Original Research

SUBOPTIMAL HEALTH STATUS AND ASSOCIATED FACTORS AMONG STUDENTS AT HANOI MEDICAL UNIVERSITY IN 2024

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ABSTRACT

Aims: Suboptimal Health Status (SHS) has been defined as a state of low-quality health, not quite illness but a risk factor for future disease. This study investigated SHS and its related factors among medical students.

Methods: A cross-sectional study was conducted on Hanoi Medical University students using the SHSQ-25 tool from December 2023 to February 2024. Multivariable logistic regression was used to identy factors associated with SHS.

Results: Forty two percent of 513 students were in SHS. Females were 2.33 times more likely to be in SHS than males. Students with average academic performance were 1.92 times more likely to be in SHS than those with excellent performance. Electronic cigarette users had 3.16 times higher odds of SHS.

Conclusion: Gender, academic performance, and electronic cigarette use were associated with SHS among medical students. To improve health, it is essential to reduce unhealthy lifestyles, especially electronic cigarette use, and enhance academic performance.

Keyword: *suboptimal health status, medical students, lifestyle behaviors.*

I. INTRODUCTION

Suboptimal health status has been described as a state of low-quality health between illness and wellness in terms of physical and mental conditions. It is a pre-disease state, meaning that in this condition, people are not diagnosed with any illness, nor do they exhibit any clinical symptoms or signs. However, these individuals are at potential risk of developing diseases, and if left prolonged without timely supportive treatment methods, they are prone to experiencing prolonged fatigue both physically and mentally [1]. According to research, people with suboptimal health status (SHS) are more susceptible to conditions such as cardiovascular diseases and metabolic syndrome [2].

Students are often subject to various influences due to challenges in education, environment, work, and life. Moreover, the unique nature of the medical field entails learning in multiple settings; apart from studying at school, medical students also engage in clinical rotations and night shifts at hospitals, which can lead to suboptimal health conditions [3]. This condition not only affects the students' mental and physical health but can also impact their academic performance and quality of life. Therefore, it is important to research suboptimal health situation among medical students.

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In a cross-sectional survey conducted at Renmin University of China in September 2015, the suboptimal health rate among 2667 first-year university students was 51.2% [4]. Furthermore, a study involving 6107 nurses in China found a 74.21% suboptimal health rate [5]. In Vietnam, a survey was conducted at Hue University of Medicine and Pharmacy among third-year students from 9 academic majors. The results indicated that 64 out of 464 students (13.8%) experienced suboptimal health conditions. Factors associated with this condition included gender, academic preferences, electronic device usage, alcohol consumption, physical activity, eating habits, and possibly excessive psychological stress [6]. Notably, most studies highlight environmental changes, excessive workload, interpersonal relationships, insufficient sleep, excessive psychological stress, an imbalanced diet, and inadequate exercise as factors contributing to suboptimal health status [4-6].

Given the importance of understanding suboptimal health status among medical students and the limited literature on this topic in Vietnam, we conducted this study to describe the suboptimal health situation of students at the Hanoi Medical University in 2024 and identify associated factors.

II. METHODS

2.1. Study design and participants

A cross-sectional study was conducted at Hanoi Medical University from December 2023 to April 2024. Students who (i) were studying at Hanoi Medical University at the time of data collection and (ii) voluntarily participated were included.

For sample size calculation, a pilot study was conducted on 200 students to estimate the proportion of students with suboptimal health status at Hanoi Medical University. The result (43%) was then applied in the formula to calculate the sample size for a single proportion. The minimum required sample size was determined to be 510. Convenience sampling was applied to select a total of 513 students for the study.

2.2. Data collection

Data were collected from December 2023 to February 2024. We distributed a self-reported online questionnaire to students via REDCap.

The SHSQ-25 tool was employed to evaluate suboptimal health status. The SHSQ-25 questionnaire was translated into Vietnamese and validated elsewhere [7]. It consisted of 25 questions focusing on participants' health status over the past three months. Participants rated their health status on a 5-point Likert scale, ranging from 1 (never or almost never) to 5 (always). Scores were converted to a range of 0 to 100, with higher scores indicating poorer health. Health status was categorized as ideal (total score < 35) or suboptimal (total score ≥ 35) [8].

Demographic variables include gender, academic year, major, place of residence, and academic performance. Additionally, to investigate factors associated with participants' suboptimal health status, we utilized lifestyle behavior variables: alcohol consumption, physical activity, e-cigarette use, and smoking frequency.

