


BMJ Open Factors associated with sleep quality among medical students in Vietnam: a national cross-sectional study

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ABSTRACT

Objective This study explored factors associated with sleep quality among medical students in Vietnam.

Design Cross-sectional study.

Setting The study was conducted from December 2019 to February 2020 among medical students in Vietnam.

Participants Medical students were defined as those enrolled in undergraduate medical programmes. 1284 medical students who met the inclusion criteria participated in this study.

Outcome measures The Pittsburgh Sleep Quality Index (PSQI) was used to measure participants' sleep quality, with a score of 5 or higher indicating poor sleep quality. Multivariable logistic and linear regression models were employed to identify the factors associated with poor sleep quality.

Results 36.6% of the study participants had poor sleep quality. There were statistically significant differences in the percentage of poor sleep quality across genders, health-related quality of life, morbidity status and depression ($p < 0.05$). Depression (Coef.=0.54, 95% CI 0.17, 0.91 and OR=1.50, 95% CI 1.13, 1.99) and any morbidity (Coef.=0.64, 95% CI 0.28, 0.99 and OR=1.44, 95% CI 1.09, 1.88) were factors associated with higher PSQI Score and increased risk of poor sleep quality. In contrast, higher health-related quality of life scores (EuroQOL-5 dimensions-5 Levels Index: OR=0.01; 95% CI 0.002, 0.03 and Coef.=−7.11; 95% CI −8.65, −5.56; and EuroQOL-Visual Analogue Scale: OR=0.99; 95% CI 0.98, 1.00 and Coef.=−0.03; 95% CI −0.04, −0.01) were related to lower PSQI Score and reduced risk of poor sleep quality.

Conclusions This study reveals that health conditions and psychological well-being were associated with sleep quality among medical students. Reducing stress, improving quality of life and improving morbidity have the potential to improve the sleep quality of medical students.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The utilisation of a large sample size facilitates the covering of a diverse medical student population with different background characteristics.
- ⇒ Our research used validated international measures such as the Pittsburgh Sleep Quality Index, Patient Health Questionnaire nine items and EuroQOL-5 dimensions, which enhanced the reliability and cross-cultural comparability.
- ⇒ The cross-sectional study design hinders the ability to draw causal relationships.
- ⇒ Self-reported data and recall approaches might cause recall bias.
- ⇒ Given the nature of the convenience sampling approach used, our findings might not be generalisable to all medical students in Vietnam.

has indicated that individuals with higher levels of sleep disturbances were more likely to experience work absenteeism and lower academic performance.⁶

Sleep disorders and poor sleep quality have been recognised as common health issues among medical students,^{7,8} which are driven by their heavy workload and study load and regular night shifts when practising in clinical settings.^{9,10} The prevalence of sleep disorders among medical students is remarkable. For instance, 19% of Chinese medical students reported poor sleep quality, and 70% experienced sleeplessness.^{9,11} Similarly, another study conducted in the USA found that the sleep quality of medical students was significantly lower compared with that of the general young adult population.¹² In Brazil, 28% of medical students reported poor sleep quality, with a higher prevalence among women compared with men.¹³ In Lithuania, 40% of medical students experienced poor sleep quality, mainly due to stress and dissatisfaction with their academic performance¹⁴ and workload. Several factors have been identified as associated with poor sleep quality and



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INTRODUCTION

Sleep disorders are a global health concern, affecting approximately a third of adults worldwide.^{1–3} Poor sleep quality leads to an increased risk of mental and physical disorders such as depression, cardiovascular disease or type 2 diabetes.^{4,5} Furthermore, sleep disorders adversely affect work and academic performance. Previous evidence

sleep disturbance in medical students, including marital status, smoking, physical activity,¹⁵ stress, academic performance,¹⁶ workload, night shifts or the number of working hours.¹⁷

Medical students currently face significant challenges due to the transition in disease patterns from communicable to non-communicable diseases, especially the emergence and re-emergence of infectious epidemics such as the COVID-19 pandemic.^{18 19} These rapid changes impose substantial pressure on medical students to effectively complete the medical task assigned while ensuring their academic performance.¹⁸ Maintaining good sleep quality is essential for protecting physical and mental health, enabling them to effectively provide patient care and concentrate on academic activities. Although several studies have assessed the sleep quality of medical students in Vietnam, they are often limited by small sample sizes and the use of invalidated measurement instruments.^{20 21} To address these gaps, this study aimed to investigate sleep quality and identify factors associated with poor sleep quality among medical students in Vietnam.²²

