Medical Science

pISSN 2321–7359; eISSN 2321–7367

Sleep quality among Al Qunfudhah medical students and its effects on their academic performance during covid-19 pandemic

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To Cite:
Alkalash S, Alzubaidi H, Alessi N, Alghanmi A, Almasoudi A. Sleep quality among Al Qunfudhah medical students and its effects on their academic performance during covid-19 pandemic. Medical Science, 2022, 26, ms50e2066.
doi: https://doi.org/10.54905/disssi/v26i120/ms50e2066

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Peer-Review History
Received: 17 December 2021
Reviewed & Revised: 19/December/2021 to 21/January/2022
Accepted: 23 January 2022
Published: 29 January 2022

Peer-review Method
External peer-review was done through double-blind method.

URL: https://www.discoveryjournals.org/medicalscience

ABSTRACT

Background: Adequate sleep is a critical issue for good human health and cognitive function. COVID-19 pandemic disrupts sleep pattern for medical students so this study assessed sleep quality among medical students in Al Qunfudhah College of medicine and its effects on their academic performance during COVID-19 pandemic. *Methods:* A random sample of 198 undergraduates was enrolled in this cross sectional study during academic year 2020-2021. A validated, an online survey Pittsburgh Sleep Quality Index (PSQI) was used to collect data. *Results:* A total of 198 undergraduates responded to survey, male students represented (59.1%) and majority were single (96.5%). Poor sleep quality was observed among 55.6% of them. About 25.0% of medical students were using sleeping medications and 53.0% of them slept less than five hours a night. Finally, 91.0% of students who got GPAs 2-2.5 were having poor sleep quality *(P 0.001). Conclusion:* COVID-19 carried major stresses for medical students which in turn led to poor sleep quality among most of them and negatively affected their academic performance. Poor sleep quality pushed medical students to use sleeping medication which is an issue of concern.

Keywords: Academic performance, COVID-19 pandemic, Medical students, Sleep quality.

1. INTRODUCTION

Sleep is a crucial part of human health and life. It plays a major role in learning, practice, physical and mental health (Dewald et al., 2010). The sleep–wake cycle, one of our biological rhythms, is driven by a circadian timing system which is influenced by many factors such as physiological function, school and work schedules (Lima et al., 2002). This cycle is vulnerable among medical students due to inadequate sleep duration, more latent time needed

to initiate sleep onset, and frequent napping episodes during daytime (Sweileh et al., 2011).

In December 2019, coronavirus disease (COVID-19) was emerged in Wuhan, China then WHO named it as pandemic due to its rapid spread worldwide. Since this time a many different social distancing measures, including holding schools, universities, retirement homes, and sports venues, and limiting all activities were obligated in the most exposed countries (Legido-Quigley et al., 2020). These measures were associated with bad psychological impact on population whether infected or not including significant psychological morbidities, negative emotions, and sleep problems (Van Bortel et al., 2016; Faheem et al., 2021; Eid et al., 2021). The medical students and healthcare workers are at high risk of getting tired, due to sleep deprivation, psychological distress, long shifts, and hardship associated with personal protective equipment (PPE) use (Low et al., 2019; Alotaybi et al., 2021). In addition to all previous circumstances, poor sleep quality, especially during examination periods have been found to negatively affect students' academic performance (Phillips et al., 2017; Akerstedt et al., 2012). Similarly, worst academic performance has been shown to relationship with poor sleep quality before exams (Chinawa et al., 2014). Among college student the commonest sleep problem is Excessive daytime sleepiness (EDS), sleep distress and poor sleep quality (Lund et al., 2010).

Some of the factors lead to sleep problems among undergraduate students such as unhealthy lifestyle (Xu et al., 2015), excessive use of social media, new social and academic environment (Nadorff et al., 2011). Some Sleep problems are frequent in college students such as insomnia and difficulty falling asleep and maintaining sleep (Bahammam et al., 2012). Recent few studies have discussed the relationship between poor sleep quality, stress, and academic success of medical students, and their result of sleep on academic performance were variable (Alqarni et al., 2018; Shatla et al., 2021). One study reported that poor sleep quality as high as 76% (Pilcher & Walters, 1997). Educators and students typically didn't recognize that sleep pattern may affect academic success (Ibrahim et al., 2017).

