms of snoring (11%), daytime sleepiness (30%), and students at high risk of OSA have a high risk of OSA (OR=2.4, p=0.027) [5].

There is no research in Vietnam on the risk of obstructive sleep apnea in students, particularly medical students, or the relationship between this condition and academic performance in this subject. Therefore, at Can Tho University of Medicine and Pharmacy, we conducted a study to: (1) Determine the proportion of medical students at risk of OSA based on STOP-BANG score, EPWORTH score, and their academic performance; and (2) Survey the association between some anthropometric characteristics, STOP-BANG score, daytime sleepiness, and poor academic performance of second-year medical students.

II. MATERIALS AND METHODS

2.1. Study population

Study population: Can Tho University of Medicine and Pharmacy's second-year medical student We chose second-year students because they had a year to become acquainted with learning methods and hours that differed from the high school program, as well as because they did not participate in the night shift under the current training program, reducing bias on the variable of the daytime sleepiness symptom.

Inclusion criteria: students agree to participate in the study.

Exclusion criteria: students with acute diseases, a history of chronic lung disease, large tumors of the oropharynx.

Place and time of the study: From November 2021 to November 2022 in Can Tho university of Medicine and Pharmacy.

2.2. Methods

Study design: descriptive cross-sectional study.

Sample size: $n = \frac{Z^2_{1-\frac{\alpha}{2}}}{d^2}.p(1-p)$

Where n denotes the sample size, Z denotes the 95% confidence level, p denotes the disease rate, and d denotes the absolute precision. According to Basheer Y. Khassawneh (2018) [4], we chose d=0.01 and p=0.054 as the proportion of students at risk of OSA. The sample size that will be chosen is 491 students.

Sampling method: convenience sampling.

Methods of data collection: interviewing research subjects on gender, snoring, daytime sleepiness, study results; measure the circumference of the neck, waist, and buttocks; Fill in the results on the data collection form.

Data processing: data entry using Excel 2019 and data processing using SPSS 20.0. Compare the two proportions using the $\chi 2$ test or Fisher's Exact Test. The data is statistically significant when $p < 0.05$.

Study content: A STOP-BANG score of 3 was used to determine the risk of OSA [2]. EPWORTH score 11 was used to define excessive daytime somnolence [6]. Neck circumference, waist circumference, buttock circumference, and BMI are some of the anthropometric characteristics studied. Snoring was determined by participants in the study or by housemates/roommates. When antihypertensive medication was used and/or there was clinical evidence of hypertension (systolic blood pressure of 140 mmHg and/or diastolic blood pressure of 90 mmHg) and blood pressure was properly measured, hypertension was diagnosed. Smokers were defined as those who had smoked at least 100 cigarettes in their lifetime and were still smoking at the time of the study [7]. According to Decision No. 777/QD-DHYDCT, poor academic performance is defined as a third semester GPA of 2.5 (point scale 4).

III. RESULTS

The percentage of males was 44.4%, the mean BMI was 21.0 kg/m^2, the mean neck circumference was 32.9 cm, the mean waist circumference was 73.2 cm, the mean waist/hip ratio was 0.80, the mean systolic blood pressure was 116.2 mmHg, the mean diastolic blood pressure was 67.8 mmHg, the mean STOP-BANG score was 1.4; and the mean EPWORTH score was 11.2, average sleep time is 6.59 hours.

Table 1. General characteristics of the hazard characteristics

Characteristics	Frequency (N=565)	Ratio (%)
Male	251	44.4
BMI≥23 kg/m^2	177	20.7
Neck circumference >43 (male), >41 (female)	5	0.9
Waist circumference ≥102 (male), ≥88 (female)	21	3.7
WHR >1.0 (male), >0.85 (female)	36	6.4
Smoking	5	0.9
Hypertension	15	2.7
Snoring	94	16.6
Poor academic performance	25	4.4
STOP-BANG ≥3	76	13.5
EPWORTH ≥ 11	330	58.4

According to the STOP-BANG scorecard; 13.5% of students were at risk for OSA (STOP-BANG score 3). According to the EPWORTH excessive daytime sleepiness transcript (EPWORTH score 11); 58.4% of students were at risk for OSA.

