

Poor sleep quality and associated factors among undergraduate students: a single-university cross-sectional study

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ABSTRACT

Poor sleep quality is a global health concern. It leads to reduced cognitive abilities and delayed reactions, which negatively affect students' ability to study and contribute to health-related issues such as depression, obesity, cardiovascular disease, and accidents. This study aims to estimate the rate of poor sleep quality among Thai undergraduate students and identify the factors associated with poor sleep quality. A cross-sectional study was conducted using self-administered questionnaires that included questions on demographic data, caffeine consumption, stress levels, health status, sleep behavior, and sleep quality measured by the Pittsburgh Sleep Quality Index (PSQI). The participants comprised 609 students from different faculties who were enrolled at the university. The factors related to poor sleep quality were analyzed using a multiple logistic regression model. The overall rate of poor sleep quality was 66.3% (95% CI [62.4, 70.1]). Multivariate analysis showed that poor sleep quality was significantly associated with high and severe stress levels (AOR = 4.51; 95% CI [2.53, 8.03]), weak and very weak overall physical health in the previous month (AOR = 1.87; 95% CI [1.03, 3.38]), and physical illnesses in the previous month (AOR = 1.64; 95% CI [1.04, 2.57]). The present study found that being stressed was associated with poor sleep quality. Stress management and lifestyle modifications are highly recommended for undergraduate students to enhance their sleep quality.

Key words:

sleep quality; Pittsburgh Sleep Quality Index; undergraduate students; Thai university

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INTRODUCTION

Sleep is crucial for our physical and mental health. Insufficient sleep can lead to poor focus, reduced cognitive abilities, delayed reactions, mood swings, and a higher risk of illness.¹ Sleep is important in every stage of life, but it is especially important during adolescence, which is a developmental period that involves significant changes in brain areas that support perception, learning, and emotion. Significant changes in sleep spindles during adolescence are related to cognition and intelligence.² Sleep spindles, which are waxing and waning 7–14 Hz EEG rhythms that occur during various stages of non-REM sleep, are likely involved in memory formation and learning.³ A previous report showed that insufficient sleep in adolescents contributes to health-related consequences, such as depression, increased obesity risk, and higher rates of drowsy driving accidents.⁴ Moreover, a review of the recent literature confirms that sleep deprivation is associated with hypertension, coronary heart disease, and diabetes mellitus.⁵

Previous studies have shown that a significant proportion of university students in different regions suffer from poor sleep quality. For instance, in Ethiopia, 56% of students were found to experience poor sleep quality.⁶ In southern Thailand, more than two-thirds (74%) of university students and 64% of medical students at a tertiary care hospital were found to experience poor sleep quality.^{7,8} Similarly, at a large urban university in Thailand, 81% of undergraduate students were classified as having poor sleep quality.⁹ Several factors have been associated with poor sleep among adolescents. In China, sleep disorders have been positively linked to factors such as watching TV, academic performance, and academic stress among adolescent students.¹⁰ Similarly, in

Ethiopia, female students, second-year students, and third-year students were found to be statistically more likely to experience poor sleep quality⁶. In Thailand, poor sleep quality among university students was found to be associated with the consumption of caffeinated beverages and stimulants,¹¹ symptoms of depression,⁷ and academic concern.⁸

Sleep quality is critical to academic performance and overall health. Unfortunately, there has never been a study on the sleep quality of undergraduate students from all faculties that teach curricula across the entire university, including students studying health science, science and technology, and engineering programs. This study aims to fill this gap and estimate the rate of poor sleep quality and associated factors. The study results will provide guidelines for improving sleep quality, promoting health and well-being, and enhancing academic performance.

METHODS

Study design and participants

This cross-sectional study was conducted among undergraduate students studying at Srinakharinwirot University in Thailand throughout their bachelor's degree studies in seven faculties from May to September 2023. The participants were selected using a stratified random sampling technique with proportional allocation, and then students were selected through volunteer sampling. A sample size of 650 was calculated for the target population using the sample size for a logistic regression method¹². The response rate was about 94%, with a total of 609 participants (VIF = 2.34). The inclusion criteria were second-year students and above, enrolled in their program since the first year, without depression, and not on academic leave.

