



Original Article

ISSN : 2277-3657  
CODEN(USA) : IJPRPM

## ***The Effect of Sleep Quality on Psychological Distress Among Saudi Healthcare Students and Professionals***

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### ABSTRACT

The negative impacts of the COVID-19 pandemic are evident in the literature. Yet nearly 2 years into the pandemic, little information is available about the sleep quality and psychological well-being of healthcare students and professionals in Saudi Arabia. This study aimed to assess the relationship between sleep quality and psychological distress in that population during the pandemic. A self-administered online questionnaire consisting of three sections was distributed to participants through social media platforms to evaluate sleep quality and psychological distress. The questionnaire was completed by 771 Saudi healthcare students and professionals. There was an inverse relationship between sleep quality and psychological distress ( $p < 0.001$ ,  $R^2 = 0.138$ ). The sleep quality score was statistically different between participants with chronic conditions and those without ( $5.2 (\pm 2.1)$ ,  $5.8 (\pm 2.2)$ ,  $p = 0.008$ , respectively). Severe psychological distress was reported by 35.5%, while 31.6% reported mild to moderate psychological distress. Female healthcare students were more susceptible to psychological distress than males ( $p < 0.001$ ). Healthcare students and interns/residents were more susceptible to psychological distress than medical specialists or consultants ( $p = 0.001$ ,  $p = 0.033$ , respectively). Engaging in healthy lifestyle behaviors decreased the risk of psychological distress ( $p < 0.001$ ,  $p = 0.006$ , respectively). The findings imply that sleep quality enhancement may decrease the risk of psychological distress among healthcare students and professionals in Saudi Arabia. Decision makers in healthcare facilities and schools could implement stress relief and coping programs to potentially reduce the risk of stress. Future in-depth qualitative research is warranted to examine the factors affecting sleep quality and psychological well-being.

**Key words:** COVID-19, Health care, Saudi Arabia, Sleep quality, Psychological distress

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### INTRODUCTION

Healthcare professionals must maintain their focus while providing healthcare services to patients. However, to provide 24-hour health care, they frequently must do shift work, which comprises irregular working hours of shift work, which is outside the regular 9:00 am to 5:00 pm workday [1]. Healthcare professionals comprise a large proportion of shift workers globally [2-4]. Despite shift work's adverse impact on health due to its disruption of circadian systems [5], shift work has been adopted globally in many sectors. In addition, irregular working hours pose a challenge to maintaining a regular sleep pattern and negatively affect sleep quality [6]. A recent study reported poor sleep quality among healthcare professionals in Saudi Arabia [7].

Psychological distress refers to unpleasant emotions or feelings that interfere with the everyday life of the affected individual [8]. Prolonged distress can lead to poor mental health and disorders such as depression and anxiety [9]. Previous research has revealed that psychological distress is common among healthcare professionals [10]. Work-related risk of psychological distress is high in stressful jobs, such as those in the healthcare sector, where work demands are considerable [11, 12]. When the coronavirus disease (COVID-19) outbreak was declared a pandemic by the World Health Organization in March 2020, it substantially increased healthcare professionals' workloads, adversely affecting their mental health. A recent meta-analysis of 97,333 healthcare professionals across 21 countries identified a high prevalence of psychological distress during the COVID-19 pandemic [13]. That study showed the highest prevalence of adverse psychological outcomes was in Middle Eastern countries. This finding is consistent with research findings from previous studies in Saudi Arabia [14-17].

Previous studies have also shown a link between sleep disorders and psychological distress among healthcare professionals [18, 19]. This link has been associated with the risk of suicide, as reported by a prospective cohort study conducted over 14 years in Japan [20]. According to a national survey in Saudi Arabia [21], individual psychological well-being was generally adversely affected during the COVID-19 pandemic, and the negative impacts were even more significant for healthcare professionals [22, 23].

Although almost 2 years have passed since the onset of the COVID-19 pandemic, there is still little information available on the sleep quality and psychological well-being of healthcare students and professionals in Saudi Arabia.

### *Objectives*

Thus, this study aimed to evaluate sleep quality and psychological distress among Saudi healthcare students and professionals due to the pandemic.

