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ORIGINAL ARTICLE

Does stress affect medical students' sleep quality? A cross-sectional study at Menoufia University, Egypt

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Background	Medical school is a stressful atmosphere. That is why medical students minimize their sleep hours to gain extra time for improved academic achievement.
Aim	The research aimed to assess the prevalence of medical students' sleep quality and psychological stress and their association.
Patients and Methods	This cross-sectional study included 381 Menoufia University medical students from March to May 2022. The Pittsburgh Sleep Quality Index and the Kessler Psychological Distress Scale were used to measure medical student stress.
Results	The mean age of the participants was 21.5±2 years and 18.1% were males. There was a statistically significant association (P= 0.01) between a higher incidence of poor sleep quality (49.6%) and stress (91.2%). Students with less stress sleep better, according to logistic regression analysis (odds ratio= 0.504, P <0.01).
Conclusions	There was a statistically significant association between medical students' psychological pressures and poor sleep quality.
Keywords	Medical students, Sleep quality, Stress.

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INTRODUCTION

Globally, medical students describe stress as one of the most significant issues. It is described as the 'wear and tear' the body undergoes while adapting to pressure or a stressful circumstance (Behere *et al.,* 2011). Medical school is a stressful atmosphere for a variety of reasons. There are multiple academic reasons for this, including many academic requisites, complex, challenging, and varied types of tests (Sreeramareddy *et al.,* 2007; Waqas *et al.,* 2015). It has been found that stress has a positive effect on the studying process and physiological function (favorable stress) but also (distress or unfavorable stress) damages the physical and emotional well-being of medical students (Dahlin *et al.,* 2005). Excessive amounts of stress may impact cognitive functioning, attention, and academic achievement (Dahlin *et al.,* 2005).

Sleep is considered a necessary therapeutic process for human physiology, as it is essential for normal mental health with better brain function and life quality (Colten *et al.,* 2006). Sleep deprivation reduces cognitive function in students, including focus and assessed effort to accomplish tasks (Pilcher and Walters, 1997). Sleep deprivation negatively affects human biology, including exhaustion, daytime sleepiness, and decreased neurocognitive function (Aldabal and Bahammam, 2011). Poor sleep quality has been shown to increase the likelihood of students failing in their examinations and being depressed in several studies conducted in India, Australia, the United States, and other countries (Vanderlind *et al.,* 2014; Menon *et al.,* 2015). Medical students attempt to sleep less to devote more time to studying. So, they adopt terrible sleeping patterns,

particularly in the weeks before a test (Ratcliff and Van Dongen, 2009).

To date, medical students in Egypt have not been studied regarding the association between stress and sleep quality. As a result, we conducted research to assess the prevalence of medical students' sleep quality and psychological stress and their association.

PATIENTS AND METHODS

Participants

An observational cross-sectional study was carried out on medical students from March 2022 to May 2022 at Menoufia University. The study was approved by the IRB, Faculty of Medicine, Menoufia University and was conducted according to the Declaration of Helsinki and its later amendment. Informed consent was taken from each medical student who agreed to participate and publish.

Study population

The inclusion criterion included every medical student who volunteered to participate in the research and gave their consent.

Exclusion criteria include nonmedical students, students with any previous or current history of psychiatric illness, caffeine, nicotine, and alcohol intake, and students taking sedative medication for any medical problems.

Data collection

The survey was shared through social media platforms such as Facebook, WhatsApp, and telegram groups. The principal investigators stored all the gathered data confidential until the end of the data collection period. Then all data will be collected, cleaned, coded, and prepared for analysis.

Sample size: the study calculation process rendered 381 participants at least to achieve a 95% confidence interval (CI), 5% margin of error, and 50% response distribution, using the Raosoft sample size calculator.

Informed consent

Informed consent was taken from each medical student who agreed to participate and publish. The consent was attached as the first question in the questionnaire, whether the participants agreed to continue or not. No names, emails, addresses, or other identifying information was required. All data were kept private. All the participants have the right to complete or withdraw from the study at any time.