In spite of previous studies were conducted to identify relationship between sleep disorders among medical students and their academic performance but no any available studies was done in AlQunfudhah college of medicine and because AlQunfudhah city is a far away any big cities and their population involving students don't have adequate level of care as peers in big cities so we tried to search this problem and focus a spotlight on them to be more recognized as others. So, current study was conducted to determine sleep quality among medical students in AlQunfudhah College of medicine and its effects on their academic performance during COVID 19 pandemic.

2. MATERIALS AND METHODS

A descriptive cross-sectional study was conducted in Al Qunfudhah College of medicine, Umm Al-Qura University, Saudi Arabia during the academic year 2020-2021, to assess sleep quality among medical undergraduate students and its effect on their academic performance. This study was conducted in time frame of 12 months from (December 2020 to December 2021). The participants were 198 male and female medical undergraduate students from the 2nd year through the 6th year who were proportionally allocated according to sum of students in each academic level. All data were collected anonymously. Data were collected through a validated well-structured electronic questionnaire that was distributed in two languages: English and Arabic among all the medical college students (327 students) with returning back of (198 submitted questionnaires) representing about 60.6% response rate. The surveys were distributed to target population through social media as what's app application. To increase their response rate, many reminders were sent to target population through data collectors.

The used questionnaire included: sociodemographic data - age, gender, marital status, body mass index (BMI), academic level, grade point average (GPA). It also included the Pittsburgh Sleep Quality Index (PSQI) to assess subjective sleep quality (Buysse et al., 1989), consisting of 19 self-rated questions which are combined to form seven components: quality of students' sleep, latent time required to initiate sleeping, night time sleep duration, habitual sleep efficiency, sleep disturbances, use of medications that help them to initiate sleeping, and day time somnolence and disturbances during the day. PSQI score which ranges from zero to 21, A score of less than five was representative of poor sleep quality, whereas a score of five and higher was indicative of good sleep quality. Each component has a score range of zero to three; zero indicates no difficulty, whereas three indicates sever difficulty.

The first component is the subjective sleep quality which was determined with question number six. The second component is sleep latency which calculated by two questions (the mean score of question number two and part of question number five). The third component with sleep duration and it was calculated by (question number four). The fourth component is related to the habitual sleep efficiency which was determined with (questions number four, three, one) while its score was calculated by dividing the total hours of sleep by total hours in the bed then multiplied by 100. The fifth component related to step disturbances and was accomplished by calculating the mean value of question five. The sixth component islinked to use of sleeping medication and was determined based on (question number seven). Last one, the seventh component is the daytime dysfunction and was assessed

throughout two questions (mean scores of questions number eight and nine). Grade Performance Average (GPA) was assessed through a simple question and stratified into high (3.5 or higher), good (3 - 3.49), low (2 - 2.99).

A pilot study was done for 19 medical students in order to check accuracy and relevance of the used tools before actual conduction of current study and to detect any obstacles that might face the study implementation. Results of this pilot were not included in the study. All data extracted were coded in excel sheet then transported to SPSS software package version 25.0 (IBM, Armonk, New York, USA). Description of quantitative variables was in the form of mean, standard deviation (SD). Frequency and percentage were used for qualitative data, which were analyzed using Chi-test ($\chi 2$) for comparison between two independent qualitative variables.

3. RESULTS

A total of 198 medical students completed an online questionnaire representing response rate 60.6%. Male students were (59.1%) of the participants and most of them group were single (96.5%). Distribution of students according to their academic level was varied as 62 (31.3%) students were from 2nd academic level , 24 (12.1%) from the 3rd , 27 (13.6%) from the 4th , 27 (13.6%) from the 5th , 58 (29.3%) from the 6th academic levels (Table 1). Regarding sleep pattern about 18.0% of medical students spent more than 60 minutes before being fallen asleep (Figure 1). More than half of medical students sleep for below five hours per night (Figure 2).