2.3. Data analysis

The collected data was cleaned and analyzed using STATA 17.0 software. Descriptive statistics were employed to provide general information about the study subjects. Graphs were created using Stata 17 and R to illustrate the relationships between variables. Quantitative variables were described using means and standard deviations, while qualitative variables were described using frequencies and percentages. Logistic regression was used to identify factors related to suboptimal health status among students at Hanoi Medical University.

2.4. Research ethics

The study was approved by Hanoi Medical University. Participants were fully informed about the purpose and content of the study, participated voluntarily, and their information was kept completely confidential.

III. RESULTS

Characteristics of participants

Among 513 students surveyed, female students accounted for 64.9%. Over one-third of the participants were first-year students. Most students were living in dormitory (29.4%), with family (23.2%) or with friends (29.6%). The number of students in the "good" academic performance group exceeded 160 (31.2%). (Table 1) The proportion of participants with suboptimal health status was 42%.

Table 1. *Characteristics of Study Participants*

Characteristics	n	%	Characteristics	n	%
Gender			Major		
Male	180	35.1	General medicine	131	25.5
Female	333	64.9	Traditional medicine	16	3.1
Academic year			Dentistry	11	2.1
1st	177	34.5	Preventive medicine	195	38.0
2nd	79	15.4	Nutrition	42	8.2
3rd	71	13.8	Public health	71	13.8
4th	107	20.9	Nursing	22	4.3
5th	69	13.5	Optometrists	16	3.1
6th	10	1.9	Laboratory medicine technique	9	1.8
Place of residence			Academic performance		
Dormitory	151	29.4	Excellent (9.0 - 10)	16	3.1
Living with family	119	23.2	Good (8.0 - 8.9)	118	23.0
Living alone	44	8.6	Fairly good (7.0-7.9)	160	31.2
Living with friends	152	29.6	Moderate (6.0 - 6.9)	146	28.5
Living with relatives	40	7.8	Average (5.0 - 5.9)	63	12.3
Others	7	1.4	Weak/Poor (≤4.9)	10	2.0

Table 2 presents participants' responses to each factor. Across all factors, most students' responses were "never," "occasionally," and "often". For Factor 1 (fatigue), students predominantly chose "occasionally," with the highest proportion at 33.53%. For Factor 2 (systemic symptoms), "often" was the most frequently chosen response, ranging from 30.21% to 53.41%. For Factor 3 (Cardiovascular and Digestive System), "never" was the top choice among students, with proportions ranging from 36.45% to 46.39%. Moving to Factor 4 (Sleep quality and immune system), students mostly selected "often," ranging from 24.76% to 33.72%. Lastly, for Factor 5 (mental health), the proportion of "often" ranged from 32.94% to 44.44%, higher than other response options. From Factor 1 to Factor 5, the proportion of students choosing "always" was low, ranging from 0.19% to 2.34%, except for item 17, which had a higher proportion than other responses, at 4.29%.

Table 2. *Distribution of choices among research participants*

	Never	Occa-sionally	Often	Very often	Always
Factor 1					
1. Were exhausted without greatly increasing your physical activity	24.76	33.14	32.75	8.58	0.78
2. Fatigue could not be substantially alleviated by rest	27.68	33.53	29.63	8.58	0.58
Factor 2					
3. Were lethargic when working	7.02	26.12	53.41	12.67	0.78
4. Suffered from headaches	14.04	34.11	38.4	12.87	0.58
5. Suffered from dizziness	18.71	40.16	33.92	6.82	0.39
6. Eyes ached or were tired	10.53	24.17	46.39	18.13	0.78
7. Suffered from a sore throat	16.37	42.5	32.94	7.6	0.58
8. Muscles or joints felt stiff	26.32	37.04	28.65	7.21	0.78
9. Have pain in your shoulder/ neck/ waist.	12.28	25.93	42.11	18.13	1.56
10. Have a heavy feeling in your legs when walking.	27.29	37.43	26.12	8.19	0.97
25. Caught a cold in the past 3 months.	29.82	31.58	30.21	7.6	0.78
Factor 3					
11. Feel out of breath while sitting still.	45.42	34.7	15.4	4.29	0.19
12. Suffered from chest congestion.	42.88	33.92	18.91	4.09	0.19
13. Were bothered by heart palpitations.	38.01	34.89	22.81	3.9	0.39
14. Appetite is poor.	36.45	39.18	20.86	3.31	0.19
15. Suffered from heartburn.	46.39	30.99	18.13	3.7	0.78
16. Suffered from nausea.	37.62	37.62	20.47	3.9	0.39
Factor 4					