Medical students currently encounter significant challenges with a transition of disease patterns from communicable diseases to non-communicable diseases, as well as the emerging and re-emerging of infectious epidemics such as the COVID-19 pandemic.^{18 19} These rapid changes heighten pressure on medical students to adapt and enhance their performance in both work and study.¹⁸ In this context, maintaining good sleep quality is considered an important factor in ensuring their physical and mental health, enabling medical students to effectively complete the assigned tasks besides acquiring knowledge and enhancing their academic achievements. Several studies have evaluated the sleep quality of medical students in Vietnam; however, there are still significant limitations, especially in small sample sizes and invalidated instruments.^{20 21} To address these issues, the purpose of this research was to investigate factors associated with poor sleep quality among medical students in Vietnam using validated instruments.²²

METHODS

Study setting and sampling

An online nationwide cross-sectional study on health professionals and medical students in Vietnam was conducted from December 2019 to February 2020. The link for the online study survey was created using the SurveyMonkey platform (surveymonkey.com) to target subjects across different regions in Vietnam. Only the information collected from medical students was included in the study analysis. Particularly, in this target group, we included participants who (1) Were aged 18 years or older; (2) Were living in Vietnam at the time of conducting the survey; (3) Were a medical student at any medical university in Vietnam; (4) Were able to access the online questionnaire; and (5) Signed electronic informed consent to participate in the study.

Furthermore, the snowball sampling method was applied to recruit the participants in this study. In particular, 50 students from different medical universities and the Vietnam Young Physicians' Association were invited to participate in this study as a core group. After completing the online survey, these participants invited other people in their network to complete the questionnaire and speed up the online survey. At the end of the data collection process, a total of 1284 medical students from 57/63 provinces in Vietnam completed the online survey and were included in the analysis process.

Measures and instruments

In this study, a structured questionnaire was developed according to a standard process. To begin with, we conducted a systematic review to identify gaps and crucial aspects of the topic of interest. Then, a questionnaire in Vietnamese was constructed which ensured covering all these issues. After that, we invited experts, public health practitioners and health services providers to jointly process translating in Vietnamese, rephrasing, piloting and shortening this research questionnaire. Finally, a research instrument with three main components was used in the data collection process in this study, including (1) Socioeconomic characteristics; (2) Health status and risk behaviours; and (3) Sleep quality. Before the data collection process, this structured questionnaire was uploaded to the SurveyMonkey platform (surveymonkey.com), a secure online survey platform.

Primary outcome

Respondents were asked to report their sleep quality using the Pittsburgh Sleep Quality Index (PSQI) instrument. This scale consists of 19 items that are divided into seven components to evaluate seven aspects of sleep quality, including (1) Subjective sleep quality, (2) Sleep latency, (3) Sleep duration, (4) Habitual sleep efficiency, (5) Sleep disturbances, (6) Use of sleeping medications, and (7) Daytime dysfunction during the last month. The total PSQI Score is calculated by summing the scores of all these seven components, ranging from 0 to 21, and a higher score corresponds to lower sleep quality. Furthermore, people with a score of 5 or higher are considered to have poor sleep quality.²³ Regarding validation information of the scale, the original version of PSQI developed by Buysse *et al*, is a widely used instrument designed to assess sleep quality and disturbances with high internal consistency (Cronbach's $\alpha=0.83$) and strong test-retest reliability (0.85 for the global score), a sensitivity of 89.6% and a specificity of 86.5% (at the cut-off point of ≥ 5), reflecting its efficacy in distinguishing between individuals with poor and good sleep quality.²³ The Vietnamese version of PSQI has also been validated among medical students' samples by Nguyen *et al* and indicated acceptable internal reliability (Cronbach's $\alpha=0.68$). Besides, sensitivity and specificity rates were also reported at 78.08% and 75.60% at the cut-off point of ≥ 5 , respectively.²⁴ This study also recommended a cut-off point of 5