Table 1 Sociodemographic data of participated medical students

Parameters	Frequency		Percentage
	N	198	%
Gender			
Male	117		59.1
Female	81		40.9
Marital status			
Single	191		96.5
Married	7		3.5
Body Mass Index (BMI)			
Less than 18.5	27		13.6
18.5-24.9	103		52.0
25-29.9	59		29.8
More than 30	9		4.5
Academic Level			
Second	62		31.3
Third	24		12.1
Fourth	27		13.6
Fifth	27		13.6
Sixth	58		29.3
Grade Point Average (GPA) on academic year (2019-2020)			
2-2.99	33		16.7
3-3.49	40		20.2
>3.5	125		63.1
Grade Point Average (GPA) on academic year (2020-2021)			
2-2.99	24		12.1
3-3.49	72		36.4
>3.5	102		51.5

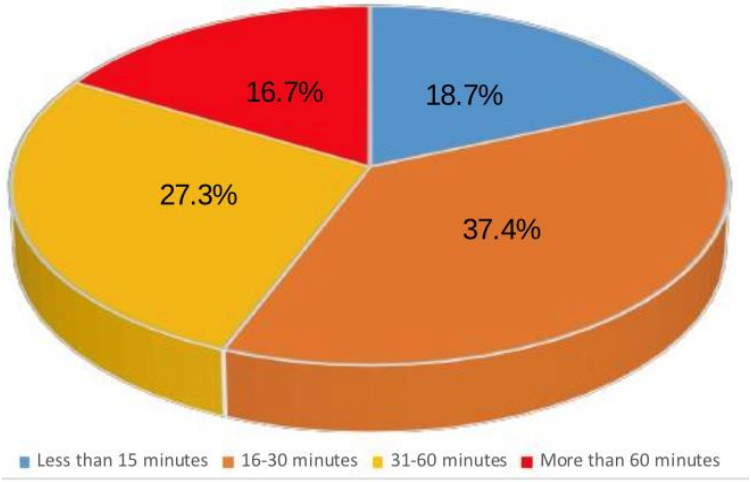

Figure 1 Pie chart demonstrates sleep latency among medical students.

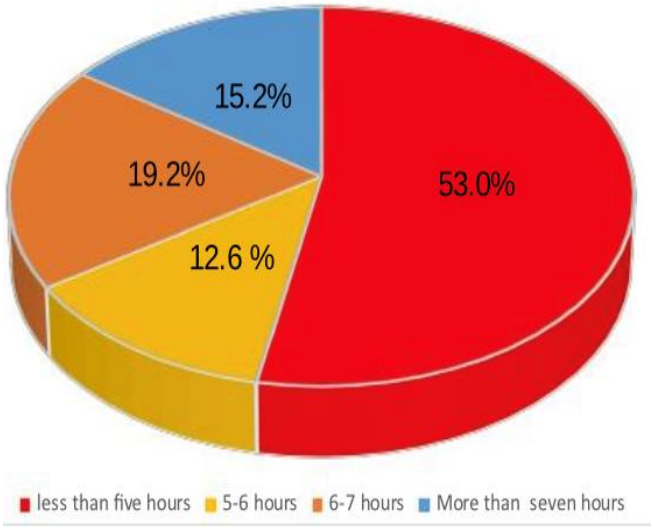

Figure 2 Pie chart demonstrates duration of night sleep among medical students.

About 21.0% of medical students used medications to facilitate their sleep (Figure 3). Regarding quality of their sleep pattern; There were 88 (44.4%) with PSQI score of five or higher which are classified as "Good sleep quality", 110 (55.6%) participants with PSQI score less than five which are classified as "Poor sleep quality" shown in (Figure 4).

