

## Assessment of Sleep Quality and Perceived Stress during COVID-19 Pandemic among Students in the Faculty of Medicine Suez Canal University

Rana E. Mansour<sup>1</sup>, Hanan A. Abdelrahman<sup>1</sup>, Reham M. Abo Emara<sup>1</sup>, Amira E. Elfouly<sup>1</sup>

<sup>1</sup> Department of Family Medicine, Faculty of Medicine, Suez Canal University, Ismailia, Egypt

**Background:** Sleep quality and stress are interrelated during the COVID-19 pandemic. Studies in different parts of the world revealed that sleep quality was lower during the lockdown period compared to the pre-lockdown period. In particular, undergraduate medical students had low sleep quality and high stress. **Objectives:** To assess the sleep quality and perceived stress of medical students at Suez Canal University during the pandemic. **Methods:** A cross-sectional study was conducted on students in the faculty of medicine at Suez Canal University. This was achieved through an online self-administered questionnaire-based study using the Pittsburgh Sleep Quality Index and perceived stress scale questionnaires. The study was conducted on 116 students collected through a stratified systematic sampling technique during the 2021-2022 academic years. **Results:** The level of perceived stress among medical students measured by the perceived stress scale (PSS) showed that about 94.8% of medical students had moderate to high levels of perceived stress. The disturbance in sleep quality among students by the Pittsburgh Sleep Quality Index showed that students who scored > 5 (had sleep disturbance) in the sleep index formed 83.6% of the total medical students. **Conclusion:** Providing mental wellbeing to medical students is crucial for ensuring the sustainability of their participation in healthcare services in the future. Our findings concluded that stress and sleep quality in medical students affected each other during the COVID-19 pandemic and should be followed closely.

**Keywords:** COVID-19; Medical students; Perceived stress; Sleep Quality.

### Introduction

Since the reported group of patients with fever, cough, and pneumonia symptoms in Wuhan—China, the coronavirus has spread worldwide to over 2 million people. The World Health Organization (WHO) announced the disease as a pandemic.<sup>(1, 2)</sup>


The COVID-19 pandemic affected internet use and sleep habits among medical students. The excessive or problematic use of the internet changed sleep habits. University students from all over the world reported a similar problem. Medical students rank the highest in terms of the prevalence of

poor sleep and poor quality of life compared to students from other faculties.<sup>(3)</sup>

In general, medical students are known to have higher levels of psychological problems in the form of depression, anxiety, and stress, about 29%, than the general population. In addition, COVID-19 is considered an added source of stress for medical students.<sup>(4- 7)</sup> No studies have examined the relationship between perceived stress and sleep quality during COVID-19 in medical students.

This study provided a better understanding of stress in medical students,

\*Corresponding author: [dr.rana.essam25@gmail.com](mailto:dr.rana.essam25@gmail.com)

 This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>)

with the aim of reducing academic stress and improving sleeping habits for better academic achievement. The current study aimed to assess perceived stress and quality of sleep in medical students during the COVID-19 pandemic.

## Methods

**Design, setting, and sampling:** This cross-sectional study was conducted at the Faculty of Medicine and Suez Canal University Hospital. Data were collected during the 2021-2022 academic year in the last three months of 2022, as the academic year of the fourth, fifth, and sixth grades at the Faculty of Medicine and Suez Canal University starts in October or November and ends around December of the next year.

A two-step sampling technique was used: proportional stratified sampling technique was used to select students studying at the faculty of medicine at Suez Canal University into 6 strata according to the number of students each year to obtain the best representative sample. Proportionate Stratified Random Sampling Formula:  $n_h = (N_h / N) * n$ .

