ORIGINAL ARTICLE

Sleep quality among School of Medicine students of a Peruvian university during the return to in-person classes after the COVID-19 social restrictions

Andrea Magaly Martin-Osorio* [1,a]; Franco Romaní-Romaní [1,b]

This study is part of the thesis by Andrea Magaly Martin Osorio. Factors associated with sleep quality in students of Human Medicine at a private university in Metropolitan Lima in 2022 [Thesis submitted for the degree of Doctor of Medicine]. Lima: School of Human Medicine, Universidad de Piura; 2022.

ABSTRACT

Objective: To evaluate the sociodemographic and academic characteristics associated with sleep quality among School of Human Medicine students.
Materials and methods: A cross-sectional study was carried out in a randomly selected sample of 184 School of Human Medicine students from a private university located in the city of Lima, Peru. The study was conducted between June and July 2022, a period of gradual return to in-person classes. The participants completed an anonymous virtual survey containing questions on sociodemographic and academic factors as well as the Pittsburgh Sleep Quality Index (PSQI). This instrument comprised seven parameters with scores ranging from 0 to 21, where a good sleep quality was established from 0 to 5 points. The outcome was dichotomous (good and poor sleep quality), so binary logistic regression was used to evaluate the associated factors.
Results: Females accounted for 53.26 % and the mean age was 20.05 with a standard deviation of 1.73. Concerning the hours of class time, 61.35 % were taught online. As for the sample, the prevalence of poor sleep quality was 69.02 %, out of which 76.53 % were females and 60.47 % males. The mean percentage of online classes was higher among those with poor sleep quality compared to those with good sleep quality (63.48 % versus 56.58 %, $p = 0.030$). Regardless of the percentage of online classes, females were twice as likely to have poor sleep quality (*OR* = 2.00, 95 % CI: 1.05 to 3.82).
Conclusions: Poor sleep quality affected 7 out of 10 School of Human Medicine students in the context of the gradual return to in-person classes after the COVID-19 social restrictions. Females had a higher chance of poor sleep quality, regardless of the percentage of online classes.

Keywords: Sleep Quality; Sleep; Students, Medical; Peru (Source: MeSH NLM).

INTRODUCTION

Sleep is a physiological process in humans with multiple effects on the body [1]. When disturbed, either quantitatively or qualitatively, both physical and mental health are affected; hence, it is important to care for and preserve sleep [2,3]. Despite of this, poor sleep quality (SQ) is frequent among medical students compared to the general population and to students of other professions [2,4,5]. The evaluation of SQ is performed using objective methods—such as polysomnography or actigraphy—as well as subjective methods, including clinical interviews and questionnaires, inter alia, the Pittsburgh Sleep Quality Index (PSQI) [1,6].

SQ can be influenced by demographic, social, academic, environmental and psychological factors, and even by the restrictions imposed during the COVID-19 pandemic [7]. The COVID-19 pandemic was a period when medical students had to adjust to online classes, a context that worsened SQ and increased the prevalence of anxiety and stress [5,8,9]. Poor SQ is associated with mental disorders among medical students; both conditions, in turn, play an antagonistic role in academic performance [10,11]. In 2017, a meta-analysis estimated that the global prevalence of poor SQ was 52.7 %, and in the Americas, it was 59.9 % [12]. Both prevalences are lower than those described in Peruvian studies [13-15].

In February 2022, the Ministry of Education of Peru approved the gradual return to in-person academic activities in public and private universities [16]. This return was gradual and was characterized by the implementation of a hybrid class model (online and in-person classes). Thus, there was a transition period in which students faced a new learning scenario which could influence their SQ.

Due to the importance of sleep to health and the background of the high prevalence of poor SQ among medical students in Peru, it became necessary to evaluate the factors associated with SQ during a transition period between online learning modality and the gradual return

1 Universidad de Piura. School of Human Medicine. Lima, Peru.
[a] Medical student; [b] Doctor of Medicine, master in Epidemiology.
*Corresponding author.

to in-person learning modality. Based on the foregoing, the objective of the study was to determine the demographic, social and academic factors associated with poor SQ among medical students at a private university in Lima.

MATERIALS AND METHODS

Study design and scope

A cross-sectional observational study was carried out. The sample of medical students was enrolled during June and July 2022. The study was conducted at a private university located in Metropolitan Lima, Peru. This school started its academic activities in 2017, and by the time of the study, there were six cohorts of incoming students.

