




THE EFFECT OF SLEEP QUALITY ON GRADE POINT AVERAGE AND CLINICAL EXAMINATION SCORES IN NORTHERN BORDER UNIVERSITY MEDICAL STUDENTS

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ABSTRACT

Objectives: Sleep disturbances are more common in medical students than in non-medical students and the general population. This study aimed to evaluate the sleep quality of medical students at Northern Border University in relation to their clinical examination scores.

Methods: We used a cross-sectional design that involved medical students in their clinical years at Northern Border University. A pre-designed questionnaire was administered online. The relationships between Grade Point Average (GPA) and Pittsburgh Sleep Quality Index (PSQI) and GPA and Epworth Sleepiness Scale (ESS) were evaluated using correlation coefficients. IBM SPSS (version 26, SPSS Inc., Chicago, IL, USA) was used.

Results: A total of 247 students participated in the study. The leading cause of disturbed sleep was the inability to sleep within 30 min. Suffering from mild to very severe difficulty in falling asleep was found in (58.7%), followed by "difficulty staying asleep" in (41.7%) and "problems waking up too early" in (38.9%). Regarding the impact of sleep quality on clinical test scores, (59.9%) indicated that it has a negative effect. There was a weak negative correlation between students' GPA and ESS, as well as GPA and PSQI.

Conclusion: A significant percentage of the study group had bad sleep quality. The most important reasons for the bad sleep quality were difficulty staying asleep and waking up early. Most of the study group came to the clinical examinations without sleeping the night before, negatively affecting their examination scores. The study found a significant negative correlation between sleep quality and academic performance.

Keywords: Sleep quality, Clinical examination scores, Academic performance, Insomnia severity index, Epworth sleepiness scale, Pittsburgh sleep quality index.

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INTRODUCTION

Clinical examinations are an essential part of medical students' evaluation. Studies showed that sleep disturbances are more common in medical students than in non-medical students and the general population. Furthermore, poor sleep quality has a negative impact on their academic performance [1].

Low sleep quality has a significant impact on clinical performance. There are many studies that prove the relationship between sleep, studying, and thinking [2]. Students of different education levels were found to be sleep deprived or suffer from poor sleep quality, which is the reason for daytime sleepiness; also, poor declarative and procedural learning in students is most likely to be associated with sleep loss, that sleep quality and quantity are closely affecting student learning capacity and academic performance; and that all studies in which sleep was actively restricted or optimized showed, worsening or improvement in neurocognitive and academic performance, respectively [3]. Poor sleep quality was found to have a negative impact on the test performed as well, which will create a vicious circle. In addition, the rate of sleep disturbances in medical students should be a cause for intervention [4,5]. A cross-sectional study utilized the questionnaire of the Pittsburgh Sleep Quality Index (PSQI) and the Epworth Sleepiness Scale (ESS) at the Faculty of Medicine and Pharmacy of Rabat, Morocco, to determine the quality of sleep and excessive daytime sleepiness concluded that the poor quality of sleep determined by PSQI ≥ 5 was the cause of

poor academic performance at the end of the study year in medical students [6,7].

Here, in Saudi Arabia, a study at King Saud University concluded that there is a high prevalence of sleep disorders found in medical students, specifically females. The relationship between disordered sleep and academic performance was analyzed, and a significant relationship was found between abnormal ESS scores, total sleeping hours, and academic performance [8,9]. Furthermore, it has been found that decreased nocturnal sleep, late bedtime on weekdays and weekends, and increased daytime sleepiness have negative associations with the academic performance of medical students [10].

Another study at King Khalid University showed that medical students at KKKU have poor sleep quality. The most important problems in this group are longer sleep latency, going to sleep after midnight, and shorter sleep duration [11]. Another study in Taif University showed that sleep quality was negatively associated with academic performance in medical students [12]. It seems highly recommended that health education should be encouraged to improve sleep quality and promote the students' lifestyles [13].

Our proposed study aims to evaluate the sleep quality of medical students in the clinical years at Northern Border University and correlate it with their clinical examination scores. By doing so, we hope to shed light on the impact of sleep quality on academic

performance, particularly in clinical examinations where limited data are currently available. We believe that this study will not only enhance our understanding of the issue but also pave the way for effective interventions to improve sleep hygiene and, consequently, academic performance [14].