### Where:

$n_h$  = Sample size for  $h^{\text{th}}$  stratum

$N_h$  = Population size for  $h^{\text{th}}$  stratum

$N$  = Size of the entire population

$n$  = Size of the entire sample

Systematic sampling was used to select the students from each year. The most common form of systematic sampling is an equiprobability method. In this approach, progression through the list is treated circularly, with a return to the top once the end of the list is passed. The sampling starts by selecting an element from the list at random, and then every  $k^{\text{th}}$  element in the frame is selected, where  $k$  is the sampling interval (sometimes known as the *skip*): this is calculated as:

$$k = \frac{N}{n}$$

Where  $n$  is the sample size, and  $N$  is the population size

Exclusion criteria were students with known psychological or chronic illnesses and students who refused to participate for personal reasons. The sample size is determined using the following equation:<sup>(8)</sup>

### Where:

$$n = \frac{(Z_{1-\alpha/2})^2 p(1-p)}{d^2}$$

$n$  = the sample size.  $Z_{1-\alpha/2}$  = the confidence interval, which equals 1.96 when the type 1 error is 5%.  $P$  = proportion of the outcome measure; in the present study, there were two measures: The proportion of students with moderate to high-stress levels equals 85 % using the Perceived Stress Scale.<sup>(9)</sup> The proportion of students who perceived that COVID-19 had a negative

impact on their quality of sleep equals 50.1 % based on previous literature.<sup>(10)</sup>  $d$ =Absolute error or precision equals 10 %.

The sample size was calculated based on the outcome measure with the lower proportion (negative sleep quality during COVID-19) to get the higher sample size, which was 96 participants. However, after adding the expected (drop-out) rate (20%), the final sample size was 116 participants. The response rate was 96%.

The dependent variable is Students' sleep quality and perceived stress during the COVID-19 pandemic. Independent variables include the students' socio-demographic characteristics and vaccination profile.

### **Study tools:**

Data was collected through an online questionnaire prepared and administered through Google platforms. It consisted of three parts.

**Part 1:** Socio-demographic characteristics of the students using the Socioeconomic Status Scale.<sup>(11)</sup> This score includes seven domains. Total score: (out of 84) Socioeconomic level: was classified into very low, low, middle, and high levels depending on the quartiles of the score calculated: Very Low 1-21, Low 22-43, Middle 44-65, and High 66-84.

**Part 2:** Sleep quality during the COVID-19 pandemic by Pittsburgh Sleep Quality Index (PSQI)<sup>(12)</sup>: The PSQI, a self-administered questionnaire, includes four open-ended and 14 questions. Each question has a range of 0-3. In all cases, a score of "0" indicates no difficulty, while a score of "3" indicates severe difficulty. The internal consistency reliability for the Global PSQI demonstrates borderline acceptability (Cronbach's alpha = .65). The reliability is further supported by moderate to high correlations between five PSQI components and the global PSQI score ( $r = .53$  to  $.82$ ,  $p < .01$ ). Convergent validity is supported by the global PSQI correlating strongly with the Insomnia Severity Index ( $r = .76$ ) and moderately with the related construct of the Medical Outcome Study Short Form-36 vitality subscale ( $r = -.33$ ).

**Part 3:** Perceived stress during the COVID-19 pandemic by perceived stress scale (PSS)<sup>(13)</sup>: The Perceived Stress Scale (PSS) is a classic stress assessment instrument and a popular choice for helping researchers understand how different situations affect perceived stress and feelings. The questions on this scale ask about the participants' emotions and thoughts during the last month. Individual scores on the PSS can range from 0 to 40, with higher scores indicating higher perceived stress. Scores ranging from 0-13 would be considered low stress. Scores

ranging from 14-26 would be considered moderate stress. Scores ranging from 27-40 would be considered high perceived stress. The Perceived Stress Scale's reliability and validity were evaluated in the Arabic version. Prior to an exploratory factor analysis, the suitability of data for factor analysis was assessed with acceptable results. The exploratory factor analysis showed two factors with eigenvalues greater than 1.0 (45.0% of variance). The Cronbach's alpha coefficients were 0.74 (Factor 1), 0.77 (Factor 2), and 0.80 for the overall Arabic version of the Perceived Stress Scale. The test-retest reliability had an intra-correlation coefficient of 0.90.

**Data management:** All statistical analyses have been performed using the *SPSS* statistical package for social science version 25. Descriptive statistics have been applied in numerical form to describe the quantitative variables. Diagrammatic and tabular forms have been used -when appropriate - to describe the qualitative variables. Associations between variables have been tested for significance using logistic regression and ANOVA for continuous variables with normally distributed data. Results were considered statistically significant at a p-value of less than or equal to 0.05.