The target population consisted of 409 students from the first to the sixth year of the Human Medicine program. The selection criteria were the following: being over 18 years old, being enrolled in the first semester of the 2022 academic year and providing an informed consent. We excluded students who reported a previous diagnosis of a sleep disorder by a specialist and those who did not complete all the questions.

The sample size for estimating a rate was calculated using OpenEpi, a free and -open-source software (https://www.openepi.com/SampleSize/SSPropor.htm). An expected prevalence of poor SQ of 59.9 % [12], a confidence level of 95 %, an absolute precision of 5 %, and a population size of 349 students over 18 years old were considered. The estimated sample size was 180. A non-response rate of 10 % was assumed; thus, 198 students were invited. Simple random sampling was used within a sampling frame obtained from the Academic Secretary's Office of the School of Human Medicine.

Variables and measurements

The data collection instrument in its first part included questions about age (in completed years), sex (female, male), number of cigarettes smoked per day over the last four weeks (no tobacco use, 1-10, 11-20 and more than 20 cigarettes per day) and frequency of alcohol use per week over the last four weeks (no alcohol use, less than once, once or twice and, three or more times per week).

As to academic characteristics, the following were inquired about: year of study (first, second, third, fourth, fifth, sixth); academic load, which indicated whether the student was enrolled in the required number of courses (recategorized as full or partial); belonging to the upper third, defined from the weighted average of grades and the student's placement in the first third of these averages ordered from highest to lowest (this variable was considered an indicator of superior academic performance); number of class hours per week; and number of hours of online classes per week. The total number of class hours per week (#cs) and the number of online class hours per week (#csv) were used to calculate the percentage of online classes: (#cvs / #cs) * 100 %.

The second part of the instrument included the PSQI, which is a 19-question tool used to assess the SQ of the last four weeks. Measurement with the PSQI is based on the sum of scores of seven sleep parameters evaluated through responses to 18 of the 19 questions, four of them with open-ended numerical responses and the others with multiple-choice responses on a Likert scale. SQ was rated based on the scores obtained from the points for each of the parameters. Each parameter was scored from 0 to 3, where 3 indicates greater dysfunction. The sum of the scores of the seven parameters ranged from 0 to 21, where 0 to 5 points defined good SQ and 6 to 21 points poor SQ.

The PSQI parameters are subjective sleep quality, latency (minutes it takes a person to fall asleep after going to bed), sleep duration, sleep efficiency (percentage that expresses the ratio of number of hours a person spends in bed and the number of hours slept), disturbances, use of sleeping medication and daytime dysfunction [6]. The study used the PSQI validated for the Peruvian adult population by Luna et al., who linguistically adapted the instrument and reported a Cronbach's alpha of 0.56 as an indicator of internal reliability [17].

Description of procedures

Expert judgement was sought to evaluate the adequacy of the Peruvian version of the PSQI for medical students. This stage was performed in April 2022 by six neurologists and two psychiatrists. The expert evaluation of the relevance of the items had an Aiken's V of 0.983. Subsequently, a pilot test was conducted with 30 medical students from two private universities in Lima to evaluate the test-retest reliability and internal consistency of the instrument. The fist pilot measurement was carried out in the first week of May 2022, and the second measurement three weeks later with the same students. Intra-observer agreement was measured using the Kappa coefficient and a value of 0.524 was obtained. Concerning internal consistency, a Cronbach's alpha value of 0.541 was estimated.

The online survey was administered between June and July 2022. Prior to this, an invitation was sent to the selected students via institutional e-mail, along with the link to the online survey. The database was cleaned in Microsoft Excel 2019.

Statistical analysis

The descriptive analysis of the categorical variables used frequencies and percentages, while the analysis of quantitative variables used means and standard deviations. The parameters of SQ were described for the entire sample and by sex, for which absolute and relative frequencies

were presented. In the analysis of the factors associated with sleep quality, Student's *t*-test was applied for quantitative variables, while the uncorrected chi-square test or chi-square test for linear trend was used for categorical variables, as appropriate. Variables with a *p* value < 0.05 (two-tailed) were included in the multivariate analysis. The assumption of no collinearity was verified by calculating the variance inflation factor (VIF), with a value < 2.5 being considered as a criterion for no collinearity. Multivariate analysis was performed using binary logistic regression, and the odds ratio with the corresponding 95 % confidence interval was estimated. JAMOVI software, version 2.3.16, was used for the described analysis. A *p* value < 0.05 was considered statistically significant.