In the Department of Medicine at Northern Border University, 40% of the final score is commonly given to the clinical examination evaluation, which consists of a long case, short case, and Objective Structured Clinical Examination. We noticed that our students' performance differed from their usual active participation in the clinical bedside sessions. When asked about their sleep, they barely had any, if not at all, the night before the examination. The objective of this study was to evaluate the sleep quality of the medical students at Northern Border University in relation to the clinical examination scores.

METHODS

Study design and setting

This is a cross-sectional study that involved medical students in the clinical years at Northern Border University as participants in the period from February 15, 2023 to April 15, 2023. We used a self-administered questionnaire directed to medical students in clinical years who had at least one clinical examination experience.

Inclusion criteria

Medical students who had a clinical examination in the first-semester academic year 2022–2023 in the 4th, 5th, and 6th clinical years were included in the study.

Exclusion criteria

Medical students in the 3 years of basic sciences and other non-medical students at Northern Border University were excluded from the study.

Sample size

Two hundred forty-seven students participated in this study.

Sampling techniques

We used a random selection method till we collected data from 247 participants.

Data collection method

A pre-designed questionnaire based on the PSQI [15], Insomnia Severity Index [16], and ESS [17] was administered online.

Ethical considerations

Research Ethics Committee at the Northern Border University approved the study (HAP-09-A-043) no. (32/43/H) dated on March 02, 2022. The informed consent form was uploaded with the pre-designed questionnaire online. Students were also asked to provide their university identification numbers for the correlation between their Grade Point Average (GPA) and clinical examination scores.

Data management and analysis

Descriptive statistics, including counts and percentages, were presented for qualitative variables. The relationships between GPA and PSQI and GPA and ESS were evaluated using correlation coefficients. The significance of the correlations was tested, with a p-value considered significant if <0.05*. IBM SPSS (version 26, SPSS Inc., Chicago, IL, USA) was used to facilitate data analysis.

RESULTS

A total of 247 students participated in the study; 104 (42.1%) were males, and 143 (57.9%) were females. The mean GPA was 4.25 out of 5, with a standard deviation of 0.58. Table 1 shows the reason for trouble in sleeping with "Cannot get to sleep within 30 min" as the leading reason, followed by "Wake up in the middle of the night or early morning" while the other reasons were uncommon. Regarding insomnia problems, 145 (58.7%) participants suffer from mild to very severe difficulty in falling asleep, followed by "difficulty staying asleep" (41.7%) and "problems waking up too early" (38.9%), as shown in Table 2.

Table 1: Reason for trouble sleeping

During the past month, how often have you had trouble sleeping because you	Not during the past month (1)	Less than once a week (2)	Once or twice a week (3)	Three or more a week (4)	Total number of participants	Mean±Standard Deviation
Cannot get to sleep within 30 minutes						
Count	85	42	49	71	247	2.43±1.51
Percent	34.4	17	19.8	28.7	100	
Wake up in the middle of the night or early morning						
Count	96	45	52	54	247	2.26±1.41
Percent	38.9	18.2	21.1	21.9	100	
Have to get up to use the bathroom						
Count	135	59	29	24	247	1.76±1.00
Percent	54.7	23.9	11.7	9.7	100	
Cannot breathe comfortably						
Count	196	24	22	5	247	1.34±0.52
Percent	79.4	9.7	8.9	2	100	
Cough or snore loudly						
Count	211	19	12	5	247	1.24±0.40
Percent	85.4	7.7	4.9	2	100	
Feel too cold						
Count	164	39	24	20	247	1.60±0.92
Percent	66.4	15.8	9.7	8.1	100	
Feel too hot						
Count	173	44	20	10	247	1.46±0.66
Percent	70	17.8	8.1	4	100	
Have bad dreams						
Count	117	66	42	22	247	1.87±0.99
Percent	47.4	26.7	17	8.9	100	
Have pain						
Count	185	27	19	16	247	1.46±0.79
Percent	74.9	10.9	7.7	6.5	100	

Table 2: Participants views on insomnia problems

Insomnia problem	None (1)	Mild (2)	Moderate (3)	Severe (4)	Very Severe (5)	Moderate or more (3 to 5)	Total	Mean±Standard Deviation
Difficulty falling asleep								
Count	102	62	50	20	13	83	247	2.11±1.41
Percent	41.3	25.1	20.2	8.1	5.3	33.8	100	
Difficulty staying asleep								
Count	144	57	25	14	7	46	247	1.72±1.09
Percent	58.3	23.1	10.1	5.7	2.8	18.6	100	
Problems waking up too early								
Count	151	36	30	18	12	60	247	1.80±1.43
Percent	61.1	14.6	12.1	7.3	4.9	24.3	100	