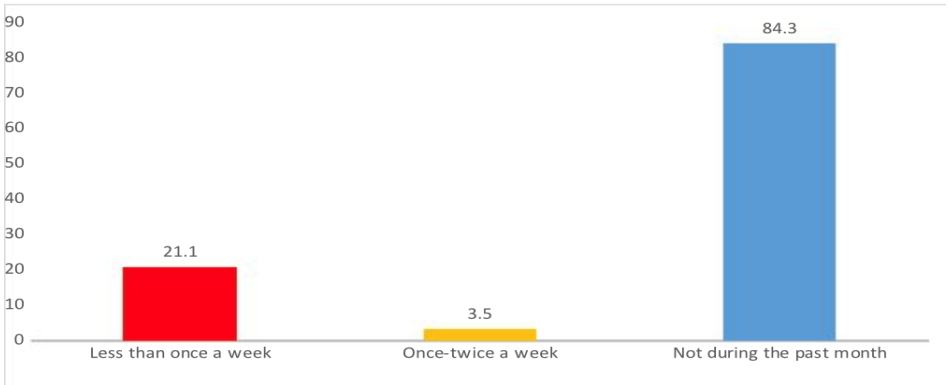

Figure 3 Bar chart demonstrates the percentage use of sleeping medications.

Figure 4 Pie chart demonstrates percentages of good and poor sleep quality.

Poor sleep quality was significantly higher among obese, overweight medical students as all obese and half of overweight students had poor sleep quality (P 0.03), more than two thirds of the fifth year medical students (81.1%) suffered poor sleep quality *(P 0.04),* majority of medical students who got poor GPAs were having poor sleep quality (P <0.001) (Table 2).

Table 2 Comparison between students who had poor and good sleep quality according to their demographic data

Parameters	**Good sleep quality**		**Poor sleep quality**		**X^2**	**P value**
	PSQI < 5		PSQI ≥5			
	N 88	%	N 110	%		
Gender						
Male	49	41.9	68	58.1	0.76	0.23
Female	39	48.1	42	51.9		
Marital status						
Single	86	45.0	105	55.0	0.74	0.32
Married	2	28.6	5	71.4		
Body Mass Index (Kg/m²)						
Less than 18.5	10	37.0	17	63.0	8.74	0.03*
18.5-24.9	49	47.6	54	52.4		
25-29.9	29	49.2	30	50.8		
More than 30	0	0.0	9	100.0		
Academic Level						
Second	30	48.4	32	51.6	9.72	0.04*
Third	14	58.3	10	41.7		
Fourth	12	44.4	15	55.6		
Fifth	5	18.5	22	81.5		
Sixth	27	46.6	31	53.4		
Grade Point Average (GPA) on academic year (2019-2020)						
2-2.99	16	47.1	18	52.9	1.69	0.43
3-3.49	21	52.5	19	47.5		
>3.5	51	41.1	73	58.9		
Grade Point Average (GPA)on academic year (2020-2021)						
2-2.99	2	8.3	22	91.7	82.25	0.000*
3-3.49	9	12.5	63	87.5		
>3.5	77	75.5	25	24.5		

4. DISCUSSION

The aim of this research was to assess quality of sleep among medical undergraduate students in AlQunfudhah College of medicine and its effects on their academic performance during COVID 19 pandemic. This study showed that 18.0% of medical students spent more than 60 minutes before being fallen asleep and 27.0% couldn't go into sleep within 30 minutes which was higher than percentage recorded in Nepal by (Shrestha et al., 2021) as they found that about 14.0% of medical students had problem to fall asleep within 30 minutes. The discrepancy between both results may be related to the difference in culture between both studies as in kingdom of Saudi Arabia there was a strong regulation to ensure social distance and regular daily reports about new cases and deaths due to COVID-19 which in turn elaborated some kind of stress among populations involving medical students.

Regarding duration of night sleep; more than half of medical students (53%) reported getting less than 6 hours of sleep at night which is less than the average amount of hours required for young adults (Watson et al., 2015). Stressful situation of COVID-19 pandemic was the most obvious cause that made people unable to live their usual life style including their sleep pattern. The most worrisome result in this study was the uptake of sleeping medications by 21.1% of medical students to help them to sleep however this percentage was greater than reported in KSA by (Eleftheriou et al., 2021) as they notified that 7.7% of medical students had to use sleeping pills to initiate their sleeping cycle during COVID-19 pandemic.