Study tools

The questionnaire included:

1. Items on sociodemographic characteristics (sex, academic year, score, residency).
2. Measures of psychological distress, sleep quality, and academic performance: the Pittsburgh Sleep Quality Index was used to determine the quality and patterns of sleep for the previous month. The questions used a four-point Likert scale (0–3). They studied sleep quality, latency, duration, habitual efficiency, sleep disruptions, and the use of sleeping drugs were all examined in this study. A cumulative score, also known as the global score (0–21), was calculated by adding the results from each component. Severe sleep quality range from 15 to 21, moderate sleep quality from 8 to 14, and mild sleep quality from 1 to 7. Utilizing the Kessler Psychological Distress Scale, medical students' stress levels were studied to determine their prevalence and incidence. Ten items on the Kessler Psychological Distress Scale measured anxiety and depression symptoms during the preceding month. The five-point scale items were rated between 10 and 50. More than 30 indicates severe distress, whereas 25 to 29 suggests moderate and 20 to 24 indicates mild distress.

Statistical Analysis

IBM Statistical Package handled SPSS (Giza, Cairo, Egypt) version 22 data for the Social Sciences. We used frequency and percentage for categorical data, while for continuous data, we used mean and SD. Pearson's χ^2 test investigated the association between sleep quality, stress, and demographic variables. The odds ratio (OR) and 95% CI will be calculated using binary logistic regression to identify the determinants of sleep quality. A two-sided *P* value of less than 0.05 was deemed statistically significant.

RESULTS

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About 81.9% of the study group were females; most were in the fifth grade, more than half had a good score, and 32.3% had an excellent score; 92% lived with their families, and more than half of the 52.5% had a physician in the family. More than half had less than 7 h of actual sleep at night (Table 1).

There was a significant relationship between sleep quality and stress (*P*= 0.0041); however, there was no significant association between sex, academic year, physician among family, or stress (*P*= 0.161, 0.552, and 0.059, respectively) (Table 2).

There was a significant association between sex and sleep quality (*P*= 0.048). However, there was no significant association between academic year, physician among family, and sleep quality (*P*= 0.449 and 0.274, respectively) (Table 3).

As indicated in Table 4, the predictors of sleep quality were determined using binary logistic regression (the dependent variable). It reveals a lower risk of poor sleep quality among students who were not stressed (OR= 0.504, 95% CI: 0.283–0.880). A significant predictor of poor

sleep quality was a physician's father, sibling, or brother's medical student (OR= 0.924, 95% CI: 0.741–1.152).

Table 1: Participants' demographics and characteristics (*N*= 381):

Characters	Level	*n* (%)
Sex	Male	69 (18.1)
	Female	312 (81.9)
Academic year	The first	21 (5.5)
	Second	45 (11.8)
	Third	38 (10.0)
	Fourth	41 (10.8)
	Fifth	206 (54.1)
	Sixth	30 (7.9)
Score	Bad	11 (2.9)
	Fair	51 (13.4)
	Good	196 (51.4)
	Excellent	123 (32.3)
Living with family	No	30 (7.9)
	Yes	351 (92.1)
Physician among family	No	181 (47.5)
	Yes	200 (52.5)
Time to go to bed	Before 00:00	80 (21.0)
	00:00–00:59	100 (26.2)
	01:00–01:59	80 (21.0)
	02:00–02:59	66 (17.3)
	After 3:00	55 (14.4)
Morning wake-up time	Before 6:00	25 (6.6)
	6:00–6:59	56 (14.7)
	7:00–7:59	87 (22.8)
	8:00–8:59	90 (23.6)
	After 9:00	123 (32.3)
Hours of actual sleep at night	£7 h	206 (54.1)
	>7 h	175 (45.9)

DISCUSSION

It is common for medical students to attempt to cut down on their sleep time because of the stress and lack of time they experience throughout their academic year. This study found that medical stude nts in Egypt have a high prevalence of poor sleep quality, which is consistent with other studies conducted on a sample of medical students at Assiut and Mansoura Universities (Elwasify *et al.,* 2016).

Almojali *et al.,* (2017) found a significant incidence of psychological stress (53%) and a high, maybe worrying, prevalence of poor sleep quality (76%). This study's findings were similar to those of earlier studies done in other nations, such as the United States (57%) (Mosley *et al.,* 1994), Thailand (61%) (Saipanish, 2003), and

Table 2: Relationship between stress and the factors studied:

	Stress [*n* (%)]			
Variables	**Well**	**Stressed**	χ^2	***P* value**
Sleep quality				
Poor	9 (24.3)	178 (51.7)	7.704	0.004
Good	28 (75.7)	166 (48.3)		
Sex				
Male	4 (10.8)	65 (18.9)	1.472	0.161
Female	33 (89.2)	279 (81.1)		
Academic year				
The first	3 (8.1)	18 (5.2)		
Second	2 (5.4)	43 (12.5)		
Third	2 (5.4)	36 (10.5)	3.983	0.552
Fourth	4 (10.8)	37 (10.8)		
Fifth	24 (64.9)	182 (52.9)		
Sixth	2 (5.4)	28 (8.1)		
Physician among family				
No	22 (61.1)	158 (45.9)	3.013	0.059
Yes	14 (38.9)	186 (54.1)		