Data collection and measurements

The structured questionnaire was developed based on academic information thoroughly reviewed by researchers. The questionnaire was divided into six sections, which were (1) sociodemographic questionnaire, (2) caffeine beverage consumption questionnaire, (3) stress test (SPST-20),¹³ (4) health status questionnaire, (5) sleep behavior questionnaire, and (6) sleep quality assessment.^{14, 15} The stress levels were classified into four groups as follows: a score of 0 to 23 was considered mild stress; a score of 24 to 41 was considered moderate stress; a score of 42 to 61 was considered high stress, and a score of 62 or more was considered severe stress. The questionnaire on frequency of sleep behavior was adapted from a study of Chanamanee P et al.⁷ and the literature review. The questionnaire contained 22 questions with answers on a scale of 0 to 3, which were never, sometimes (1-2 times per week), often (3-4 times per week), and regularly (5 times per week and over). The Pittsburgh Sleep Quality Index (PSQI) was used to measure the quality of sleep. The overall score of the PSQI ranges from 0 to 21. In this study, poor sleep quality among university students was defined as a total PSQI score over 5.¹⁴

The data was collected through self-administered online questionnaires. We obtained permission from each faculty and distributed the questionnaires to all students through their classroom leader, whose contact information we received from the student affairs staff. However, during the data collection period, we faced a slight issue of non-response in some faculties. By the end of the data collection period, we had a non-response rate of around 6.3%.

Statistical analysis

Statistical analysis was performed using the STATA version 15 software

package (StataCorp, College Station, TX). A descriptive analysis was performed on demographic variables and sleep quality in the survey. The chi-square test was used to compare the proportions between poor sleep quality and the frequency of sleep behavior. In this study of university students, logistic regression was used to analyze the relationship between poor sleep quality and certain characteristics or habits. After identifying all significant variables through bivariate analysis, a multivariate logistic regression analysis was conducted using a backward approach. The final models and statistical significance were determined at a p-value of less than 0.05.

Ethics statement

The study was approved by the Srinakharinwirot University Ethics Committee for Human Research (SWUEC) (reference number SWUEC/E-157/2566), and all participants provided written informed consent.

RESULTS

Survey data comprised responses from 609 undergraduate students across seven different faculties. The majority of participants were women aged between 18 and 26 years old, with a mean age of 20.3 ± 1.2 years. Over half of the participants were in their second year of study, and the mean cumulative grade point average was 3.31 ± 0.43 . Almost 72% of participants lived in dormitories, with 52% sharing a room with single beds. Furthermore, 81% of participants reported having no conflicts with others in the previous week. In terms of income, 56% of respondents reported earning between 6,000 and 12,000 baht. Details on caffeine beverage consumption, stress levels, body mass index, and health status can be found in Table 1.

Table 1. Socio-demographics, caffeine beverage consumption, stress level, and health status data of participants

Factor	Number (%)
Gender	
Women	405 (66.5)
Men	204 (33.5)
Age	
< 20 years	169 (27.8)
20 – 20.9 years	215 (35.3)
21 – 21.9 years	125 (20.5)
≥ 22 years	100 (16.4)
Median (Q1-Q3)	20 (19-21)
Faculty or college	
Faculty of Physical Education	224 (36.8)
Faculty of Engineering	112 (18.4)
Faculty of Physical Therapy	75 (12.3)
Faculty of Agricultural Product Innovation and Technology	73 (12.0)
Faculty of Nursing	52 (8.5)
Faculty of Pharmacy	52 (8.5)
College of Creative Agriculture for Society	21 (3.5)
College year	
Second year	375 (61.1)
Third year	134 (22.0)
Fourth year and over	103 (16.9)
Current residence	
Dormitory	436 (71.6)
Apartment	142 (23.3)
Home	19 (3.1)
Rented house	12 (2.0)
Housemate or roommate	
Share a room with single beds	319 (52.4)
None	179 (29.4)
Share a room with a shared bed	94 (15.4)
Have an individual room in a house	17 (2.8)
Cumulative grade point average (GPA)	
< 3.00	135 (22.2)
3.00 – 3.49	237 (38.9)
3.50 – 3.99	226 (37.1)
4.00	11 (1.8)
Median (Q1-Q3)	3.37 (3.00-3.64)
Hometown region	
Central	335 (55.2)
Northeast	89 (14.7)
South	68 (11.2)
East	65 (10.7)
North	26 (4.3)
West	24 (3.9)
Income per month	
< 6000 baht	234 (38.4)
6000 – 12000 baht	341 (56.0)