**Ethical consideration:** The study was approved by the Research Ethics Committee of the Faculty of Medicine, Suez Canal University (Ref No. 4098/2020, dated 23-2-2020). Informed consent was obtained from all participants.

**Results:** In the present study, a self-reported questionnaire by the students was used to detect the prevalence of the experienced outcomes. Females represented 68.1% of the participants, and almost all were single.

About two-thirds of the medical students had at least one particular habit, mainly tea or coffee. High socioeconomic status comprised 68% of the total medical students, while 25% had moderate socioeconomic status.

The level of perceived stress among medical students by perceived stress scale (PSS) shows that about 94.8% of medical students have moderate to high levels of perceived stress. The disturbance in sleep quality among students by Pittsburgh Sleep Quality Index showed that the mean Sleep Quality Index among the medical students was  $9.31 \pm 3.49$  and that students who score  $> 5$  (had sleep disturbance) in the sleep index formed 83.6% of the total medical students.

Figure 1 shows that about 94.8% of medical students have moderate to high

levels of perceived stress. Figure 2 shows that students who scored  $> 5$  (had sleep disturbance) in the sleep index formed 83.6% of the total medical students. Table 1 Logistic regression analysis was used to assess predictors of the Sleep Quality Index among medical students. It found that students with a high-stress level were positively significantly associated with a high sleep quality index (i.e., more sleep disturbance) ( $p=0.034$ ). Moreover, students with a history of COVID-19 infection were positively significantly associated with a high sleep quality index ( $p=0.017$ ).

**Discussion:** This cross-sectional study aimed to assess the outcomes of the COVID-19 pandemic on the sleep quality and perceived stress of medical students. The study included 116 students at the faculty of medicine at Suez Canal University in Ismailia, Egypt—conducted in the last three months of 2022.

In the current study, 83.6% of total medical students showed a disturbance in sleep quality, as measured by the Pittsburgh Sleep Quality Index, which scored  $> 5$ . The mean Sleep Quality Index among the medical students was  $9.31 \pm 3.49$ , with a range between 0 and 19.

These results correlate with the study by Fernandes *et al.*, 2022, which showed a

prevalence of low sleep quality in 78.16% of medical students from Brazil.<sup>(14)</sup>

Our results differed from those of Mishra's study. *et al.*, 2022, explored that 45% of the undergraduate medical students at KIIT University had poor sleep quality during the COVID-19 lockdown period.<sup>(15)</sup>

The variation between studies may be due to methodologies, different study settings, socio-cultural habits, sampling techniques, tools used to assess sleep quality or perceived stress, and studying approaches in medical faculties.

A pre-pandemic study in similar populations in Saudi Arabia by Ibrahim *et al.*, 2017 revealed that (70.4%) of medical students at Abdulaziz University were found to have poor sleep quality.<sup>(16)</sup> In another study conducted by Wondie *et al.*, 2021 among undergraduate medical students in Ethiopia, the prevalence of poor sleep quality was 62%.<sup>(17)</sup>

The increase in the prevalence of this condition can be explained by the events of the pandemic, such as the order to stay at home, online learning, the ban on outdoor activities, updates of COVID-19 in all media, the sudden changes in lifestyle, deprivation of direct interaction with laboratories in universities and medical centers to perform the essential practices for their professional training.<sup>(18)</sup>

In the current study, about 41.4% of medical students have a high level of perceived stress. Moreover, about 53.4% of the participants have a moderate stress level, while only 5.2% have a low one. Also, results showed a statistically significant association between different stress levels among medical students and previous COVID-19 infection ( $p=0.001$ ).

Concomitant to our results, in the study of Boushehri *et al.*, 2020 high perceived stress was reported at a higher rate among medical students, 42.5%, and only 5.8% experienced low stress.<sup>(19)</sup> However, Abdulghani *et al.*, 2020 have conducted a study to assess the influence of COVID-19 on undergraduate medical students' learning. It showed that COVID-19 changes the educational strategies and attitudes among medical students and induces stress among them; the level of stress was reported as no stress (44.9%), mild stress (30.9%), moderate stress (11.5%), and severe stress (12.8%).<sup>(20)</sup>

This variation may be related to the increasing numbers of COVID-19-affected and vaccinated cases and direct face-to-face learning. Before the COVID-19 pandemic, a study on the same population by El-Zoghby *et al.* (2022) revealed that the prevalence of stress among the students was 51%.<sup>(21)</sup> So,

the stress level increased after the COVID-19 pandemic.