	Never	Occa-sionally	Often	Very often	Always
17. Could not tolerate the cold.	15.01	25.34	24.76	7.21	0.78
18. Had difficulty falling asleep.	17.74	31.38	37.23	12.09	1.56
19. Had trouble with waking up during night.	28.85	38.4	24.76	7.21	0.78
Factor 5					
20. Had trouble with your short-term memory.	12.87	33.14	37.04	15.01	1.95
21. Could not respond quickly.	15.98	39.96	32.94	10.33	0.78
22. Had difficulty concentrating.	8.97	25.73	44.44	18.52	2.34
23. Were distracted for no reason.	14.81	27.88	37.82	17.54	1.95
24. Felt nervous or jittery.	20.47	33.33	34.5	10.53	1.17

Factors related to suboptimal health status

Logistic regression analysis was conducted to identify some factors associated with suboptimal health status. After adjusting for gender, field of study, place of residence, academic performance, and lifestyle behaviors (alcohol consumption, physical activity, e-cigarette use, and cigarette smoking), individuals in one group were found to have 2.33 times higher odds of suboptimal health status compared to those in the other group (95% CI: 1.50–3.67, $p < 0.001$). The odds of suboptimal health status among students with average academic performance were 1.92 times higher than those with good academic performance (95% CI = 1.04-3.58, $p = 0.039 < 0.05$). Additionally, the odds of suboptimal health status were 3.16 times higher among students who used e-cigarettes compared to those who did not (95% CI = 1.10-9.91, $p = 0.036 < 0.05$).

Table 3. *Logistic regression analysis of factors influencing suboptimal health status*

Variables	Healthy n (%)	SHS n (%)	OR (95% CI) (univariable)	OR (95% CI) (multivariable)
Gender				
Male	128 (71.1)	52 (28.9)	ref	ref
Female	170 (51.1)	163 (48.9)	2.36 (1.61-3.50)[c]	2.33 (1.50-3.67)[c]
Major				
General medicine, traditional medicine, dentistry	98 (62)	60 (38)	ref	Ref
preventive medicine, public health, nutrition	181 (58.8)	127 (41.2)	1.15 (0.77-1.70)	0.77 (0.49-1.19)
Nursing, radiology, laboratory medicine	19 (40.4)	28 (59.6)	2.41 (1.25-4.47)[a]	1.49 (0.74-3.06)
Place of residence				
With family	206 (58.2)	148 (41.8)	Ref	Ref
Living alone	92 (57.9)	67 (42.1)	1.01 (0.69-1.48)	1.00 (0.66-1.50)

Variables	Healthy n (%)	SHS n (%)	OR (95% CI) (univariable)	OR (95% CI) (multivariable)
Academic performance				
Excellent	76 (56.7)	58 (43.3)	Ref	Ref
Good	192 (62.7)	114 (37.3)	0.78 (0.52-1.18)	0.73 (0.48-1.13)
Average	30 (41.1)	43 (58.9)	1.88 (1.06-3.37)[a]	1.92 (1.04-3.58)[a]
Alcohol consumption				
No	150 (53.6)	130 (46.4)	Ref	Ref
Yes	148 (63.5)	85 (36.5)	0.66 (0.46-0.94)[a]	0.80 (0.54-1.18)
Physical activity				
No	96 (50.8)	93 (49.2)	Ref	Ref
Yes	202 (62.3)	122 (37.7)	0.62 (0.43-0.90)[a]	0.74 (0.50-1.10)
E-cigarette use				
No	292 (58.9)	204 (41.1)	Ref	Ref
Yes	6 (35.3)	11 (64.7)	2.62 (0.98-7.72)	3.16 (1.10-9.91)[a]
Cigarette smoking				
No	9 (52.9)	8 (47.1)	Ref	ref
Yes	289 (58.3)	207 (41.7)	0.81 (0.30-2.18)	0.50 (0.18-1.41)

SHS: suboptimal health status, OR: odds ratio, CI: confidence interval.

[a]p<0.05, [b]p<0.01, [c]p< 0.001

Table 4 shows that the VIF (Variance Inflation Factor) values for all independent variables in the model are below 5, ranging from 1.03 to 1.21, indicating no significant multicollinearity. This confirms that the variables in the logistic regression model exhibit good independence and do not require removal or further adjustment. The model ensures reliability in analysis and interpretation of the results.