## **MATERIALS AND METHODS**

A cross-sectional design was used for this study, and the convenience sampling method was used to recruit participants through personal invitations and distribution of the survey link via multiple social media platforms, including WhatsApp, Snapchat, and Twitter. A self-administered online questionnaire in Arabic was distributed as a link. The study eligibility criteria were as follows: 1) students/workers in medicine, dentistry, public health, pharmacy, nursing, or applied medical science; 2) Saudi nationals; and 3) agreement on the study consent form. The data collection was conducted for 2 months, from April to June 2022.

The questionnaire contained three sections with 20 questions in total. The first section investigated demographic variables, including sex, age, qualification, specialty, region, city, and simple (yes/no) questions about chronic disease, regular walking, and healthy food consumption. The second section measured sleep quality using the one-item sleep quality scale (SQS) [24]. The participants answered the questions by choosing from 0 to 10 on a scale, with 10 indicating excellent sleep quality and 0 indicating terrible sleep quality. The SQS showed a good correlation with other known scales for assessing sleep quality and test-retest validation [24]. Section 3 measured psychological distress using the 10-item Kessler Scale (K10) [25, 26]. The questionnaire had a Cronbach's alpha value of 0.88 [27], and the Arabic version of the scale was also validated with a Cronbach's alpha of 0.88 [28]. K10 uses a 5-point Likert scale ranging from 1 (never) to 5 (always), with a total score ranging from 5 to 50 (highest level of psychological disorder) [29]. The research team translated the SQS into Arabic and distributed it to 13 participants in a pilot round to validate the questionnaire in terms of understanding, language, syntax, grammar, and organization. The questionnaire took approximately 10 minutes to complete.

Data cleaning and analyses were performed using Microsoft Excel (Microsoft, Inc., Redmond, WA) and SPSS v.27 software (IBM Corp., Armonk, NY). A descriptive analysis was performed using frequencies and percentages for categorical variables and mean and standard deviation ( $\pm$  SD) for continuous variables. Statistical

significance was set at  $p < 0.05$ . Inferential analysis was performed using a range of statistical tests that included linear regression, t-test, Kruskal–Wallis test, and analysis of variance (ANOVA).

This study was implemented following the Declaration of Helsinki and approved by the institutional review board committee of Umm Al-Qura University (approval No. HAPO-02-K-012-2022-04-1048). Agreeing to the consent form was a condition for participating in this study. The consent form explained that participation was voluntary, anonymous, and offered without incentives. The data obtained were stored on a private device and could not be accessed by anyone except through a password known only by the research team. The data used in this study were from a large research project aimed at evaluating the lifestyle habits and psychological well-being of healthcare professionals in Saudi Arabia. It is possible to identify the methods employed for the large research project.

## RESULTS AND DISCUSSION

A total of 771 Saudi healthcare students and professionals completed the study questionnaire. The participants' mean age was 25.5 ( $\pm 7.8$ ) years, 39.9% were male and 60.1% were female. The specialties included public health (33.3%), dentistry (23.2%), medicine (20.2%), pharmacy (12.7%), applied medical sciences (7.4%), and nursing (3.1%). Of the participants, 58.1% were students, 23.6% were interns or residents, and 18.3% were specialists or consultants. Most participants were from the western region (62.3%), followed by those from the central (25.2%), southern (9.0%), eastern (2.6%), and northern regions (0.9%). Among the participants, 13.4% had a chronic disease, 36.8% walked regularly, and 40.9% ate healthy food [30], according to their perspectives. The participants were all Saudi nationals residing in 33 cities across Saudi Arabia, including Dahrhan, Skaka, Ahsa, Buljurashi, Makkah, Tabok, Khobar, Najran, Umluj, Muhayel, Qatif, Ras Tanura, Hafr Albaten, Badr, Jeddah, Khamis Mushait, Badaea, Qassim, Buraidah, Traif, Dammam, Riyadh, Jazan, Taif, Madinah, Abha, Shaqra, Beshah, Kharj, and Baha. The socio-demographic data and other characteristics of the sample are summarized in **Table 1**.

When we examined the effect of the SQS score on K10 using a simple linear regression test, we found a significant inverse relationship ( $F_{1,769} = 123.17$ ,  $p < 0.001$ ,  $R^2 = 0.138$ ). A  $\beta$  coefficient of  $-1.76$  (95% confidence interval [CI],  $-2.072$  to  $-1.449$ ) indicated that each point increases in sleep quality was responsible for a decrease in the K10 score (**Figure 1**).