Table 3: Relationship between sleep quality and the factors studied:

	Sleep quality [*n* (%)]			
Variables	**Poor**	**Good**	χ^2	***P* value**
Sex				
Male	25 (14.3)	44 (21.4)	3.192	0.048
Female	150 (85.7)	162 (78.6)		
Academic year				
The first	13 (7.4)	8 (3.9)		
Second	20 (11.4)	25 (12.1)		
Third	15 (8.6)	23 (11.2)	4.735	0.449
Fourth	15 (8.6)	26 (12.6)		
Fifth	99 (56.6)	107 (51.9)		
Sixth	13 (7.4)	17 (8.3)		
Physician among family				
No	79 (45.4)	101 (49.0)	0.498	0.274
Yes	95 (54.6)	105 (51.0)		

Table 3: Sleep quality indicators:

		Poor sleep quality		
	Level	**Significance**	**OR**	**95% CI**
Stress	Positive*	0.006*	0.504	0.283–0.899
	Negative			
Physician among family	No	0.536*	0.924	0.741–1.152
	Yes*			

CI, confidence interval; OR, odds ratio.

Pakistan (60%) (Waqas *et al.,* 2015). In contrast, it was greater than the Malaysia study (42%) (Sherina *et al.,* 2004). In addition, the frequency of poor sleep quality was more than that reported in the existing literature (Brick *et al.,* 2010), ranging from 30 to 59% (Brick *et al.,* 2010; Preišegolavicˇiu-te˙ *et al.,* 2010; Abdulghani *et al.,* 2012; Alsaggaf *et al.,* 2016).

Almojali *et al.,* (2017) found a significant incidence of psychological stress (53%) and a high, maybe worrying, prevalence of poor sleep quality (76%). This study's findings were similar to those of earlier studies done in other nations, such as the United States (57%) (Mosley *et al.,* 1994), Thailand (61%) (Saipanish, 2003), and Pakistan (60%) (Waqas *et al.,* 2015). In contrast, it was greater than the Malaysia study (42%) (Sherina *et al.,* 2004). In addition, the frequency of poor sleep quality was more than that reported in the existing literature (Brick *et al.,* 2010), ranging from 30 to 59% (Brick *et al.,* 2010; Preišegolavicˇiu-te˙ *et al.,* 2010; Abdulghani *et al.,* 2012; Alsaggaf *et al.,* 2016).

The Saudi Commission for Health Specialties has recently established new criteria for admission to postgraduate education programs. In addition to their academic burden, medical students must publish research, participate in conferences, engage in seminars, and arrange social/community activities to be accepted (Saudi Commission for Health Specialties, 2016). Furthermore, the rarity of residency opportunities in Saudi Arabia puts Saudi medical students in a difficult and stressful position when trying to get into their first choice of residency. These findings may provide light on the high incidence of poor sleep quality between the Saudi study (76%) and earlier local results 37% at King Saud University (Abdulghani *et al.,* 2012) and 30% at King Abdul Aziz University (Alsaggaf *et al.,* 2016), which were conducted before the implementation of the Saudi Commission for Health Specialties acceptance criteria. Furthermore, according to the research, medical students cut their sleeping hours to meet many academic obligations. Moreover, stress and lack of sleep among Saudi medical students are causes for concern. They may impact their well-being, psychological and physical health, and academic performance, hindering their future capacity to offer high-quality patient care. This study found a strong correlation between medical students' stress levels and sleep quality. It demonstrates that stress strongly predicts and contributes to poor sleep quality. This was comparable to earlier studies conducted at a Pakistani private medical school, which found a significant link between sleep deprivation and poor academic performance (Waqas *et al.,* 2015). Various studies indicate that stress and sleep are physiologically connected to the hypothalamic–pituitary–adrenal axis, which may clarify their strong association (Van Reeth *et al.,* 2000; Morin *et al.,* 2003; Steiger, 2003; Kashani *et al.,* 2012). A reduction in slow-wave and rapid eye movement activity is linked to acute stress. Circadian rhythms and sleep architecture are substantially affected by stress (Morin *et al.,* 2003). These specific changes in the sleep electroencephalogram have also been found in those suffering from depression (Steiger *et al.,* 2013). Due to various academic obligations, medical students are frequently compelled to cut down on their sleep schedules to increase their study time. However, they may not prioritize sleep over studying and other academic needs. As a result, individuals become sleep deprived and anxious in the weeks before an exam (Ahrberg *et al.,* 2012). This is confirmed by participants' responses to the Pittsburgh Sleep Quality Index question, 'How often have you experienced trouble sleeping due to other reason(s)? Please explain,' where stress was the most prevalent reply. Responses like 'starting to review at night,' 'overthinking my future,' 'concentrating on my research project,' and 'exam anxiety.' As a result, students become caught in a vicious loop of attempting to cope with their many academic demands and pressures by limiting their sleep time, leading to poor sleep quality and sleep deprivation, raising stress. This cycle necessitates interventions that promote excellent sleep hygiene and teach medical students new skills (such as time management) so that they can handle the high demands of their demanding and competitive profession. On the basis of prior research (Ahrberg *et al.,* 2012; Bahammam *et al.,* 2012), the findings indicate a substantial relationship between sleep quality and cumulative GPA. According to the study, GPA was a significant indicator of sleep quality, with students with a GPA of less than 4.25 (out of 5) experiencing bad sleep. Sleep deprivation has long been linked to lower focus, memory problems, and impaired academic performance. However, many sleep-deprived students are unaware that their ability to concentrate and execute mental tasks might be seriously harmed by their lack of sleep (Ahrberg *et al.,* 2012; Bahammam *et al.,* 2012). Furthermore, they expected to do better in exams and reported greater levels of anticipated performance (Pilcher and Walters, 1997). As a result, appropriate interventions must be done to increase students' comprehension of the need for good sleep quality and the negative consequences of sleep deprivation.