Ethical considerations

The Institutional Review Board of the Universidad de Piura approved the research protocol (file PREMED04202202). The research adhered to the current ethical standards, an online informed consent was required applied, and the analysis was performed on an anonymized database.

RESULTS

Characteristics of the sample

A total of 198 students were invited; nevertheless, the analysis was conducted on data from 184 students. The selection process and reasons for exclusion are shown in Figure 1. Of the participants, 53.26 % were females, the age range was 18-26 years, while the mean (standard deviation [*SD*]) was 20.05 (1.73) years; additionally, 75.54 % had a full academic load. The mean percentage of online classes was 61.35 % (*SD* = 19.97) (Table 1). Among those with a full academic load, the mean percentage of online classes was 60.78 % (*SD* = 20.19), while among those without a full academic load, the mean was 63.09 % (*SD* = 19.40) (*p* = 0.501).

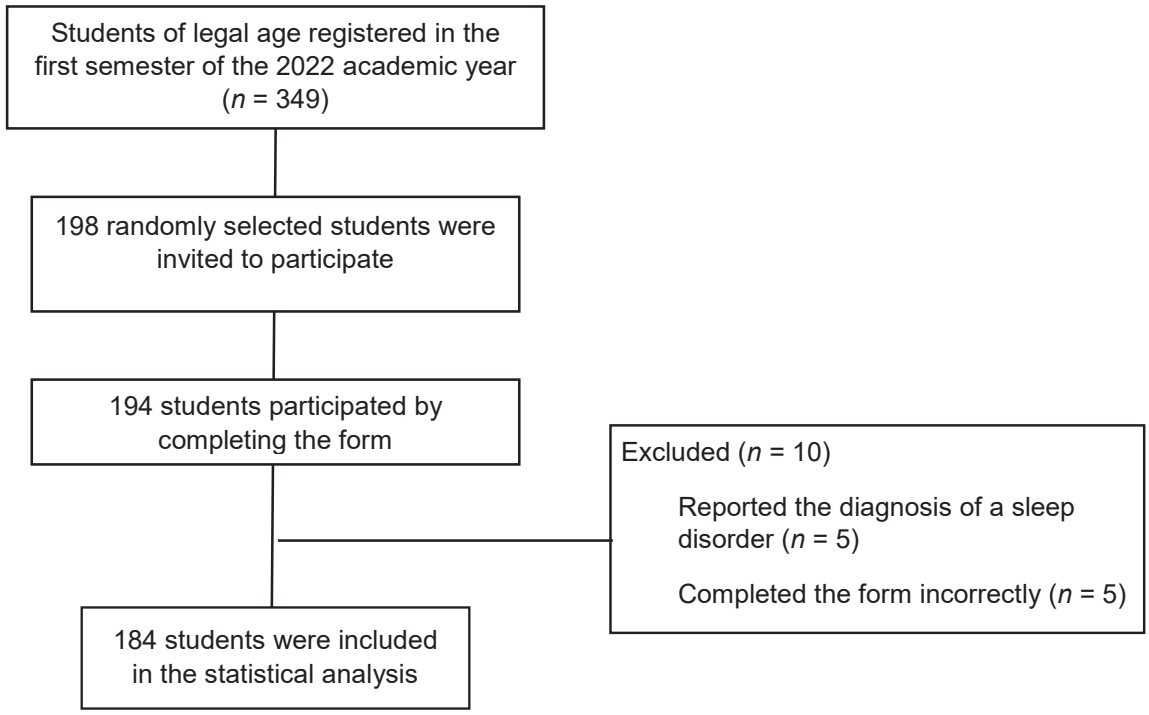

Figure 1. Flowchart of the sample selection process

Table 1. Sociodemographic and academic characteristics of medical students (*N* =184)

Variables	*n* (%)
Age (years), mean (*SD*)	20.05 (1.73)
Sex	
Female	98 (53,26)
Male	86 (46.74)
Year of study	
First	37 (20.11)
Second	45 (24.46)
Third	41 (22.28)
Fourth	30 (16.30)
Fifth	14 (7.61)
Sixth	17 (9.24)
Academic load	
Full	139 (75.54)
Partial	45 (24.46)
Class hours per week, mean (*SD*)	31.90 (6.65)
Online class hours per week, mean (*SD*)	19.29 (6.71)
Percentage of online classes	61.35 (19.97)
Upper third *	
Yes	52 (35.37)
No	95 (64.63)
Daily tobacco use	
No	161 (87.50)
Yes	23 (12.50)
Alcohol use per week	
No alcohol use	78 (42.39)
< once	85 (46.20)
Once or twice	19 (10.33)
≥ 3 times	2 (1.09)