Covid-19 pandemic is an emergency situation that associated with great stresses for all population especially medical students whose avery critical study and need to practice well whether in skills laboratory or hospitals what they were learnt. All these stresses made them abnormalities in their sleep pattern. The study revealed that 55.6% of medical students suffered poor sleep quality. When compared with other studies, this result was the same as that was detected by (Fawzy & Hamed, 2017) in Egypt was 55.7%. The fact that medical students undertake vigorous schedules as they advance in their medical curriculum, may responsible for higher incidence of poor sleep quality among medical students in their all years even with normal situations. Beside the previous rational we see that public stress during early period of COVID-19 pandemic may be the main source for this condition. Another suspected reason for such high frequency of poor sleep quality is related to sudden shift of education from traditional in site to virtual learning among this practical students who should train on clinical cases.

Even though this finding was considerably higher than prevalence reported by (Abdulghani et al., 2012) who found that 36.6% of students in Riyadh's King Saud University suffered from poor sleep quality and (Choueiry et al., 2016) in Lebanon 37.1% in Lebanon. Another Palestinian and European studies revealed that poor sleep quality among medical students was much lower than our results represented 9.8% and 7% respectively this great dissimilarities between our and their results may be due to difference between study settings and Estonian study was conducted in normal situations without any pandemic (Sweileh et al., 2011; Veldi et al., 2005).

Poor sleep quality was significantly higher among obese, overweight medical students as all obese and half of overweight students showed poor sleep quality and these findings are supported by a research conducted by (Patel & Hu, 2008) among children and adolescents where authors detected a positive association between short sleep and obesity. More than two thirds of the fifth year medical students retained poor quality of their sleep which was in a contrary with what is reported by (Krueger & Friedman, 2009) that sleep duration declines with age by about ten minutes per decade. The nature of fifth year medical study based on clinical and field study which were blocked and shifted to virtual learning in a sudden so students in this academic year felt lost due to shortage in their learning process and absence of dealing with real patients in workplace due to COVID-19 emergency.

Majority of medical students who got poor GPAs suffered from poor sleep quality this result was similar to what was extracted by (Maheshwari & Shaukat, 2019) in Pakistan as medical students experienced poor sleep quality which had a negative impact on their academic performance. Adequate sleep is essential to refresh the students every day and help them in learning and cognitive function so poor sleep quality can negatively affect their understanding and cognitive function to the extent that decline their academic performances.

The reason of poor academic performance may be due to different factors including stress and fear from this unknown infectious disease, complete lockdown which increased this stress among public including medical students. Poor sleep may also affect students' cognitive levels as they should receive enough time to get rest in order to focus during learning process. Abrupt shift to virtual learning was non familiar for most students, also another factor that increase anxiety is poor quality and finally all of these factors coincided together and affected students GPAs. On the other hand (Sweileh et al., 2017) in their study established that academic performance of medical students was not associated with their sleep quality.

5. CONCLUSION

COVID-19 and its associated stresses negatively affected sleep quality of AlQunfudhah medical students as poor sleep quality was predominant among most of them and this by its role led to lowering their academic performance. Poor sleep quality accounted for dependence of medical students on sleeping medication in order to enter sleep which is an issue of concern. So it is recommended to provide help for medical students in form of educational session about importance of healthy sleep, how to overcome stress and warning them about drawbacks of sleeping medication.

Acknowledgement

We thank the participants who were all contributed samples to the study.

Authors' contributions

SHA: conceptualization and designed study, data analysis and interpretation, drafting article and revising finally proofed and submitted it on the journal web site. HLA: designing survey, research materials, and collected and organized data, editing article, and provided logistic support. NAM: designing survey, data acquisition, editing of manuscript. AAA: data acquisition, editing of manuscript. ASA: data acquisition, editing of manuscript.

Ethical approval

The study was approved by the Medical Ethics Committee of Umm Al-Qura University (ethical approval code: CTLN160221).

Funding

The study did not receive any external funding.