Table 3: Sleep quality and satisfaction with sleep patterns

Variable	Variable levels (score)	Count	Percent	Mean±Standard Deviation
During the past month, how would you rate your sleep quality overall?	Very good (4)	49	19.8	2.69±1.12
	Fairly good (3)	117	47.4	
	Fairly bad (2)	37	15	
	Very bad (1)	44	17.8	
	Total	247	100	
How satisfied/dissatisfied are you with your current sleep pattern?	Very Satisfied (5)	24	9.7	2.96±1.22
	Satisfied (4)	53	21.5	
	Moderately Satisfied (3)	80	32.4	
	Dissatisfied (2)	70	28.3	
	Very Dissatisfied (1)	20	8.1	
	Total	247	100	

Table 3 summarizes students' evaluation of their sleep quality in the past month and their satisfaction with their current sleep patterns. Out of them, 49 (19.8%) indicated very good quality, 117 (47.4%) indicated fairly good quality, 37 (15%) indicated fairly bad quality, whereas 44 (17.8%) indicated very bad quality. Regarding students' satisfaction/dissatisfaction with their current sleep patterns, 70 (28.3%) and 20 (8.1%) were dissatisfied and very dissatisfied, respectively. Out of the participants, 179 (73.7%) indicated that in most clinical tests, they came to the test without sleeping. With regard to the impact of sleep quality on test scores, 148 (59.9%) indicated that it has a negative effect (Table 4). When conducting correlation analysis between GPA and ESS as well as GPA and PSQI, the results showed a negative correlation coefficient of -0.18 and -0.13 with p-values of **0.005 and *0.041, respectively. This indicates a statistically significant weak negative correlation (Table 5).

DISCUSSION

All human beings need adequate sleep for normal functioning and well-being. Sleep habits and sleep disturbances are affected by many influences, including physical, mental, social, and environmental, such as age, sex, occupation, lifestyle, stress, and noise. Adults must sleep for between 7 and 9 h each night. Sleep quantity and quality are essential for the proper psychological and physical well-being of individuals [6].

In our study, 247 medical students participated; 42.1% were males, and 57.9% were females. All of them were in the clinical phase (4th, 5th, or 6th year).

In our study, almost 67% of the participants evaluated their sleep as very good or good quality, while 33% as very bad or bad quality. Many studies worldwide approved the relationship between sleep, learning, and memory processes [18]. The findings support that students of different education levels (from school to university) are chronically sleep-deprived or suffer from poor sleep quality, which results in daytime sleepiness, and that poor declarative and procedural learning in students is frequently associated with sleep loss. Sleep quality and quantity are closely affecting student learning capacity and academic

Table 4: Sleep behavior during the clinical tests and students' perception of sleep quality on test scores

Variable	Variable levels	Count	Percent
In most tests, do you come to the test and you do not sleep?	Yes	179	73.7
	No	64	26.3
	Total	243	100.0
From your perspective, do you think that your sleep quality affects negatively or positively or does not affect your test scores?	Positive	34	13.8
	No effect	65	26.3
	Negative	148	59.9
	Total	247	100.0

Table 5: Correlation between sleeping quality and GPA

GPA	Correlation coefficient	p-value
GPA versus ESS	-0.18	0.005**
GPA versus PSQI	-0.13	0.041*

GPA: Grade point average, ESS: Epworth sleepiness scale, PSQI: Pittsburg sleep quality index

performance, and all studies in which sleep was actively restricted or optimized showed worsening or improvement in neurocognitive and academic performance, respectively [19,20]. In Germany, a study showed that in medical students, it is not the generally poor sleepers who perform worse in the medical board examinations; instead, studies showed that students will perform worse on their examinations when they are more stressed and suffer from poor sleep quality [21]. As in our study, a similar result of poor sleep quality (32.5%) was reported in Nigeria [22]. Studies done in Malaysia, Ethiopia, and Saudi Arabia showed poor sleep quality results of 44.23%, 55.8%, and 63.2% in medical students, respectively [23-25]. Studies done in Rwanda, Kazakhstan, and Brazil showed very high results of poor-quality sleep, reaching 80% of the study group of medical students [26-28]. The reasons for poor sleep quality in our participants were difficulty falling asleep (58.7%), difficulty staying asleep (41.7%), and waking up early

(38.9%). This is most likely due to the stress faced during preparation for examinations because of the high academic burden. In other countries, there are other reasons for stress, like financial demands, which are not present in our study group. A study done on Mexican medical students has found symptoms of stress, anger, worry, cognitive hyperarousal, and hypervigilance which are the predominant causes of poor quality of sleep [29].