Data available from 147 students

Pittsburgh Sleep Quality Index (PSQI)

Subjective quality was reported as poor in 44.57 % of the students, with a higher value among females compared to males (52.04 % versus 36.05 %). Sleep latency was greater than 60 minutes in 11.96 % of students, with a higher rate among females (15.31 % versus 8.14 %). In addition, 33.70 % indicated that they slept seven or more hours, 79.89 % reported a sleep efficiency ≥ 85 %. Furthermore, 90.76 % reported that they did not take sleeping medication. A total of 28.80 % reported feeling quite drowsy while driving, eating or doing other activity; this affected more females (37.76 %) than males (18.60 %) (Table 2).

The PQSI score had a minimum of 1 and a maximum of 18; the median was 7, and the interquartile range (IQR) was from 5 to 9. The median was 8 (IQR: 6-10) among females and 6 (IQR: 5-8) among males.

Table 2. Sleep quality parameters of the PSQI among medical students (*N* = 184)

Sleep quality parameters	Male *n* (%)	Female *n* (%)	*p* value	Total *N* (%)
Subjective quality				
Fairly good	7 (8.14)	2 (2.04)	0.059[a]	9 (4.89)
Good	45 (52.33)	41 (41.84)		86 (46.74)
Poor	31 (36.05)	51 (52.04)		82 (44.57)
Fairly poor	3 (3.49)	4 (4.08)		7 (3.80)
Latency (minutes)				
≤ 15	29 (33.72)	16 (16.33)	0.002[b]	45 (24.46)
16-30	34 (39.53)	30 (30.61)		64 (34.78)
31-60	16 (18.60)	37 (37.76)		53 (28.80)
> 60	7 (8.14)	15 (15.31)		22 (11.96)
Sleep duration (hours)				
≥ 7	31 (36.05)	31 (31.63)	0.145[b]	62 (33.70)
< 7 and ≥ 6	31 (36.05)	25 (25.51)		56 (30.43)
< 6 and ≥ 5	13 (15.12)	27 (27.55)		40 (21.74)
< 5	11 (12.79)	15 (75.31)		26 (14.13)
Efficiency (%)				
≥ 85 %	68 (79.07)	79 (80.61)	0.182[a]	147 (79.89)
75 %-84 %	14 (16.28)	8 (8.16)		22 (11.96)
65 %-74 %	3 (3.49)	7 (7.14)		10 (5.43)
< 65 %	1 (1.16)	4 (4.08)		5 (2.72)
Disturbances (scores)				
0	16 (18.60)	3 (3.06)	< 0.001[a]	19 (10.33)
≥ 1 y ≤ 9	68 (79.07)	78 (79.59)		146 (79.35)
≥ 10 y ≤ 18	2 (2.33)	16 (16.33)		18 (9.78)
≥ 19 y ≤ 27	0 (0)	1 (1.02)		1 (0.54)
Use of sleeping medication (times a week)				
0	79 (91.86)	88 (89.80)	0.150[a]	167 (90.76)
< 1	7 (8.14)	5 (5.10)		12 (6.52)
1-2	0 (0)	4 (4.08)		4 (2.17)
≥ 3	0 (0)	1 (1.02)		1 (0.54)
Daytime dysfunction				
None	3 (3.49)	1 (1.02)	0.012[a]	4 (2.17)
Mild	23 (26.74)	15 (15.31)		38 (20.65)
Moderate	44 (51.16)	45 (45.92)		89 (48.37)
Severe	16 (18.60)	37 (37.76)		53 (28.80)
Scoring according to the PQSI				
Good	34 (39.53)	23 (23.47)	0.019[b]	57 (30.98)
Poor	52 (60.47)	75 (76.53)		127 (69.02)

[a] Fisher's exact test, [b] Pearson's chi-square test

A total of 69.02 % (95 % CI: 62.30 to 75.75 %) had poor SQ. Poor SQ was reported by 76.53 % (95 % CI: 68.14 to 84.92) of females, compared to 60.47 % (95 % CI: 50.13 to 70.79) of males. Significant association was found between poor SQ with the year of study and the percentage of online classes; a higher rate of students with poor SQ was seen in the early years of study. Moreover, the percentage of online classes was higher among those with poor SQ (Table 3).