Conflict of interests

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

REFERENCES AND NOTES

1. Abdulghani HM, Alrowais NA, Bin-Saad NS, Al-Subaie NM, Haji AM. Sleep disorder among medical students: Relationship to their academic performance. Med teach 2012; 1: S37-41. doi: 10.3109/0142159X.2012.656749.
2. Akerstedt T, Orsini N, Petersen H, Axelsson J, Lekander M, Kecklund G. Predicting sleep quality from stress and prior sleep – A study of day-to-day covariation across six weeks. Sleep Med. 2012; 13:674–9. doi: 10.1016/j.sleep.2011 .12.013
3. Alotaybi MS, Al-Mugti HS, Alosaimi MN, Alsabban AM, Al Otaibi AF, Bugis OAA. Prevalence and determinants of stress among medical residents in ministry of National Guard, Saudi Arabia. Medical Science 2021; 25(110):868-881
4. Alqarni AB, Alzahrani NJ, Alsofyani MA. The interaction between sleep quality and academic performance among the medical students in Taifuniversity. Egypt J Hosp Med 2018; 70:2202–8. DOI: 10.12816/0045053
5. Bahammam AS, Alaseem AM, Alzakri AA, Almeneessier AS, Sharif MM. The relationship between sleep and wake habits and academic performance in medical students: A cross-sectional study. BMC Med Educ 2012; 12:61. doi: 10.1186/1472-6920-12-61.
6. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. Psychiatry Res 1989; 28:193–213. doi: 10.1016/0165-1781(89)90047-4.
7. Chinawa JM, Chukwu BF, Obu HA. Sleep practices among medical students in Pediatrics Department of University of Nigeria Teaching Hospital, Ituku/Ozalla, Enugu, Nigeria. Niger J Clin Pract 2014; 17:232–236. doi: 10.4103/1119-3077.127565.
8. Choueiry N, Salamoun T, Jabbour H, El Osta N, Hajj A, RabbaaKhabbaz L. Insomnia and relationship with anxiety in University students: a cross-sectional designed study. PLoS ONE 2016; 11(2):e0149643. doi: 10.1371/journal.pon e.0149643.
9. Dewald JF, Meijer AM, Oort FJ, Kerkhof GA, Bogels SM. Theinfluence of sleep quality, sleep duration and sleepiness on schoolperformance in children and adolescents: A meta-analytic review. Sleep Med Rev 2010; 14(3):179–189. doi:10.1 016/j.smrv.2009.10.004.