Sleep deprivation among medical students was found to lead to sleepiness during the daytime, cause medical errors, road traffic accidents, and, most importantly, a decrease in academic performance [30,31]. The results of the study done in Rwanda were almost comparable to our results, where more than half (53.5%) of the participants were found to have difficulties falling asleep [26].

Although in our study, the second and third most important reasons for bad quality sleep were difficulty staying asleep (41.7%) and waking up early (38.9%), in the Mexico study, the percentages were 6.3% and 11.4%, respectively.

In our study, 73.7% of the participating students come to most clinical examinations without sleeping, which causes decreased concentration, sleepiness, and fatigue. According to 59.9% of the participants, this habit negatively affected examination scores. Other studies also demonstrated a significant negative correlation between sleep duration on the nights before the examinations and sleep quality, which affects examination scores. Students usually tend to change the duration of sleep before examinations: This change and delay lead to a change in the circadian rhythm, leading to poor sleep quality and negatively affecting examination scores [32,33]. Another study concluded that medical students have reduced sleeping hours when approaching their clinical years, possibly due to increased academic load [34].

A study in the United States of America reported that on the final examination, the students who slept 8.0 h or more performed better than those who slept 7.9 h or less [35].

In our study, the correlation between the students' GPA and the ESS was -0.18 , with a $p=0.005$, and the correlation between the students' GPA and the PSQI was -0.13 with a $p=0.041$, indicating a significant negative correlation between the GPA and the sleep quality. One study done at King Abdulaziz University to study the effect of sleep quality and mental health on academic performance concluded that there is no effect of sleep quality and mental health on the GPA; rather, they increased depression, anxiety, and stress [36]. The same result was reached by a study done at Kermanshah University of Medical Sciences [37].

According to a study done in Brazil, medical students were more prone to sleep disturbances than other non-medical students, and students in the basic years were more affected than students in the clinical years because they had worse subjective sleep quality [38]. A study done at Zagazig University 4th-year medical students found that the prevalence of poor sleep was 25.5% and that there was a significant effect of poor sleep quality on GPA and physical activity during the day [39].

Similar to our results, one study reported poor sleep quality the night before the clinical examination in 34.7% of the study group, significantly affecting the clinical examination scores [40].

Study limitations

Our study utilized a cross-sectional design, and because of this, academic performance and sleep variables were collected simultaneously, and questions regarding the recent past were used. This type of inquiry limited the ability to draw causal relations because these relationships' temporality cannot be established. In addition, recall bias will most likely influence the findings' validity. There is a need for longitudinal studies examining the association between academic performance and sleep quality, which may help differentiate between subject variation at a given time and within subject variation over time. The study limitations include the absence of an assessment of factors that may

influence some students' choice to wake up all night and sleep during the day, such as the student's sleep habits, housing, living arrangements, and relevant lifestyle factors.

CONCLUSIONS

A significant percentage of the study group had bad quality of sleep. The most important reasons for the bad sleep quality were difficulty falling asleep, difficulty staying asleep, and waking up early. Most of the study group came to the clinical examinations without sleeping the night before, negatively affecting their examination scores. The study found a significant negative correlation between sleep quality and academic performance.

Students may benefit from educational sessions highlighting the strong association between low academic performance and poor sleep quality. Counselling students and encouraging them to adopt habits that can improve their sleep quality and academic performance, such as increasing the duration of sleep, setting an early bedtime, and getting enough sleep before exams, was necessary. Developing policies in the College of Medicine that can promote healthy and adequate sleep among medical students can have significant changes in their academic performance and overall well-being.

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AUTHORS CONTRIBUTION:

Abdulrahman M A, Almujtaba A, and Mohammed O A came up with the study concept and the research objective. In addition, they were engaged in various aspects of the study, including designing the research, determining the intellectual content, doing literature searches, and collecting data. Furthermore, they were responsible for creating and editing the manuscript, as well as reviewing it. Zakariya M S M: Contributed significantly to the study by participating in the design, defining the intellectual aspects, doing literature searches, collecting data, and analyzing and interpreting data. Hafiz O A. and Omaima H A.: Developed the framework for the study and were also responsible for literature search, study design, defining intellectual content, collecting data, and reviewing the manuscript.

CONFLICT OF INTEREST

Researchers declare that there was no conflict of interest.

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