Table 2. Comparison of some characteristics in the group of students at risk of OSA and the group of students at no risk of OSA according to STOP-BANG

Characteristics	Group has risk to take OSA	Group has no risk to take OSA	$\chi 2$/ Fisher's, p
Male	92.1%	37%	$\chi 2$ =80.859, p<0.001
BMI ≥ 23 kg/m^2	51.3%	16%	$\chi 2$=50.102, p<0.001
Neck circumference >43 (male), >41 (female)	3.9%	0.4%	$\chi 2$=9.389, p=0.019
Waist circumference ≥102 (male), ≥88 (female)	9.2%	2.9%	$\chi 2$=7.406, p=0.015
WHR >1.0 (male), >0.85 (female)	7.9%	6.1%	$\chi 2$=0.341, p=0.611
Smoking	3.9%	0.4%	$\chi 2$=9.389, p=0.019
Hypertension	17.1%	0.4%	$\chi 2$=70.951, p<0.001
Snoring	69.7%	8.4%	$\chi 2$=178.519, p<0.001
Excessive daytime sleepiness	52.6%	59.3%	$\chi 2$=1.206, p=0.272
Poor academic performance	10.5%	3.5%	$\chi 2$=7.730, p=0.012

In the group at risk for OSA compared with the group without risk for OSA according to the STOP-BANG score, proportion of male, BMI ≥ 23, neck circumference >43 cm in male or >41 cm in female, circumference waist 102 cm in male or ≥88 cm in female, smoking, hypertension, snoring, and poor academic performance are statistically significant.

Table 3. Comparison of some characteristics in the group of students at risk of OSA and the group of students without risk of OSA according to EPWORTH

Characteristics	Group has risk to take OSA	Group has no risk to take OSA	$\chi 2$/ Fisher's, p
Male	37.6%	54.0%	$\chi 2$=5.075, p<0.001
BMI ≥ 23	15.8%	27.7%	$\chi 2$=11.841, p<0.001
Neck circumference >43 (male), >41 (female)	0.9%	0.9%	$\chi 2$ =0.005, p=1.000
Waist circumference ≥102 (male), ≥88 (female)	3.3%	4.3%	$\chi 2$ = 0.326, p=0.568
WHR >1.0 (male), >0.85 (female)	5.5%	7.7%	$\chi 2$ =1.119, p=0.290
Smoking	0.6%	1.3%	$\chi 2$=0.704, p=0.654
Hypertension	1.2%	4.7%	$\chi 2$=6.390, p=0.011
Snoring	16.1%	17.4%	$\chi 2$=0.19, p=0.663
Excessive daytime sleepiness	6.60	6.58	t=0.248, p=0.808
Poor academic performance	2.7%	6.8%	$\chi 2$=5.406, p=0.02

In the group at risk for OSA compared with the group without risk for OSA according to the EPWORTH transcript, the proportion of males, BMI ≥23, hypertension, and poor academic performance was statistically significantly lower.

Table 4. Comparison of some factors between the group of students with poor academic results and the other group

Characteristics	Group of students with poor academic results	Group of students with average or better academic results	$\chi 2$/ Fisher's, p
Male	68%	43.3%	$\chi 2$=5.888, p=0.015
BMI ≥ 23 kg/m^2	48%	19.4%	$\chi 2$=11.866, p=0.001
Excessive daytime sleepiness (EPWORTH ≥ 11)	36%	59.4%	$\chi 2$=5.406, p=0.02
STOP-BANG ≥ 3	32%	12.6%	$\chi 2$=7.730, p=0.012

The group of students with poor academic performance has higher male proportions, a higher BMI ≥23, less daytime sleepiness, and a higher risk of OSA than the group with average academic results. and the difference was statistically significant.

Table 5. Multivariable Logistic Regression Analysis on the association between poor academic achievement and characteristics.

Characteristics	Coefficient B	p	OR	CI 95%
Male	0.5	0.316	1.6	0.6 – 4.3
BMI ≥ 23 kg/m^2	0.9	0.043	2.5	1.0 – 6.1
Excessive daytime sleepiness (EPWORTH ≥ 11)	- 1.0	0.024	0.384	1.1 – 6.0
STOP-BANG ≥ 3	0.6	0.281	1.7	0.6 – 4.7

When analyzing multivariable regression, the odds of poor academic performance in the group of students with BMI ≥23 was 2.5 (95% CI 1.0 – 6.1, p=0.043), the odds ratio of poor academic performance in the group of students with excessive daytime sleepiness was 0.384 (95% CI 1.1 – 6.0, p=0.024).