10. Eid MM, Alsufiany MB, Alshehri FH, Wazna NI, Alzahrani H, Ahmed RM, Faizo NL, El-Gendy AM, Abdelbasset WK, Eladl HM. Psychological impact of COVID-19 pandemic on University Students: A cross-sectional study. Medical Science 2021; 25(110):964-972
11. Eleftheriou A, Rokou A, Arvaniti A, Nena E, Steiropoulos P. Sleep Quality and Mental Health of Medical Students in Greece during the COVID-19 Pandemic. Front Public Health 2021(19); 9:775374. doi: 10.3389/fpubh.2021.775374. .
12. Faheem AM, Al Qarni AS, Al banawi NA, Abashar NK, Al Wagdani HS, Al Amri RO. Insomnia during COVID-19 pandemic and lockdown: Prevalence, severity, and associated risk factors in Jeddah, Saudi Arabia. Medical Science 2021; 25(113):1631-1640
13. Fawzy M, Hamed SA. Prevalence of psychological stress, depression and anxiety among medical students in Egypt. Psychiatry Res 2017; 255:186–194. doi: 10.1016/j.psychres. 2017.05.027.
14. Ibrahim NK, Badawi FA, Mansouri YM, Ainousa AM, Jambi SK, Fatani AN and Andijani RA.Sleep Quality among Medical Students at King Abdulaziz University: A Cross-sectional Study. J Community Med Health Educ 2017; 07(05). doi: 10.4172/2161-0711.1000561
15. Krueger PM, Friedman EM Sleep duration in the United States: a cross-sectional population-based study. Am J Epidemiol 2009; 169(9):1052-63. doi: 10.1093/aje/kwp023.
16. Legido-Quigley, H.; Mateos-García, J.T.; Campos, V.R.; Gea-Sánchez, M.; Muntaner, C.; McKee, M. The Resilience of the Spanish Health System against the COVID-19 Pandemic. Lancet Public Health 2020; 5, e251–e252. doi: 10.1016/S2468-2667(20)30060-8.
17. Lima PF, Medeiros AL, Araujo JF. Sleep-wake pattern of medical student: Early versus late class string time. Braz J Med Biol Res 2002; 35:1373–1377. doi: 10.1590/s0100-879x2002001100016.
18. Low ZX, Yeo KA, Sharma VK, Leung GK, McIntyre RS, Guerrero A, Lu B, Lam CC, Tran BX ,Nguyen LH , Ho CS Tam WW and Ho R . Prevalence of burnout in medical and surgical residents: a meta-analysis. Int J Environ Res Public Health 2019; 16: 1479. doi: 10.3390/ijerph16091479
19. Lund HG, Reider BD, Whiting AB, Prichard JR. Sleep patterns and predictors of disturbed sleep in a large population of college students. J Adolesc Health 2010; 46(2):124–132. doi: 10.1016/j.jadohealth.2009.06.016.
20. Maheshwari G, Shaukat F, Impact of Poor Sleep Quality on the Academic Performance of Medical Students. Cureus 2019; 11(4): e4357. doi:10.7759/cureus.4357.
21. Nadorff MR, Nazem S, Fiske A. Insomnia symptoms, nightmares, and suicidal ideation in a college student sample. Sleep. 2011; 34(1):93–98. doi: 10.1093/sleep/34.1.93.
22. Patel SR, Hu FB. Short sleep duration and weight gain: a systematic review. Obesity 2008; 16(3):643–653. doi: 10.1038/oby.2007.118.
23. Phillips AJ, Clerx WM, O'Brien CS, Sano A, Barger LK, Picard RW, Lockley SW, Klerman EP, Czeisler CA. Irregular sleep/wake patterns are associated with poorer academic performance and delayed circadian and sleep/wake timing. Sci Rep. 2017; 7:3216. doi:10.1038/s41598-017-03171-4
24. Pilcher JJ, Walters AS. How sleep deprivation affects psychological variables related to college students' cognitive performance. Journal of American college health: J of ACH 1997; 46(3):121–6. doi: 10.1080/07448489709595597.
25. Shatla MM, Alotaibi NT, Munshi SA, Yaseen EE, Qanadeely EM, Alshaddadi WA, Garout MA, Aljahdali IA. Covid-19 and its impact on education, social life, and mental health among medical students in Saudi Arabia. Medical Science 2021; 25(116):2708-2717
26. Shrestha D,Adhikari, Rawal N, Budhathoki P, Pokharel S, Adhikari Y, Rokaya P,Raut U.Sleep quality among undergraduate students of a medical college in Nepal during COVID-19 pandemic: an online survey .Journal List, F1000 Res, v.10; 2021. doi: 10.12688/f1000.
27. Sweileh WM, Ali IA, Sawalha AF, Abu-Taha AS, Zyoud SH, Al-Jabi SW. Sleep habits and sleep problems among Palestinian students. ChildAdolesc Psychiatry Ment Health 2011; 5(1):25. doi:10.1186/1753-2000-5-25.
28. Van Bortel T, Basnayake A, Wurie F, Jambai M, Koroma AS, Muana AT, Hann K, Eaton J, Martin S, Nellums LB. Effetspsychosociauxd'uneflambée de maladie à virus ebola aux échellesindividuelle, communautaire et international. Bull World Health Organ 2016; 94, 210–214. doi: 10.2471/BLT.15.158543
29. Veldi M, Aluoja A, Vasar V. Sleep quality and more common sleep-related problems in medical students. Sleep Med 2005; 6:269–75. doi: 10.1016/j.sleep.2004.12.003.
30. Watson NF, Badr MS, Belenky G, Bliwise DL, Buxton OM, Buysse D, Dinges DF, Gangwisch J, Grandner MA, Kushida C, Malhotra RK, Martin JL, Patel SR, Quan SF, Tasali E. Joint Consensus Statement of the American Academy of Sleep Medicine and Sleep Research Society on the Recommended Amount of Sleep for a Healthy Adult: Methodology and Discussion. Consensus Conference Panel. Sleep 2015; 38(8):1161-83. doi: 10.5665/sleep.4886.
31. Xu XL, Zhu RZ, Sharma M, Zhao Y. The influence of social media on sleep quality: a study of undergraduate students in Chongqing, China. J Nurs Care 2015; 4(3):1–7. doi: 10.4172/2167-1168.1000253