Factor	Number (%)
≥ 12000 baht	34 (5.6)
Mean ± SD	6519.3 ± 3022.6
Median (Q1-Q3)	6000 (4500-8000)
Conflict with other people in the past week	
No	490 (80.5)
Yes	119 (19.5)
Caffeine beverage consumption	
Yes	398 (65.4)
No	211 (34.6)
Stress level	
Mild	270 (44.3)
Moderate	194 (31.9)
High	100 (16.4)
Severe	45 (7.4)
Body mass index	
Underweight (< 18.5 kg/m ²)	113 (18.6)
Normal (18.5-22.9 kg/m ²)	314 (51.6)
Overweight (≥ 23.0 kg/m ²)	182 (29.8)
Mean ± SD	21.9 ± 4.3
Median (Q1-Q3)	21.1 (19.0-23.6)
Overall physical health in the past month	
Moderate	288 (47.3)
Strong	165 (27.1)
Weak	117 (19.2)
Very strong	29 (4.8)
Very weak	10 (1.6)
Physical illnesses in the past month	
Yes	483 (79.3)
No	126 (20.7)
Congenital disease	
No	355 (58.3)
Yes	230 (37.8)
Unknown	24 (3.9)
Taking medicine regularly (≥ 4 times per week)	
No	529 (86.9)
Yes	80 (13.1)
Taking dietary supplements regularly (≥ 4 times per week)	
Yes	410 (67.3)
No	199 (32.7)
Used health services in the past month	
Yes	350 (57.5)
No	259 (42.5)

Q1= first quartile; Q3= third quartile; SD=standard deviation; Unknown=not available

A summary of the participants' sleep quality scores is presented in Table 2. A majority of participants (57%) reported having fairly good subjective sleep quality. Sleep latency was also found to be favorable, with 42% of the participants reporting minor difficulty in falling asleep. Most individuals reported a sleep duration

of over 7 hours, and habitual sleep efficiency was excellent, with 65% reporting habitual sleep efficiency of ≥ 85%. Sleep disturbances were mostly low, with 73% of the participants reporting minimal disruptions. Furthermore, the use of sleep medications was infrequent, with 92% of the participants reporting no use of

sleep medicine during the previous month, indicating very good sleep practices. Daytime dysfunction was low, with 57% of participants indicating good overall functioning during the day. The average overall sleep quality score was 7.0 ± 3.0 .

However, 404 participants (66%) experienced poor sleep quality. Additionally, there was a significant difference between poor sleep quality and the frequency of sleep behavior, as shown in Table 3.

Table 2. Components of the Pittsburgh Sleep Quality Index (PSQI) and overall sleep quality

Components of the PSQI	Number (%)
1. Subjective sleep quality	
Fairly good	345 (56.7)
Fairly bad	179 (29.4)
Very good	63 (10.3)
Very bad	22 (3.6)
2. Sleep latency	
Minor problem	257 (42.2)
Moderate problem	179 (29.4)
Not at all a problem	94 (15.4)
Serious problem	79 (13.0)
3. Sleep duration	
> 7 hours	194 (31.8)
> 6 – 7 hours	146 (24.0)
> 5 – 6 hours	148 (24.3)
≤ 5 hours	121 (19.9)
4. Habitual sleep efficiency	
≥ 85%	393 (64.5)
75% – 84%	108 (17.8)
65 – 74%	64 (10.5)
< 65%	44 (7.2)
5. Sleep disturbance	
Low	444 (72.9)
Moderate	124 (20.4)
None	38 (6.2)
High	3 (0.5)
6. Use of sleeping medicine	
None	557 (91.5)
< 1 time per week	20 (3.3)
1 – 2 times per week	18 (2.9)
≥ 3 times per week	14 (2.3)
7. Daytime dysfunction	
Low	346 (56.8)
Moderate	135 (22.2)
None	114 (18.7)
High	14 (2.3)
Overall sleep quality	
Poor (global PSQI score > 5)	404 (66.3)
Good (global PSQI score ≤ 5)	205 (33.7)
Median (Q1-Q3)	7 (5-9)

PSQI=Pittsburgh Sleep Quality Index; Q1= first quartile; Q3= third quartile; SD=standard deviation

Table 3. Differences in poor sleep quality between aspects of sleep behavior frequency, analyzed using the chi-square test