IV. DISCUSSION

Our study included 565 students, 44.4% of them were male. The average BMI was 21.0 kg/m^2 (normal according to WHO classification), the mean neck circumference was 32.9 cm, the mean waist circumference was 73.2 cm, the mean waist-to-hip ratio was 0.80; the mean systolic and diastolic blood pressure was 116.2 and 67.8 mmHg (normal range), the mean STOP-BANG score was 1.4 (excessive daytime sleepiness). The percentage of students who smoke is 0.9%; which is comparable to the 0.6% found at Hue University of Medicine and Pharmacy (p=0.38) [8]. The rate of hypertension in students was 2.7%, lower than the result of 4.4% at Duy Tan University (p=0.043) [9]. The rate of snoring is 16.6% higher than the study of Basheer Y. Khassawneh (2018) of 11.1% (p<0.001) [5].

We also recorded a 13.5% risk of OSA based on the STOP-BANG transcript, which is similar to the results of Rasoul S. Piro (2018), who found an OSA prevalence of 13.6% when using the questionnaire SLEEP-50, and higher than the results of author Basheer Y. Khassawneh (2018) by 5.4% [5], [10]. According to the study of Basheer Y. Khassawneh (2018), the proportion of males in the group of students with a higher risk of OSA is statistically significant [5]. Obesity is linked to an increase in the frequency of OSA because of increased soft tissue volume in and around the airways, which contributes to airway collapse during sleep [11]. Obesity was also significantly higher in the group of students at

risk of OSA in our study, as measured by BMI 23 (51.3% vs 16%, p<0.001). Waist circumference of 102 cm for males and 88 cm for females (9.2% vs 2.9%; p=0,015). Males and females have different upper airway structures and craniofacial shapes, and smoking and drinking habits are more common in males [11]. Hypertension increases the risk of OSA and excessive daytime sleepiness [12]. In our study, students at risk of OSA had a statistically significant higher rate of smoking and hypertension (3.9% vs. 0.4%; p=0.019). and 17.1% versus 0.4%, p<0.001), which agrees with the risk factors investigated by author NNVinh [12]. Students at risk of OSA snore more than the group without OSA risk (69.7% versus 8.4%< p<0.001), consistent with the study of Diab HS (2015) [13].

According to the STOP-BANG scoreboard, the percentage of students with excessive daytime sleepiness (EPWORTH > 11) in the two groups with and without OSA risk in our study was not statistically significant. Furthermore, the percentage of males with BMI≥23 in the group of students with excessive daytime sleepiness was statistically significantly lower than in the group of students without excessive daytime sleepiness. We also discovered that according to the EPWORTH transcript, the proportion of students at risk of OSA was 58.4%, which was higher than the proportion of medical students in Jordan at 30% [5] and Malaysia at 35.5% [14].

Students with poor academic performance have higher male proportions, a higher BMI≥23, less daytime sleepiness, and a higher risk of OSA than students with average academic results. Male and female students have different study habits, which leads to different academic achievement; poor academic performance is more associated with male, which is consistent with Yassin's (2020) study [15]. Students with poor academic performance had a higher BMI≥23 than the other group, as well as a higher odds ratio in the multivariate regression analysis (OR=2.5; CI 95% 1.0 – 6.1; p=0.043), which is consistent with the findings of Yassin (2020) [15]. According to Rasoul S Piro et al. (2018) [10], the group with poor academic performance is more likely to have OSA than the other group. In the multivariable regression analysis, the group with poor academic performance was less likely to experience excessive daytime sleepiness than the other group (OR = 0.384, CI 95% 1.1 – 6.0, p=0.024). In contrast to the Colombian study [16] it is possible that excessive daytime sleepiness in medical students in this study is the result of staying up late and actively learning the word, which leads to excessive sleepiness the next day. Another factor that contributes to improved academic performance is staying up late to study.

V. CONCLUSION

The percentage of students at risk of OSA based on STOP-BANG scores was 13.5%, and 58.4% based on EPWORTH scores. The proportion of students at risk of OSA according to the STOP-BANG transcript who had poor academic results was higher than that of the group of students without OSA risk (10.5% vs. 3.5%; p=0.012). The proportion of students at risk of OSA according to the EPWORTH scale who had poor academic results was lower than that of the group of students without OSA risk (2.7% vs. 6.8%; p=0.02). In multivariable logistic regression analysis, BMI ≥ 23kg/m^2 was a risk factor for poor academic results (OR=2,5, p=0.043), while daytime sleepiness was a protective factor for poor academic results (OR = 0.384, p = 0.024).