Table 1 Sociodemographic characteristics of respondents

Characteristics	Poor sleep quality						P value
	No		Yes		Total		
	N	%	N	%	N	%	
Total	813	63.3	471	36.7	1284	100.0	
Gender							
Male	220	27.1	104	22.1	324	25.2	0.048
Female	593	72.9	367	77.9	960	74.8	
Living location							
Urban	763	94.3	436	93.6	1199	94.0	0.585
Rural	46	5.7	30	6.4	76	6.0	
Living arrangement							
Alone	145	17.9	93	19.7	238	18.6	0.816
Partner/spouse	4	0.5	3	0.6	7	0.5	
Relatives	422	52.0	235	49.9	657	51.2	
Others	241	29.7	140	29.7	381	29.7	
Marital status							
Single	799	98.8	461	98.3	1260	98.6	0.492
Others	10	1.2	8	1.7	18	1.4	
Major							
General doctor	143	18.0	91	19.5	243	17.7	0.370
Tropical diseases	99	12.5	68	14.5	170	12.4	
Preventive and public health	360	45.2	189	40.4	575	41.9	
Others	193	24.3	120	25.6	385	28.0	
	Mean	SD	Mean	SD	Mean	SD	P value
Age, years	20.6	1.4	20.4	1.4	20.5	1.4	0.471
SD, Standard deviation.							

SD, Standard deviation.

points or above to identify sleep disturbances among Vietnamese medical students.²⁴ In the current study, the value of Cronbach's α of this instrument was reported at 0.70.

Sociodemographic characteristics

Sociodemographic characteristics were obtained, including questions about age, gender (male/female), marital status (single/others), major, education level (college/undergraduate/postgraduate/others), living location (urban/rural) and living arrangements (alone/partner/spouse/relatives/others).

Health status and risk behaviours

Data on health status and risk behaviours were obtained, including questions about alcohol drinking, tobacco smoking, morbidity, body mass index (BMI) and depression (Patient Health Questionnaire nine items (PHQ-9)).²⁵ The PHQ-9 Scale had nine items that measured depressive symptoms in the last 2 weeks. Each item had four response levels with a score ranging from 0 to 3, resulting in a total score between 0 and 27.²⁵ Participants with a score of 10 or above were classified into the 'Depression' group. Furthermore, the PHQ-9 has

been widely used and validated among medical staff and medical students in several countries, including Vietnam.^{26 27} In this study, the Cronbach's α for this scale was reported at 0.91. Participants' health-related quality of life was measured by using EuroQOL-5 dimensions-5 Levels (EQ-5D-5L) and EuroQOL-Visual Analogue Scale (EQ-VAS).^{28–30} The EQ-5D-5L included five dimensions, including mobility, self-care, usual activities, pain/discomfort and anxiety/depression. A Vietnamese version of the EQ-5D-5L translation that had been validated was applied in this study.^{31 32} In this study, the Cronbach's α of the EQ-5D-5L was good at 0.92. Additionally, the EQ-VAS was used with a score ranging from 0 points (worst imaginable health state) to 100 points (best imaginable health state). BMI was calculated and classified into three groups: underweight ($<18.5 \text{ kg/m}^2$), normal ($18.5\text{--}22.9 \text{ kg/m}^2$) and overweight/obesity ($\geq 23 \text{ kg/m}^2$).³³

Statistical analysis

Stata software V.15.0 (Stata Corp, College Station, Texas, USA) was used for data analysis. A value of $p < 0.05$ was statistically significant. χ^2 and Mann-Whitney tests were

employed to compare the rate of poor sleep quality across different sociodemographic, health status and behaviour characteristics. We used a multivariable logistic regression model to identify factors associated with poor sleep quality (yes/no) and a multivariable linear regression model to detect factors associated with sleep quality score (PSQI Score). Independent variables included sociodemographic, health status and behavioural characteristics. A forward stepwise strategy with a threshold value of $p < 0.2$ was used to develop reduced regression models.

Ethics approval

All procedures performed in studies involving human participants were by the ethical standards of the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Participation was completely voluntary. Collected data were saved in a secured system and only served the study purposes. Participants were

asked to give online informed consent if they agreed to participate in the study. Participants' information is confidential and only principal investigators can access the data set.

Patient and public involvement

None.