When the participants were assessed using the SQS, a mean total score of 5.7 ( $\pm 2.2$ ) was obtained. According to the SQS classification, participants' sleep was terrible (0.3%), poor (17.6%), fair (45.9%), good (30.4%), and excellent (5.8%). **Table 2** shows these results in comparison with the SQS scores according to the demographic data. Participants who reported having a chronic condition had slightly lower SQS scores (mean [ $\pm$  SD], 5.2 [ $\pm 2.1$ ]) than those who did not have a chronic condition (5.8 [ $\pm 2.2$ ]), and the difference in scores was statistically significant ( $p = 0.008$ ).

The K10 results showed a mean score of 25.8 ( $\pm 10.3$ ). According to the 2001 Victorian Population Health Survey [29] cutoff points, 32.9% of the participants were well, 17.2% had mild distress, 14.4% had moderate distress, and 35.5% had severe distress. **Table 2** shows these results in comparison with the K10 scores according to the demographic data. The participants' psychological distress scores were statistically significant regarding sex ( $p < 0.001$ ), qualification ( $p = 0.002$ ), regular walking habits ( $p = 0.006$ ), and healthy food-eating habits ( $p < 0.001$ ). Female participants had higher K10 scores than male participants ( $p < 0.001$ ). Also, specialists/consultants had significantly lower K10 scores than students ( $p = 0.001$ ) and interns/residents ( $p = 0.033$ ). However, the students and interns/residents were not significantly different ( $p = 0.756$ ). The participants' psychological distress scores were significantly lower when they reported walking regularly ( $p = 0.006$ ) and eating healthy food ( $p < 0.01$ ).

**Table 1.** Sociodemographic data and other characteristics of the study sample ( $n = 771$ )

Characteristic	<i>n</i>	%	
Sex	Male	308	39.9
	Female	463	60.1
Specialty	Dentistry	179	23.2
	Public health	257	33.3
	Pharmacy	98	12.7
	Medicine	156	20.2

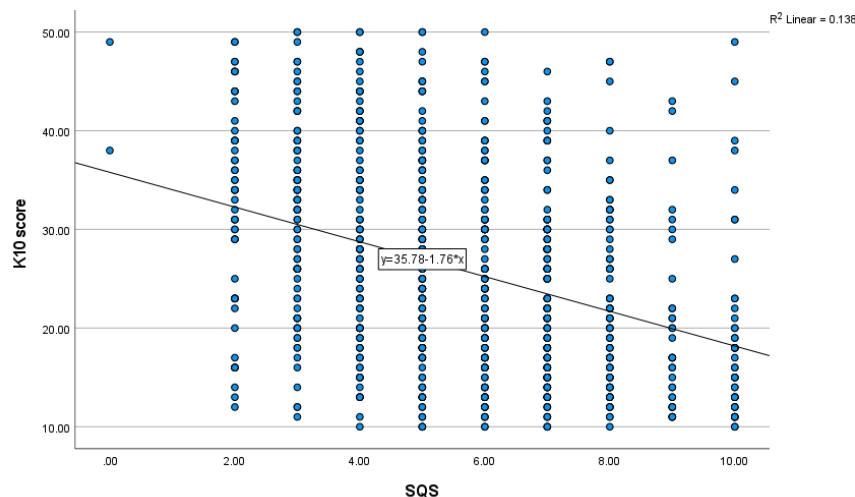
	Applied medical science	57	7.4
	Nursing	24	3.1
Qualification	Student	448	58.11
	Intern/resident	182	23.61
	Specialist or consultant	141	18.29
	Western	480	62.3
Region	Central	194	25.2
	Southern	70	9.0
	Eastern	20	2.6
	Northern	7	0.9
	Yes	103	13.4
General health: chronic disease	No	668	86.6
	Yes	284	36.8
General health: walks regularly	No	487	63.2
	Yes	315	40.9
General health: healthy food	No	456	59.1