REFERENCES

1. Vishesh K Kapur Kapur, Vishesh K, Auckley, Dennis H, et al. Clinical practice guideline for diagnostic testing for adult obstructive sleep apnea: an American Academy of Sleep Medicine clinical practice guideline. *Journal of Clinical Sleep Medicine*. 2017. 13(3), 479-504.
2. Ricardo LM Duarte, Flavio J Magalhães-da-Silveira and David Gozal. Screening for obstructive sleep apnea: comparing the American Academy of Sleep Medicine proposed criteria with the STOP-Bang, NoSAS, and GOAL instrumalets. *Journal of Clinical Sleep Medicine*. 2023. 10546.
3. Chung F, Yegneswaran B, Liao P, Sharon A Chung, et al. STOP questionnaire: a tool to screen patients for obstructive sleep apnea. *The Journal of the American Society of Anesthesiologists*. 2008. 108(5), 812-821.
4. Aibek E Mirrakhimov, Talant Sooronbaev và Erkin M Mirrakhimov. Prevalence of obstructive sleep apnea in Asian adults: a systematic review of the literature. *BMC pulmonary medicine*. 2013. 13(1), 1-10.
5. Basheer Y Khassawneh, Loiy L Alkhatib, Ali M Ibnian, Yousef S Khader. The association of snoring and risk of obstructive sleep apnea with poor academic performance among university students. *Sleep and Breathing*. 2018. 22, 831-836
6. Johns M. About the ESS Epworth Sleepiness Scale. 2023. https://epworthsleepinessscale.com/about-the-ess/.
7. Centers for disease Control and Prevention. National Health Interview Survey. 2017. https://www.cdc.gov/nchs/nhis/tobacco/tobacco_glossary.htm.
8. Truong Duong Thi, Nguyen Thien Phuoc Nguyen, Nguyen Thi Huong Lam. Characteristics according to traditional medicine of suboptimal health status and some related factors in students of University of Medicine and Pharmacy, Hue University. *Journal of Medicine and Pharmacy - Hue University of Medicine and Pharmacy*. 2022. 3 (12), 59-66.
9. Nguyen Song Hieu, Huynh Le Thai Bao. Warning of hypertension and obesity in college students. *Vietnam Journal of Diabetes and Endocrinology*. 2021. 47, 150-154.
10. Rasoul S Piro, Salim S Miho Alhakem, Salim S Azzez, Deldar M Abdulad. Prevalence of sleep disorders and their impact on academic performance in medical students/University of Duhok. *Sleep and Biological Rhythms*. 2018. 16, 125-132.
11. Meir H Kryger, Thomas Roth, William C Demalet. Principles and Practice of Sleep Medicine E-Book. *Saunders Elsevier*. 2017. 1076-1210.
12. Nguyen Nhu Vinh, Dang Thi Mai K, Tran Do Hung, Tran Quang Khai, et al. High Blood Pressure and Obstructive Sleep Apnea: A Cross-Sectional Study. *J Vasc Med Surg*. 2021. 9(4), 418.
13. Haytham Samy Diab. The utility of the elbow sign in the diagnosis of OSA. *Egyptian Journal of Chest Diseases and Tuberculosis*. 2015. 64(2), 431-439.
14. AH Zailinawati, CL Teng, YC Chung, TL Teow, et al . Daytime sleepiness and sleep quality among Malaysian medical students. *The Medical journal of Malaysia*. 2009. 64(2), 108-110.
15. Ahmed Yassin, Abdel-Hameed Al-Mistarehi, Othman Beni Yonis, Abdelwahab J Aleshawi, et al. Prevalence of sleep disorders among medical students and their association with poor academic performance: A cross-sectional study. *Annals of Medicine and Surgery*. 2020. 58, 124-129
16. Julián Esteban Barahona-Correa, Juan Diego Aristizabal-Mayor, Pieralessandro Lasalvia, Álvaro J Ruiz, et al .Sleep disturbances, academic performance, depressive symptoms and substance use among medical students in Bogota, Colombia. *Sleep Science*. 2018. 11(4), 260.