Our data showed an intriguing finding: poor sleep quality is more common among medical students whose families include one or more doctors. This contradicts our theory that being a medical student in a physician's family is advantageous due to greater environmental and time management counseling in medical schools. However, various research studies have identified high parental expectations as one of the most common and severe stressors among medical students whose parents are physicians (Sreeramareddy *et al.,* 2007; Waqas *et al.,* 2015).

In the research by Almojali *et al.,* (2017), no strong association was found between sex and stress or sleep quality. These results are comparable with previous

studies, which found no link between sex and sleep quality or stress levels (Cohen *et al.,* 1993; Brick *et al.,* 2010; Preišegolaviciu-te *et al.,* 2010; Bahammam *et al.,* 2012; Abdel Rahman *et al.,* 2013; Waqas *et al.,* 2015). In contrast, a few studies (Shah *et al.,* 2010; Abdulghani *et al.,* 2011) have found that being a female medical student significantly predicts high stress and sleep disturbance (Abdulghani *et al.,* 2012). Meanwhile, the present study's approach limits the scope of research on sex differences. More research is needed to examine these discrepancies.

Furthermore, no significant association was identified between sleep quality and coffee intake frequency. This surprising finding was reported in a few prior research, which indicated no significant relationship between caffeine consumption and sleep quality (Brick *et al.,* 2010; Bahammam *et al.,* 2012; Alsaggaf *et al.,* 2016). According to several studies, coffee consumption has been linked to an increased risk of insomnia and daytime fatigue (Lemma *et al.,* 2012; Giri *et al.,* 2013; Tran *et al.,* 2014; Whittier *et al.,* 2014). The present research did not examine tea or coffee consumption appropriately. More research is required to determine the association between the quantity, kind, and time spent consuming caffeinated drinks and sleep quality.

CONCLUSION

A high prevalence of stress was associated with poor sleep quality among the medical students of the Faculty of Medicine, Menoufia University. As a result, stress was shown to be the most significant indicator of poor sleep quality.

RECOMMENDATIONS

Future studies involving multiple Egyptian medical schools are encouraged to estimate the exact prevalence of stress and poor sleep quality in Egypt and to determine whether poor sleep quality increases stress or is a consequence of a high-stress level.

Medical students must be counseled on sleep hygiene and the detrimental repercussions of poor sleep quality. A suggestion for medical school administration in Egypt is to construct academic counseling centers that strengthen students' study abilities and cope with their demanding environment.

LIMITATIONS

Because it is cross-sectional, it may suffer from recall bias. Furthermore, the study sample represents a single medical school, so the results may not apply to all Egyptian medical students.

We did not have sufficient information about caffeine intake in the study population. Therefore, the present study might be susceptible to confounding bias. Future studies should consider adjusting for dietary factors that might be assessed with sleep disturbance.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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