**Study limitations:** The study has several limitations.

1. The study is limited by its cross-sectional nature and needs longitudinal follow-up.
2. The data were based on self-rating measurements, which might introduce recall bias.
3. Differences in the students' sleep quality at different times could not be found as we did not have any baseline data on them before the COVID-19 pandemic.
4. The impact of introducing online learning needs to be clarified.

**Conclusion:** Providing medical students with mental well-being is crucial for ensuring the sustainability of their participation in healthcare services in the future. Our findings concluded that stress and sleep quality further affected medical students during the COVID-19 pandemic and should be followed closely.

**Authors' contributions:** All authors were equally contributing to this work

**Competing interest:** All authors have no competing interests

**Funding:** None

**Acknowledgments:** Deepest appreciation for the students who responded to the

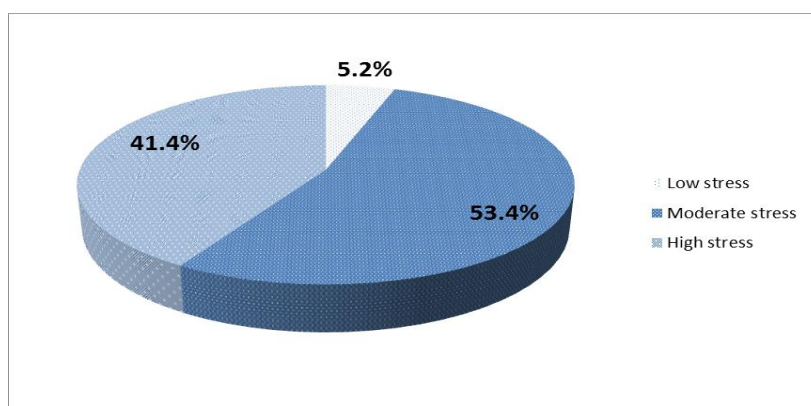
research questionnaire, and their time was appreciated.

### References:

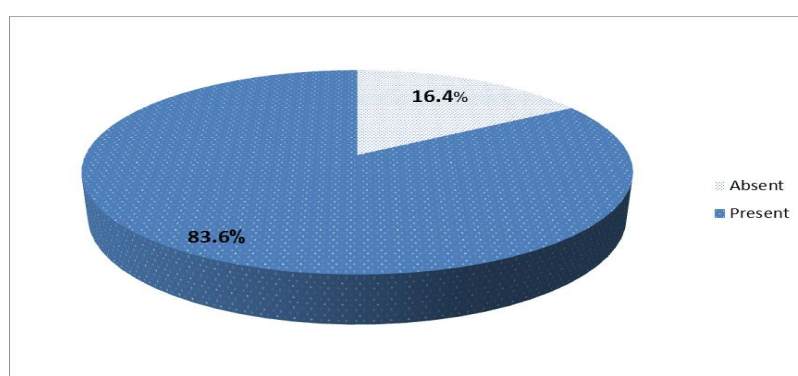
1. Baloch S, Baloch MA, Zheng T, *et al.* The coronavirus disease 2019 (COVID-19) pandemic. *The Tohoku journal of experimental medicine.* 2020; 250(4): 271-8.
2. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. *Acta bio medica: Atenei parmensis.* 2020; 91(1): 157.
3. Azad MC, Fraser K, Rumana N, *et al.* Sleep disturbances among medical students: a global perspective. *Journal of Clinical Sleep Medicine.* 2015 Jan 15; 11(1):69-74.
4. Tian-Ci Quek T, Wai-San Tam W, X. Tran B, *et al.* The global prevalence of anxiety among medical students: a meta-analysis. *International journal of environmental research and public health.* 2019 Aug; 16(15): 2735.
5. Zeng W, Chen R, Wang X, *et al.* Prevalence of mental health problems among medical students in China: A meta-analysis. *Medicine.* 2019 May; 98(18): 1-10.
6. Moir F, Yelder J, Sanson J, *et al.* Depression in medical students: current insights. *Advances in medical education and practice.* 2018 May 7:323-33.
7. Pandey U, Corbett G, Mohan S, *et al.* Anxiety, depression and behavioral changes in junior doctors and medical students associated with the coronavirus pandemic: a cross-sectional survey. *The Journal of Obstetrics and Gynecology of India.* 2021 Feb; 71: 33-7.
8. Charan J, Biswas T. How do you calculate sample size for different study designs in medical research? *Indian journal of psychological medicine.* 2013 Apr; 35(2): 121-6.
9. Nizami AT, Anwar M, Hayat AA, *et al.* Perceived Stress among Students in Medical/Dental and Allied Health Universities in Pakistan due to COVID-19 Pandemic. *Journal of Rawalpindi Medical College.* 2021 Mar 30; 25(1): 102-106.
10. Seetan K, Al-Zubi M, Rubbai Y, *et al.* Impact of COVID-19 on medical students' mental well-being in Jordan. *PLOS One.* 2021 Jun 17; 16(6): e0253295.
11. El-Gilany A, El-Wehady A, El-Wasify M. Updating and validating the socioeconomic status scale for health research in Egypt. *Eastern Mediterranean health journal.* 2012 Sep 1; 18(9): 962-968.
12. Suleiman KH, Yates BC, Berger AM, *et al.* Translating the Pittsburgh sleep quality index into Arabic. *Western*