RESULTS

Table 1 summarises the sociodemographic characteristics of participants. Among 1284 respondents, 36.7% had poor sleep. The majority of participants lived in urban areas (94.0%). More than half of the participants lived with their relatives (51.2%). The mean age was 20.5 years ($SD=1.4$). Furthermore, there was a statistically significant difference in the percentage of poor sleep quality between men and women (77.9% vs 22.1%), with $p=0.048$,

Table 2 Health status and risk behaviours of participants

Characteristics	Poor sleep quality						P value
	No		Yes		Total		
	N	%	N	%	N	%	
Drinking							
No	680	85.3	387	83.8	1067	84.7	0.460
Yes	117	14.7	75	16.2	192	15.3	
Smoking							
No	806	99.4	464	99.1	1270	99.3	0.624
Yes	5	0.6	4	0.9	9	0.7	
BMI group							
Underweighttt	211	26.6	128	27.6	339	26.9	0.709
Normal	471	59.3	278	59.9	749	59.5	
Overweight or obese	112	14.1	58	12.5	170	13.5	
Having any morbidity							
No	604	74.3	285	60.5	889	69.2	<0.001
Yes	209	25.7	186	39.5	395	30.8	
Depression							
Non-depression	640	78.7	326	69.2	966	75.2	<0.001
Depression	173	21.3	145	30.8	318	24.8	
EQ-5D-5L domains							
Having problems in mobility	97	12.0	111	23.7	208	16.3	<0.001
Having problems in self-care	32	4.0	37	7.9	69	5.4	
Having problems in usual activity	80	9.9	118	25.2	198	15.5	<0.001
Having problems in pain	264	32.8	266	57.0	530	41.6	
Having problems in anxiety	437	54.4	337	72.6	774	61.0	<0.001
	Mean	SD	Mean	SD	Mean	SD	
PSQI Score (0–21)	3.2	1.4	8.1	2.3	5.0	3.0	<0.001
EQ-5D Index (0–1)	0.91	0.10	0.83	0.15	0.88	0.12	<0.001
EQ-VAS (0–100)	77.9	13.6	72.2	15.1	75.8	14.4	<0.001
BMI, body mass index; EQ-5D-5L, EuroQOL-5 dimensions-5 Levels ; EQ-VAS, EuroQOL-Visual analogue Scale; PSQI, Pittsburgh Sleep Quality Index.							

BMI, body mass index; EQ-5D-5L, EuroQOL-5 dimensions-5 Levels; EQ-VAS, EuroQOL-Visual analogue Scale; PSQI, Pittsburgh Sleep Quality Index.

Table 3 Factors associated with sleeping quality of participants

Characteristics	Poor sleep quality		PSQI Score	
	OR	95% CI	Coef.	95% CI
Having any morbidity (Ref-No)				
Yes	1.44***	1.09, 1.88	0.64***	0.28, 0.99
Depression (Ref-No)				
Yes	1.50***	1.13, 1.99	0.54***	0.17, 0.91
Having problems in self-care (Ref-No)				
Yes	0.47**	0.25, 0.88	-0.56	-1.36, 0.25
EQ-VAS (unit: per score)	0.99**	0.98, 1.00	-0.03***	-0.04, -0.01
ED-5D Index	0.01***	0.002, 0.03	-7.11***	-8.65, -5.56

***p<0.01, **p<0.05, *p<0.1.

EQ-5D, EuroQOL-5 Dimensions; EQ-VAS, EuroQOL-Visual analogue Scale; PSQI, Pittsburgh Sleep Quality Index; Ref, Reference.

while no difference in poor sleep quality was found across age, living location, living arrangement, marital status and major ($p>0.05$).

Table 2 shows that the average PSQI Score was 5.0 (SD=3.0). 15.3% of people consumed alcohol and 0.7% smoked tobacco. Most of the respondents (59.5%) had normal BMI. The differences between those with and without poor sleep in terms of morbidity and depression were statistically significant ($p<0.05$). The mean EQ-5D Index was 0.91 (SD=0.10), and the mean EQ-VAS was 75.8 (SD=14.4). The differences in the ED-5D Index and EQ-VAS between people with and without poor sleep were statistically significant ($p<0.05$). The rates of people having problems in the five domains were remarkably higher in poor sleepers than in good sleepers ($p<0.05$).

Table 3 shows the results of the regression analysis, with odds ratios (OR), coefficient (Coef.), and 95% confidence intervals (CI). Only variables with a value of $p<0.2$ were presented in a stepwise manner. Depression was associated with a higher PSQI Score (Coef.=0.54, 95% CI 0.17, 0.91) and a higher risk of poor sleep quality (OR=1.50, 95% CI 1.13, 1.99). Furthermore, people with any morbidity were more likely to suffer from poor sleep quality (OR=1.44, 95% CI 1.09, 1.88) and have higher scores of PSQI (Coef.=0.64, 95% CI 0.28, 0.99). Higher scores in EQ-5D-5L Index (OR=0.01; 95% CI 0.002, 0.03 and Coef.=-7.11; 95% CI -8.65, -5.56) and EQ-VAS (OR=0.99; 95% CI 0.98, 1.00 and Coef.=-0.03; 95% CI -0.04, -0.01) were positively associated with sleep quality of the participants.