Table 4. *Variance inflation factor analysis in multivariable logistic regression*

Variables	VIF	1/VIF
Gender	1.21	0.83
Major	1.16	0.86
Place of residence	1.12	0.89
Academic performance	1.09	0.92
Alcohol consumption	1.07	0.93
Physical activity	1.07	0.93
E-cigarette use	1.04	0.95
Cigarette smoking	1.03	0.97
Mean VIF	1.10	0.91

VIF: inflation factor analysis

IV. DISCUSSION

This study examines the prevalence of suboptimal health status and its associated factors among students at Hanoi Medical University. The results showed a total suboptimal health rate of 42% (215/513) among these students, comparable to the suboptimal health status rate among nurses in China at 49.7% [9]. A study in Southern China also indicated a suboptimal health prevalence rate of 46.0% in that region [10].

Through logistic regression analysis, the study identified significant factors associated with suboptimal health status, including gender, academic performance, and electronic cigarette use. Female students were 2.33 times more likely to experience suboptimal health compared to male students (95% CI = 1.5–3.67). This finding aligns with a study conducted across 20 universities in Ho Chi Minh City in 2023 [11]. This issue can be attributed to genetic characteristics and hormonal changes, as females are more likely to internalize emotions and communicate less openly compared to males [11]. If timely interventions are not implemented, this could result in serious consequences, such as long-term health deterioration, negative impacts on academic performance, and an increased risk of engaging in unhealthy behaviors.

The study indicates that students with average academic performance face a 1.92 times higher risk of experiencing suboptimal health compared to those with excellent academic achievements. This risk may stem from academic pressure, family expectations, and exam-related stress, creating an environment that significantly impacts mental well-being. Medical students, in particular, are more vulnerable due to the demanding nature of their studies, including a heavy workload, heightened competition, and prolonged hours of study and practice [12]. Similarly, a study in the United Kingdom revealed that students with lower academic performance frequently encounter academic stress and feelings of failure, leading to various health issues such as sleep disorders, headaches, fatigue, and depression. If timely interventions are not implemented, there is a risk of developing severe psychological disorders, such as chronic depression and anxiety, which can negatively affect academic performance and long-term quality of life [13]. Therefore, equipping students with skills to cope with academic pressure is essential.

E-cigarette use has become a significant issue among young people in general and students in particular. The results of this study indicate that students who use e-cigarettes are 3.16 times more likely to experience suboptimal health compared to non-users (95% CI = 1.1–9.91, p = 0.036). According to the American Heart Association, e-cigarettes contain nicotine, an addictive substance that can directly affect the brain, impairing memory, concentration, and information processing [14]. Students who use e-cigarettes may experience decreased academic performance, along with increased symptoms of stress and anxiety, leading to respiratory issues such as pneumonia, asthma, and even lung cancer, significantly affecting their health and quality of life [14].

Although this study provides valuable information, several limitations should be considered. First, the cross-sectional study design cannot establish causal relationships between the identified factors and suboptimal health status. Second, as the study relies on self-

reported data, information bias may occur. Additionally, the scope of the study is limited, as it was conducted solely on students at Hanoi Medical University and did not account for other potential factors influencing suboptimal health, such as genetic predispositions or pre-existing health conditions. The sample is not representative of the entire population of medical students, thus limiting the generalizability of the findings.

To address these limitations, future research should adopt a longitudinal study design to examine the causal relationships. Furthermore, objective data collection methods, such as direct medical examinations or measurement technologies, would enhance data accuracy. Future studies should also expand the sample size and include students from various medical universities to improve representativeness. Additionally, other potential factors affecting suboptimal health, such as genetic influences, lifestyle habits, sleep quality, and levels of social support, should be analyzed to provide a more comprehensive understanding.

To improve health and reduce the risk of experiencing suboptimal health, regular health screenings should be conducted to ensure students maintain their best condition. Engaging in physical activities, such as yoga, walking, or meditation, can help reduce stress and improve mood, thereby decreasing the likelihood of suboptimal health. Moreover, students should be educated about the health risks associated with electronic cigarettes. Sharing experiences, supporting each other, and seeking assistance for addiction recovery and stress management should also be encouraged.

V. CONCLUSION

Our study revealed that the prevalence of suboptimal health status among students at Hanoi Medical University is 42%. Some factors related to this situation include gender, academic performance, and e-cigarette smoking behavior. Findings of this study may help reduce the prevalence of suboptimal health status among medical students and improve their quality of life.

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