- Journal of Nursing Research. 2010 Mar; 32(2): 250-68.
13. Almadi T, Cathers I, Mansour AM, Chow CM. An Arabic version of the Perceived Stress Scale: Translation and validation study. *International journal of nursing studies*. 2012 Jan 1; 49(1): 84-9.
  14. Fernandes AC, Padilha DD, de Moura AC, *et al.* The COVID-19 pandemic decreased the sleep quality of medical students. *Sleep Science*. 2022 Oct; 15(4): 436.
  15. Mishra J, Panigrahi A, Samanta P, *et al.* Sleep quality and associated factors among undergraduate medical students during COVID-19 confinement. *Clinical Epidemiology and Global Health*. 2022 May 1; 15:101004.
  16. Ibrahim NK, Badawi F, Mansouri Y, *et al.* Sleep quality among medical students at King Abdulaziz University: a cross-sectional study. *J Community Med Health Educ*. 2017; 7(561): 2161-711.
  17. Wondie T, Molla A, Mulat H, *et al.* Magnitude and correlates of sleep quality among undergraduate medical students in Ethiopia: cross-sectional study. *Sleep Science and Practice*. 2021 Dec; 5(1): 1-8.
  18. Saguem BN, Nakhli J, Romdhane I, *et al.* Predictors of sleep quality in medical students during COVID-19 confinement. *L'encephale*. 2022 Feb 1; 48(1): 3-12.
  19. Boushehri YK, Jeyaseelan L, Sultan MA. Stress and Coping Strategies among Medical Students in Dubai, United Arab Emirates, in 2020: A Cross-Sectional Study. *medRxiv*. 2022:2022-09.
  20. Abdulghani HM, Sattar K, Ahmad T, *et al.* Association of COVID-19 pandemic with undergraduate medical students' perceived stress and coping. *Psychology research and behavior management*. 2020; 13: 871.
  21. El-Zoghby, S., Khattab, M., El Gammal, H., *et al.* Effect of a Brief Intervention Program on Burnout among Medical Students at Faculty of Medicine in Suez Canal University, Egypt. *Suez Canal University Medical Journal*, 2022; 25(2): 96-108. doi: 10.21608/scumj.2022.260723.