DISCUSSION

This study assessed the sleep quality of medical students from 57 different provinces in Vietnam. Furthermore, the findings highlighted that sleep quality was driven by the health conditions and psychological well-being of the medical students.

The results indicated that more than a third of medical students encountered sleep disturbance (36.7%).

However, this figure could not be representative of the prevalence of sleep disturbance among Vietnamese medical students due to the application of the convenience sampling method. Nevertheless, our findings suggested that sleep disturbances among the medical student sample in this study may be a significant concern because medical students usually experience longer duration and intensity of academic study, as well as clinical duties that include overnight and on-call shifts and deal with illness and death, contributing to a higher rate of sleep disturbance compared with other fields of study.⁹

Regarding factors related to sleep quality among medical students in this study, we found that individuals with any illnesses were more likely to have poor sleep quality. Indeed, this phenomenon can be explained by the fact that physical illnesses can lead to increased fatigue and a reduced ability to perform daily activities, including sleep. As a result, this can significantly heighten the risk of poor sleep quality. Furthermore, previous studies have also reported similar findings. For instance, in Nepal, a study among nurses suggested that those with backache, stomach pain or nausea were more likely to have poor sleep quality.³⁴

Additionally, in this study, the findings showed that medical students who suffered from depression had a higher likelihood of having poor sleep quality than their counterparts, as well as the relationship between quality of life and sleep quality. This result was consistent with a meta-analysis that has been conducted by Bacaro *et al.*³⁵ Particularly, the meta-analysis has identified a bidirectional relationship between psychological well-being and sleep quality among young people over time. Indeed, on the one hand, medical students often suffer from stress due to examinations and working overnight without adequate daytime and night-time sleep, leading to the reduction of social and personal interactions, which increases the risk of depression and anxiety.³⁶ Insomnia, excessive drowsiness and fatigue were common symptoms of depressed patients.³⁷ On the other hand, experiencing depressive

or stressful events might trigger the body's neuroendocrine and behavioural responses, including changes in the activity and function of the immune system of the hypothalamo-pituitary-adrenal axis, leading to hysteria, masking slow-wave sleep and causing poor sleep.^{38–40}

This study has several implications. First, understanding poor sleep quality in the current sample of medical students may be a significant concern. Medical schools and health facilities in Vietnam should perform regular screening to identify those with sleep problems and implement interventions to improve their sleep quality. Second, educational campaigns should be conducted to facilitate healthy sleep behaviours and appropriate work/study allocations to improve the quality of sleep as well as support medical students to protect their psychological well-being.^{41 42}

Strengths and limitations

This study addresses shortcomings in the literature by employing a relatively large sample size from various regions in Vietnam and validated international measures such as PSQI and EQ-5D. It enhances the comparability of our results to other studies. However, some limitations should be acknowledged. First, this was a cross-sectional study, which might hinder our ability to draw causal relationships. However, this study suggests important evidence of the association between sleep quality among the current sample of medical students and their psychological well-being and health conditions. Moreover, this study collected the data through an online survey and used self-reported and recall approaches, which might cause recall bias. Last but not the least, participants were recruited for this study by using the snowball sampling approach, which might have affected the representativeness of the medical students in Vietnam as well as the results and external validity of this study. Hence, further studies should be conducted longitudinally, and probability sampling methods should be applied to ensure the representativeness of the sample.

CONCLUSIONS

This study reveals that health conditions and psychological well-being were associated with sleep quality among medical students. Reducing stress, improving quality of life and limiting morbidity hold great potential in improving the sleep quality of these populations. The result suggests the need for medical educational institutions, health facilities and policy makers to develop regular screening programmes for sleep problems, as well as apply appropriate educational campaigns to ensure the sleep quality of medical students in Vietnam.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Consent obtained directly from patient(s)

Ethics approval This study involves human participants. The Vietnamese Institutional Review Board of the Young Research Institute reviewed and approved the study protocol (No 177 QĐ/TWĐTN-VNCTN). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. All data generated or analysed during this study are available from the corresponding author on request.

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