**Table 2.** Relationships of the demographic variables with the SQS and K10 scores

Variable	SQS			K10			
	mean	SD	p	mean	SD	p	
Sex*	Male	5.9	2.2	0.064	23.6	10.2	<0.001
	Female	5.6	2.2		27.3	10.0	
Specialty**	Dentistry	5.5	2.2	0.796	27.1	11.1	0.486
	Public health	5.7	2.2		26.0	10.1	
	Pharmacy	5.7	2.2		25.0	10.6	
	Medicine	5.8	2.2		24.8	9.9	
	Applied medical science	5.8	1.8		25.7	9.2	
	Nursing	5.7	2.4		24.7	8.1	
	Student	5.5	2.2	0.057	26.6	10.4	0.002 <sup>a</sup>
Qualification***	Intern/resident	5.8	2.1		26.0	10.0	
	Specialist or consultant	6.0	2.2		23.1	9.9	
	Western	5.8	2.2	0.164	26.0	10.4	0.459
Region**	Central	5.3	2.1		26.0	10.0	
	Southern	5.9	2.2		24.0	10.5	
	Eastern	5.9	2.5		24.3	9.5	
	Northern	5.7	3.5		26.0	9.7	
	Yes	5.2	2.1	0.008	26.3	10.6	0.620
Chronic disease*	No	5.8	2.2		25.7	10.2	
	Yes	5.8	2.2	0.433	24.5	10.0	0.006
Walks regularly*	No	5.6	2.2		26.6	10.3	
	Yes	5.9	2.2	0.056	23.5	9.5	<0.001
Eats healthy food*	No	5.6	2.1		27.4	10.4	

\*T-test, \*\*Kruskal–Wallis test, \*\*\*ANOVA.

The specialists or consultants had significantly lower K10 scores than the students ( $p = 0.001$ ) and interns/residents ( $p = 0.033$ ). However, the scores of the students and interns/residents did not significantly differ ( $p = 0.756$ ).



**Figure 1.** Simple linear regression showing a negative relationship between sleep quality (SQS score) and psychological distress (K10 score) among healthcare professionals

This study aimed to evaluate sleep quality and psychological distress among healthcare students and professionals in Saudi Arabia due to the COVID-19 pandemic. The linear regression analysis showed a significant inverse relationship between sleep quality and psychological distress scores ( $p < 0.001$ ). This finding is consistent with previous studies among healthcare workers in Saudi Arabia, where sleep quality mediated psychological distress [16, 31]. A similar significant association was demonstrated among medical students in Saudi Arabia [32, 33], and a significant association between sleep quality and psychological distress was reported among the general population of Saudi Arabia [34]. Previous studies have reported a physiological link between sleep and stress, both of which are closely linked to the hypothalamic–pituitary–adrenal (HPA) axis [35–37].

In the sleep quality assessment, the participating students and professionals had a mean SQS score of  $5.7 (\pm 2.2)$ . In agreement with this finding, recent studies from Oman have reported poor sleep quality among healthcare workers based on their SQS scores [38, 39]. Other Omani studies have reported mean SQS scores similar to our findings, with Khamis *et al.* [39] reporting a mean SQS score of  $5.9 (\pm 2.1)$ , while Badahdah *et al.* [38] reported a slightly higher mean SQS score of  $6.8 (\pm 2.0)$ . In addition, recent studies have reported poor sleep quality among healthcare workers in Saudi Arabia using different assessment tools (e.g., Pittsburgh Sleep Quality Index Scale) [7, 16, 40]. Participants who had a chronic condition reported worse sleep quality than those without chronic conditions ( $p = 0.008$ ). This finding is similar to recent studies among the general population in Saudi Arabia and Poland [34, 41].

The results from the present study showed a mean psychological distress score of  $25.8 (\pm 10.3)$ , with 35.5% of respondents reporting severe psychological distress and 31.6% showing mild to moderate psychological distress. Similar levels were reported by a previous study among healthcare workers in Saudi Arabia [15], with a mean K10 score of  $23.1 (\pm 21.0)$  and severe and mild to moderate psychological distress in 27.3% and 28.9% of the participants, respectively. However, Alqutub *et al.* [15] reported a significant association between psychological distress and the region of practice, which contradicts our findings. This could be explained by the fact that most of our participants were from the western region, whereas the participants in the study by Alqutub *et al.* [15] were mostly from the central region.