Sleep behavior	Number of samples	Poor sleep quality (%)	p-value
Go to bed on time			<0.001
Never	159	80.5	
Sometimes	293	69.3	
Often	113	48.7	
Regularly	44	40.9	
Go to bed and wake up at the same time each day			<0.001
Never	116	79.3	
Sometimes	233	71.2	
Often	160	65.6	
Regularly	100	41.0	
Get out of bed immediately after waking up			0.001
Never	137	75.9	
Sometimes	270	68.9	
Often	131	58.8	
Regularly	71	52.1	
Drink a caffeinated beverage after noon			0.006
Never	236	59.3	
Sometimes	205	70.7	
Often	126	66.7	
Regularly	42	83.3	
Think about various problems while going to bed			<0.001
Never	51	41.2	
Sometimes	240	59.2	
Often	187	74.9	
Regularly	131	77.1	

Table 4. Analysis of factors associated with poor sleep quality using multiple logistic regression

Factor	Crude OR	95% CI	p-value	AOR	95% CI	p-value
Stress level			<0.001			<0.001
Mild	1			1		
Moderate	3.13	2.09 – 4.69		2.42	1.57 – 3.72	
High and severe	6.44	3.79 – 10.92		4.51	2.53 – 8.03	
Overall physical health in the past month			<0.001			0.002
Strong and very strong	1			1		
Moderate	2.77	1.89 – 4.05		2.04	1.36 – 3.06	
Weak and very weak	4.34	2.58 – 7.30		1.87	1.03 – 3.38	
Physical illnesses in the past month			<0.001			0.032
No	1			1		
Yes	2.96	1.98 – 4.43		1.64	1.04 – 2.57	
Current residence			0.436			
Home	1					

Factor	Crude OR	95% CI	p-value	AOR	95% CI	p-value
Apartment or rented house	1.87	0.72 – 4.90				
Dormitory	1.79	0.71 – 4.50				
Housemate or roommate			0.044			
None	1					
Have an individual room	2.34	0.73 – 7.47				
Share a room with single beds	1.67	1.14 – 2.45				
Share a room with a shared bed	1.54	0.91 – 2.60				
Conflict with other people in the past week			<0.001			
No	1					
Yes	2.63	1.60 – 4.32				
Congenital disease			0.005			
No	1					
Yes	2.42	0.89 – 6.62				
Unknown	1.72	1.20 – 2.47				
Taking medicine regularly			0.007			
No	1					
Yes	2.22	1.25 – 3.95				
Used health services in the past month			0.010			
No	1					
Yes	1.56	1.11 – 2.19				

AOR=adjusted odds ratio; CI=confidence interval; OR=odds ratio; Unknown=not available

The multivariate analysis revealed that high and severe stress levels were strongly associated with poor sleep quality;

moreover, physical health and illness were also related to poor sleep quality (Table 4).

Table 4. Analysis of factors associated with poor sleep quality using multiple logistic regression

Factor	Crude OR	95% CI	p-value	AOR	95% CI	p-value
Stress level			<0.001			<0.001
Mild	1			1		
Moderate	3.13	2.09 – 4.69		2.42	1.57 – 3.72	
High and severe	6.44	3.79 – 10.92		4.51	2.53 – 8.03	
Overall physical health in the past month			<0.001			0.002
Strong and very strong	1			1		
Moderate	2.77	1.89 – 4.05		2.04	1.36 – 3.06	
Weak and very weak	4.34	2.58 – 7.30		1.87	1.03 – 3.38	
Physical illnesses in the past month			<0.001			0.032
No	1			1		
Yes	2.96	1.98 – 4.43		1.64	1.04 – 2.57	

Factor	Crude OR	95% CI	p-value	AOR	95% CI	p-value
Current residence			0.436			
Home	1					
Apartment or rented house	1.87	0.72 – 4.90				
Dormitory	1.79	0.71 – 4.50				
Housemate or roommate			0.044			
None	1					
Have an individual room	2.34	0.73 – 7.47				
Share a room with single beds	1.67	1.14 – 2.45				
Share a room with a shared bed	1.54	0.91 – 2.60				
Conflict with other people in the past week			<0.001			
No	1					
Yes	2.63	1.60 – 4.32				
Congenital disease			0.005			
No	1					
Yes	2.42	0.89 – 6.62				
Unknown	1.72	1.20 – 2.47				
Taking medicine regularly			0.007			
No	1					
Yes	2.22	1.25 – 3.95				
Used health services in the past month			0.010			
No	1					
Yes	1.56	1.11 – 2.19				

AOR=adjusted odds ratio; CI=confidence interval; OR=odds ratio; Unknown=not available

DISCUSSION

This study identified the factors associated with sleep quality among undergraduate students in an entire university, with stress levels, physical health, and physical illnesses associated with poor sleep quality.