**Figure 1. Level of perceived stress among medical students**



**Figure 2. Level of sleep disturbance among medical students**

**Table 1. Logistic regression of determinants of the Pittsburgh Sleep Quality Index**

Predictors	Unstandardized Coefficients		Standardized Coefficients Beta	p-value
	B	SE		
(Constant)	8.102	3.789	-	<b>0.035*</b>
Perceived stress (mild)	Reference			
Perceived stress (moderate)	1.670	1.407	0.239	0.238
Perceived stress (severe)	1.357	1.443	0.192	<b>0.034*</b>
Special habits (present)	1.870	0.646	0.257	<b>0.005*</b>
SES (low)	Reference			
SES (Moderate)	1.051	1.279	0.131	0.413
SES (High)	-0.215	1.181	-0.029	0.856
Chronic illness (present)	0.500	0.473	0.129	0.293
Previous COVID-19 infection (present)	1.015	0.738	0.123	<b>0.017*</b>
COVID-19 vaccination (present)	-0.816	3.326	-0.031	0.807

ANOVA=0.003,  $R^2= 0.506$

\* Statistical significance at  $P < 0.05$

## المخلص العربي

## تقييم جودة النوم والضغط النفسي الملموس خلال جائحة كوفيد ١٩ بين طلاب كلية الطب جامعة قناة السويس.

رنا منصور<sup>١</sup>، حنان عبدالرحمن<sup>١</sup>، ريهام محمد أبو عمارة<sup>١</sup>، أميرة الفولي<sup>١</sup><sup>١</sup> قسم طب الأسرة، كلية الطب، جامعة قناة السويس، الإسماعيلية، مصر

**الخلفية:** انتشر فيروس كورونا المستجد كوفيد ١٩ في جميع أنحاء العالم وأثرت الجائحة على عادات النوم بين طلاب الطب. يحتل طلاب الطب المرتبة الأولى في انتشار قلة النوم مقارنة بالطلاب من الكليات الأخرى. بشكل عام، من المعروف أن طلاب الطب لديهم مستويات أعلى من المشاكل النفسية متمثلة في صورة الاكتئاب والتوتر؛ هذا بسبب بيئة الضغط النفسي حيث يدرسون ويتدربون. بالإضافة إلى ذلك، يعتبر كوفيد ١٩ مصدرًا إضافيًا للتوتر بين طلاب الطب. **الأهداف:** وقد أجريت هذه الدراسة لتقييم جودة النوم والضغط النفسي الملموس لجائحة كوفيد ١٩ على طلاب كلية الطب بجامعة قناة السويس. **طرق البحث:** تم عمل دراسة مقطعية تشمل ١١٦ طالب من كلية الطب بجامعة قناة السويس. وتم استبعاد الطلاب الذين يعانون من الأمراض النفسية قبل الجائحة والطلاب الذين رفضوا المشاركة. تم التقييم من خلال استمارة استبيان تم ملؤها بواسطة كل طالب مشارك بالبحث عن طريق الإنترنت. تتضمن استمارة تقييم جودة النوم والضغط النفسي ٢١ سؤالاً. **النتائج:** وفقاً ل (PSS) حوالي ٩٤,٨٪ من طلاب الطب لديهم مستوى متوسط إلى عالٍ من التوتر الملموس. بينما ٥,٢٪ فقط منهم لديهم مستوى توتر منخفض. يُظهر اضطراب جودة النوم بين الطلاب وفقاً لمؤشر جودة النوم (PSQI) أن متوسط مؤشر جودة النوم بين طلاب الطب كان  $9,31 \pm 3,49$  مع نطاق يتراوح بين ٠ إلى ١٩ وأن الطلاب الذين حصلوا على < ٥ في درجة النوم التي تم حسابها ٨٣,٦٪ من مجموع طلاب الطب. أظهر الارتباط بين مقياس الإجهاد ومقياس جودة النوم أن هناك علاقة إيجابية بين درجة الإجهاد ودرجة جودة النوم بين طلاب الطب ( $p = 0.013$ ) ( $r = 0.307$ ). **التوصيات:** وقد أوصت الدراسة بمراقبة طلاب الطب عن كثب كمجموعة عالية الخطورة للإصابة بالاضطرابات النفسية أثناء جائحة فيروس كورونا. وإقامة ندوات نفسية لطلاب الطب حول الصحة النفسية مع التأكيد على أهمية أدوارهم لحماية أنفسهم وأسرتهم أثناء الأوبئة.