In this study, a significant association was found between sex and psychological distress, but no significant association was found between sex and sleep quality. Our findings showed that female respondents had more severe psychological distress than male participants. Similarly, previous studies in Saudi Arabia have found that female healthcare workers were more susceptible to psychological distress than their male counterparts [14, 15, 42, 43]. However, our finding contradicts those from a previous study in Saudi Arabia in which psychological distress had a more significant impact on males than females [42]. This could be attributed to the fact that the sample from the previous study consisted of frontline nurses who provided direct care to patients with COVID-19 [43, 44], whereas our study sample did not include nurses. In addition, the previous study was conducted during the COVID-19 pandemic, unlike our study, which was conducted after the pandemic. Recent studies have assessed psychological distress in Italy and China after the COVID-19 pandemic and found that females were more

susceptible to psychological distress than males [45, 46]. This could be explained by the difference in hormonal response to stress between the sexes, with female hormones intensifying the stress response [47].

Our findings showed that medical students and interns/residents were more susceptible to psychological distress than medical specialists or consultants ( $p = 0.001$  and  $p = 0.033$ , respectively). These findings concur with those of a previous study that reported a high prevalence of psychological distress according to K10 scale scores among medical students in Saudi Arabia [32].

The psychological distress score in the present study was significantly lower among participants who reported walking regularly ( $p = 0.006$ ) and eating healthy food ( $p < 0.01$ ). A healthy lifestyle could be a coping strategy that mitigates the impact of stress. In a US-based study, physical activity was the most frequently reported stress-coping behavior during the COVID-19 pandemic among healthcare workers in New York [48]. One recent study reported that exercise was the third most common coping strategy among consultant physicians working in Saudi Arabia [49]. Another recent systematic review of psychological distress-coping strategies among dental students in Saudi Arabia reported healthy eating and regular exercise as recommended stress-coping strategies [50].

The present study has several limitations. First, its cross-sectional nature makes it difficult to make causal inferences. Second, the use of a convenience sampling procedure and the fact that most participants were from the western region of Saudi Arabia limits the generalizability of the results. Third, a risk of reporting bias was possible due to the self-reported nature of the questionnaire. Fourth, the use of a web-based questionnaire distributed through social media platforms that are mainly accessed by young age groups affected the representativeness of the study sample. This could explain why most participants were around the age of 25 years. Thus, the findings of this study should be interpreted with caution.

Our findings highlight the need for post-pandemic stress relief programs at healthcare facilities, with more emphasis on female healthcare workers. In addition, behavioral stress-coping strategies that focus on physical activities and healthy eating could assist with reducing the negative impact of stressful work demands among health professionals. Schools and internship programs at healthcare facilities should include stress-coping programs for students, as data indicate that they are susceptible to psychological distress. Future research with longitudinal study designs should be conducted to examine the association between sleep quality and psychological distress over time. Furthermore, future qualitative studies should be conducted to assess factors affecting healthcare students' and professionals' sleep quality and psychological well-being.

## CONCLUSION

This study demonstrates a statistically significant association between sleep quality and psychological distress among healthcare students and professionals in Saudi Arabia. This association implies that improving sleep quality can reduce the risk of psychological distress. Our findings show that female healthcare students are more susceptible to psychological distress than males. Moreover, engaging in healthy lifestyle behaviors such as walking regularly and eating healthy food decreased the risk of psychological distress. Decision-makers in healthcare facilities and schools should implement stress relief and coping programs to reduce the risk of stress among their students and professionals. Future in-depth qualitative research is warranted to examine factors affecting sleep quality and psychological well-being among healthcare students and professionals in Saudi Arabia.

**ACKNOWLEDGMENTS :** Nourah bint Abdulrahman University Researchers Supporting Project number (PNURSP2023R144), Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia.

**CONFLICT OF INTEREST :** None

**FINANCIAL SUPPORT :** None

**ETHICS STATEMENT :** Ethical approval of this study was obtained from the ethical research committee of the Institutional Review Board (IRB) of the University of Umm Al-Qura, Saudi Arabia, which approved this project (HAPO-02-K-012-2022, Project No. 04-1048).