The present study found that the overall rate of poor sleep quality was 66%, which was slightly lower than the rates found in previous studies in Thailand. For example, one study found that 81% of undergraduate students in a large urban university had poor sleep quality, while another found that 74% of university students in southern Thailand had poor sleep quality. A third study found that 64% of medical students at a super tertiary care hospital had poor sleep quality.⁷⁻⁹ A global meta-analysis revealed that the estimated pooled prevalence of poor sleep quality

among medical students worldwide was approximately 57%.¹⁶ It is concerning that a large number of students suffer from poor sleep quality. Insufficient sleep can have negative effects on physical health and mental well-being, as well as cognitive function.¹⁷ Furthermore, research has shown that poor sleep quality, coupled with shortened sleep duration, late bedtimes and rise times, and inconsistent sleep and wake schedules, can have a detrimental impact on academic performance among young adults.¹⁷ However, our poor sleep quality rate was slightly lower than that found in some other studies. This may be because our participants were mostly in their second year of study; the results of a previous study on university students showed that older age was a significant predictor of poor sleep quality.¹⁸

Our findings suggest that individuals experiencing moderate to high

levels of stress are more likely to have poor sleep quality. Specifically, participants with high or severe stress levels were 4.51 times more likely to have poor sleep quality compared to those with mild stress. This result is in line with a study conducted on medical students in Saudi Arabia, which demonstrates that a high level of stress is a significant predictor of poor quality sleep.¹⁹ On the other hand, poor sleep quality was associated with 4.7 times higher stress levels compared to good sleep quality among University of Indonesia students.²⁰ A daily intensive longitudinal study demonstrated a bi-directional relationship between stress and total sleep time for both objective and subjective sleep measures²¹. Poor sleep quality and stress are interconnected and can have negative impacts on the academic performance and mental health of university students.²²

The present study also finds that individuals who have had moderate to very weak overall physical health in the past month are more likely to have poor sleep quality when compared to those who have had strong and very strong overall physical health in the past month. Additionally, those students who have experienced physical illnesses such as fever, runny nose, cough, diarrhea, aches, etc. in the past month are also more likely to have poor sleep quality. This aligns with a previous study that established a significant relationship between sleep quality and physical-health-related quality of life among university students from the University of Alicante,²³ and a study that found sleep duration and quality had direct and indirect effects on physical health among Chinese undergraduates aged 18 to 25 from 16 universities and colleges in Hong Kong and Macau.²⁴ A multi-instrument analysis study found that sleep quality was the strongest independent predictor of physical health outcomes in young healthy adults aged 18 to 30.²⁵

According to one review article, regularly getting less than 6 or 7 hours of sleep can damage the immune system that protects our body from harmful substances, germs, and cell changes that could make us ill.^{17, 26} Additionally, sleep helps to regulate our appetite and our ability to feel satisfied, and control body weight. Therefore, sleep deprivation causes unhealthy and impulsive food choices or more intense cravings¹⁷. However, there were some limitations in this study. Firstly, the health results of Srinakharinwirot University students studying at the Ongkharak campus were not solely influenced by the university environment as they usually returned home on weekends. Secondly, we used an online questionnaire, which may have led to participants selecting themselves for the sample, leading to social desirability bias.^{27, 28} Thirdly, since the study design was cross-sectional, it was not possible to determine the causal relationships.

CONCLUSION

The study showed that many Srinakharinwirot University students studying at the Ongkharak campus had poor sleep quality due to high stress levels, physical illnesses, and weak overall physical health.

RECOMMEDATIONS

To address this issue, we need more research to develop interventions to improve the sleep quality of university students. Our results clearly show that stress management in university students should be supported by providing stress reduction strategies for students as well as assessing students' stress levels continuously to evaluate the effectiveness of these solutions. University policies should also prioritize the importance of sleep quality for student well-being.

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