## REFERENCES

1. McMenamin TM. A time to work: recent trends in shift work and flexible schedules. *Mon Labor Rev.* 2007;130(12):3-15.

2. Australian Bureau of Statistics. Working time arrangements: Report No. 6342.0. Sydney: Australian Bureau of Statistics; 2012.
3. Kennedy JL, Howard ME. Shift work in healthcare. Rapid research summary. Geelong: WorkSafe Victoria; 2021.
4. National Statistics Office. Shift employment in Malta 2015. Valletta: National Statistics Office; 2015.
5. Boivin DB, Boudreau P, Kosmadopoulos A. Disturbance of the circadian system in shift work and its health impact. *J Biol Rhythms*. 2022;37(1):3-28. doi:10.1177/07487304211064218
6. Ganesan S, Magee M, Stone JE, Mulhall MD, Collins A, Howard ME, et al. The impact of shift work on sleep, alertness and performance in healthcare workers. *Sci Rep*. 2019;9(1):4635. doi:10.1038/s41598-019-40914-x
7. Alanazi BG, Alshagraawi SA, Alobaidi IM, Alturki N, Kofi M. Impact of shift work on Sleep and the Quality of Life of healthcare workers in Saudi Arabia. *J Family Med Prim Care*. 2022;6(2):176. doi:10.29011/2688-7460.100076
8. Viertiö S, Kiviruusu O, Piirtola M, Kaprio J, Korhonen T, Marttunen M, et al. Factors contributing to psychological distress in the working population, with a special reference to gender difference. *BMC Public Health*. 2021;21(1):611. doi:10.1186/S12889-021-10560-Y
9. Drapeau A, Marchand A, Beaulieu-Prévost D. Epidemiology of psychological distress. In: L'Abate L, ed. *Mental illnesses: understanding, prediction, and control*. Rijeka: InTech. 2012;69(2):105-34.
10. Nena E, Katsaouni M, Steiropoulos P, Theodorou E, Constantinidis TC, Tripsianis G. Effect of shift work on sleep, health, and quality of life of health-care workers. *Indian J Occup Environ Med*. 2018;22(1):29-34. doi:10.4103/ijoom.ijoom\_4\_18
11. Marchand A, Demers A, Durand P. Do occupation and work conditions matter? A longitudinal analysis of psychological distress experiences among Canadian workers. *Social Health Illn*. 2005;27(5):602-27. doi:10.1111/J.1467-9566.2005.00458.x
12. Chueh KH, Chen KR, Lin YH. Psychological distress and sleep disturbance among female nurses: anxiety or depression? *J Transcult Nurs*. 2021;32(1):14-20. doi:10.1177/1043659619881491
13. Li Y, Scherer N, Felix L, Kuper H. Prevalence of depression, anxiety, and post-traumatic stress disorder in health care workers during the COVID-19 pandemic: a systematic review and meta-analysis. *PLoS One* 2021;16(3):e0246454. doi:10.1371/journal.pone.0246454
14. Al-Hanawi MK, Mwale ML, Alshareef N, Qattan AM, Angawi K, Almubark R, et al. Psychological distress amongst health workers and the general public during the COVID-19 pandemic in Saudi Arabia. *Risk Manag Health Policy*. 2020;13:733-42. doi:10.2147/rmhp.s264037
15. Alqutub S, Mahmoud M, Baksh T. Psychological impact of COVID-19 on frontline healthcare workers in Saudi Arabia. *Cureus*. 2021;13(5):e15300. doi:10.7759/cureus.15300
16. Alyami H, Krägeloh CU, Medvedev ON, Alghamdi S, Alyami M, Althagafi J, et al. Investigating predictors of psychological distress for healthcare workers in a major Saudi COVID-19 center. *Int J Environ Res Public Health*. 2022;19(8):4459. doi:10.3390/ijerph19084459
17. Bahamdan AS. Review of the psychological impact of the COVID-19 pandemic on healthcare workers in Saudi Arabia. *Risk Manag Health Policy*. 2021;14:4105-11. doi:10.2147/rmhp.S324938
18. Han KS, Kim L, Shim I. Stress and sleep disorder. *Exp Neurobiol*. 2021;21(4):141-50. doi:10.5607/en.2012.21.4.141
19. Pappa S, Sakkas N, Sakka E. A Year in Review: sleep dysfunction and psychological distress in healthcare workers during the COVID-19 pandemic. *Sleep Med*. 2022;91:237-45. doi:10.1016/j.sleep.2021.07.009
20. Fujino Y, Mizoue T, Tokui N, Yoshimura T. A prospective cohort study of stress, life satisfaction, self-rated health, insomnia, and suicide death in Japan. *Suicide Life Threat Behav*. 2005;35(2):227-37. doi:10.1521/suli.35.2.227.62876
21. Al Mutair A, Alhajji M, Shamsan A. Emotional wellbeing in Saudi Arabia during the COVID-19 pandemic: a national survey. *Risk Manag Health Policy*. 2021;14:1065-72. doi:10.2147/rmhp.S279716
22. Shaukat N, Ali DM, Razzak J. Physical and mental health impacts of COVID-19 on healthcare workers: a scoping review. *Int J Emerg Med*. 2020;13(1):40. doi:10.1186/S12245-020-00299-5
23. Vizheh M, Qorbani M, Arzaghi SM, Muhidin S, Javanmard Z, Esmaeili M. The mental health of healthcare workers in the COVID-19 pandemic: a systematic review. *J Diabetes Metab Disord*. 2020;19(2):1967-78. doi:10.1007/S40200-020-00643-9

24. Snyder E, Cai B, DeMuro C, Morrison MF, Ball W. A new single-item sleep quality scale: results of psychometric evaluation in patients with chronic primary insomnia and depression. *J Clin Sleep Med*. 2018;14(11):1849-57. doi:10.5664/jcsm.7478
25. Andrews G, Slade T. Interpreting scores on the Kessler Psychological Distress Scale (K10). *Aust N Z J Public Health*. 2001;25(6):494-7. doi:10.1111/j.1467-842x.2001.tb00310.x
26. Kessler RC, Andrews G, Colpe LJ, Hiripi E, Mroczek DK, Normand SL, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol Med*. 2002;32(6):959-76. doi:10.1017/s0033291702006074
27. Sampasa-Kanyinga H, Zamorski MA, Colman I. The psychometric properties of the 10-item Kessler Psychological Distress Scale (K10) in Canadian military personnel. *PLoS One*. 2018;13(4):e0196562. doi:10.1371/journal.pone.0196562
28. Easton SD, Safadi NS, Wang Y, Hasson RG. The Kessler psychological distress scale: translation and validation of an Arabic version. *Health Qual Life Outcomes*. 2017;15(1):215. doi:10.1186/s12955-017-0783-9
29. Department of Human Services. Victorian Population Health Survey: selected findings. Melbourne: Rural and Regional Health and Aged Care Services Division; 2002. Available from: <https://www.health.vic.gov.au/sites/default/files/migrated/files/collections/research-and-reports/v/vic-population-health-survey-2001.pdf>
30. Tahseen NJ, Shaker NS, Hussein ZA, Mutee AF, Al-Tuhafi AM. The effects of Phentermine and Lorcaserin on body weight, food intake, and visceral fat in Mice: comparative study. *J Adv Pharm Educ Res*. 2020;10(1):1-8.
31. Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsis E, Katsaounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: a systematic review and meta-analysis. *Brain Behav Immun*. 2020;88:901-7. doi:10.1016/j.bbi.2020.05.026
32. Almojali AI, Almalki SA, Allothman AS, Masuadi EM, Alaqeel MK. The prevalence and association of stress with sleep quality among medical students. *J Epidemiol Glob Health*. 2017;7(3):169-74. doi:10.1016/j.jegh.2017.04.005
33. Safhi MA, Alafif RA, Alamoudi NM, Alamoudi MM, Alghamdi WA, Albishri SF, et al. The association of stress with sleep quality among medical students at King Abdulaziz University. *J Family Med Prim Care*. 2020;9(3):1662-7. doi:10.4103/jfmprc.jfmprc\_745\_19
34. AlRasheed MM, Al-Aqeel S, Alkadir AM, Bin Shuqiran K, Khurshid F, AlRasheed NM, et al. The prevalence of psychological distress and its relationship to sleep quality in Saudi Arabia's general population during the COVID-19 pandemic. *Front Psychiatry*. 2022;12:809040. doi:10.3389/fpsy.2021.809040
35. Asarnow LD. Depression and sleep: what has the treatment research revealed and could the HPA axis be a potential mechanism? *Curr Opin Psychol*. 2020;34:112-6. doi:10.1016/j.copsyc.2019.12.002
36. Martire VL, Caruso D, Palagini L, Zoccoli G, Bastianini S. Stress & sleep: a relationship lasting a lifetime. *Neurosci Biobehav Rev*. 2020;117:65-77. doi:10.1016/j.neubiorev.2019.08.024
37. van Dalsen JH, Markus CR. The influence of sleep on human hypothalamic–pituitary–adrenal (HPA) axis reactivity: a systematic review. *Sleep Med Rev*. 2018;39:187-94. doi:10.1016/j.smrv.2017.10.002
38. Badahdah AM, Khamis F, Al Mahyijari N. Sleep quality among health care workers during the COVID-19 pandemic. *J Clin Sleep Med*. 2020;16(9):1635. doi:10.5664/jcsm.8624
39. Khamis F, Al Mahyijari N, Al Lawati F, Badahdah AM. The mental health of female physicians and nurses in Oman during the COVID-19 pandemic. *Oman Med J*. 2020;35(6):e203. doi:10.5001/omj.2020.103
40. Alnofaiey YH, Alshehri HA, Alosaimi MM, Alswat SH, Alswat RH, Alhulayfi RM, et al. Sleep disturbances among physicians during the COVID-19 pandemic. *BMC Res Notes*. 2020;13(1):493. doi:10.1186/S13104-020-05341-6
41. Wolińska W, Brzeźniak H, Mroczek B. Analysis of the relationship between insomnia and adult chronic diseases about working conditions. *Fam Med Prim Care Rev*. 2020;22(3):228-34. doi:10.5114/fmprc.2020.98251
42. Balay-Odao EM, Alquwez N, Inocian EP, Alotaibi RS. Hospital preparedness, resilience, and psychological burden among clinical nurses in addressing the COVID-19 crisis in Riyadh, Saudi Arabia. *Front Public Health*. 2021;8:573932. doi:10.3389/fpubh.2020.573932



43. Remizova AA, Dzgoeva MG, Tingaeva YI, Hubulov SA, Gutnov VM, Bitarov PA. Tissue dental status and features of periodontal microcirculation in patients with new covid-19 coronavirus infection. *Pharmacophore*. 2021;12(2):6-13.
44. Mishununa VV, Chapanov MM, Gakaeva KI, Tsoroeva MB, Kazanova SA, Gorlova MI, et al. Computed quantum chemical modeling of the effect of nanosilver on coronavirus COVID-19. *Pharmacophore*. 2021;12(2):14-21.
45. Moccia L, Janiri D, Pepe M, Dattoli L, Molinaro M, De Martin V, et al. Affective temperament, attachment style, and the psychological impact of the COVID-19 outbreak: an early report on the Italian general population. *Brain Behav Immun*. 2020;87:75-9. doi:10.1016/j.bbi.2020.04.048
46. Qiu J, Shen B, Zhao M, Wang Z, Xie B, Xu Y. A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: implications and policy recommendations. *Gen Psychiatr*. 2020;33(2):e100213. doi:10.1136/gpsych-2020-100213
47. Young E, Korszun A. Sex, trauma, stress hormones, and depression. *Mol Psychiatry*. 2010;15(1):23-8. doi:10.1038/mp.2009.94
48. Shechter A, Diaz F, Moise N, Anstey DE, Ye S, Agarwal S, et al. Psychological distress, coping behaviors, and preferences for support among New York healthcare workers during the COVID-19 pandemic. *Gen Hosp Psychiatry*. 2020;66:1-8. doi:10.1016/j.genhosppsy.2020.06.007
49. Alosaimi FD, Alawad HS, Alamri AK, Saeed AI, Aljuaydi KA, Alotaibi AS, et al. Stress and coping among consultant physicians working in Saudi Arabia. *Ann Saudi Med*. 2018;38(3):214-24. doi:10.5144/0256-4947.2018.214
50. Khanagar SB, Al-Ehaideb A, Jamleh A, Ababneh K, Maganur PC, Vishwanathaiah S, et al. Psychological distress among undergraduate dental students in Saudi Arabia and its coping strategies—a systematic review. *Healthcare*. 2021;9(4):429. doi:10.3390/healthcare9040429