Table 3. Sleep quality according to the sociodemographic and academic characteristics

Characteristics	Sleep quality		*p* value[a]
	Good (57) *n* (%)	Poor (127) *n* (%)	
Age – mean (*SD*)	20.42 (1.77)	19.88 (1.69)	0.051[b]
Sex			
Female	23 (23.47)	75 (76.53)	0.019
Male	34 (39.53)	52 (60.47)	
Year of study			
First	9 (24.32)	28 (75.68)	0.037[c]
Second	11 (24.44)	34 (75.56)	
Third	13 (31.71)	28 (68.29)	
Fourth	10 (33.33)	20 (66.67)	
Fifth	6 (42.86)	8 (57.14)	
Sixth	8 (47.06)	9 (52.94)	
Academic load			
Full	45 (32.37)	94 (67.63)	0.472
Partial	12 (26.67)	33 (73.33)	
Percentage of online classes - mean (*SD*)	56.58 (21.79)	63.48 (18.79)	0.030
Upper third			
Yes	17 (32.69)	35 (67.31)	0.994
No	31 (32.63)	64 (67.37)	
Tobacco use			
No tobacco use	51 (30.91)	114 (69.09)	0.952
1-10 cigarettes per day	6 (31.58)	13 (68.42)	
Alcohol use per week			
No alcohol use	23 (29.49)	55 (70.51)	0.166[c]
< once	24 (28.24)	61 (71.76)	
Once or twice	8 (42.11)	11 (57.89)	
≥ 3 times	2 (100)	0 (0)	

The values are expressed as *n* (%) or mean, [a] chi-square test, [b] Student's *t*-test, [c] chi-square test for linear trend

Factors associated with SQ

The variables found to be associated with SQ in the bivariate analysis were sex, year of study and percentage of online classes (Table 3). The association between them was analyzed before including them in the binary logistic regression model. Age and year of study were found to be associated with each other (Kruskal-Wallis test = 108, degrees of freedom = 5, $p < 0.001$). The median of the percentage of online classes decreased with increasing year of study: first year (median [Mdn] = 73.5), second (Mdn = 78.8), third (Mdn = 75.0), fourth (Mdn = 43.9), fifth (Mdn = 37.8) and sixth (Mdn = 23.5). Since the year of study was correlated with age and the percentage of online classes, only the last variable was included in the model. Finally, the multivariate analysis revealed that, regardless of the percentage of online classes, females had twice the chance of poor SQ compared to males (95 % CI: 1.05 – 3.82) (Table 4).

Table 4. Binary logistic regression analysis for factors associated with poor sleep quality among medical students.

Characteristic	Odds ratio	Lower limit	Upper limit	*p* value
Sex				
Male	1			
Female	2.00	1.05	3.82	0.035
Percentage of online classes	1.02	1.00	1.03	0.057

Variance inflation factor (sex and percentage of online classes) = 1.01
Hosmer-Lemeshow test (chi-square = 6.407, p = 6.02), Nagelkerke's R^2 = 6.8 %

DISCUSSION

It was found that seven out of 10 medical students at a Peruvian university had poor SQ. This is a higher rate than that reported worldwide (52.7 %) and in the Americas (59.9 %) [12], but consistent with studies from Peru (83.9 %) [14], Colombia (79.3 %) [18] and Chile (91.8 %) [19]. The poor SQ found was lower than what has been reported in other studies in Peru in years prior to the quarantine [20,21], during the COVID-19 health emergency [14] and the progressive return to in-person learning at a university in Lambayeque [22].

It is suggested that the transition period, during which in-person classes were resumed, had a positive influence on SQ; however, this hypothesis cannot be confirmed due to the absence of pre-pandemic baseline data to contrast our results. The provisions of the Peruvian Ministry of Education resulted in transition period in which online and in-person classes coexisted [16]. We consider that it will not be feasible to replicate this context for further research and that our results will serve to report what happened in this particular juncture.

Females were more affected by poor SQ, and this association that has been seen in other studies [20,23,24]. Hormonal changes during their menstrual cycle, even without causing symptoms or discomfort, influence SQ negatively [25,26]. These same hormonal factors also contribute to a higher prevalence of mental health disorders—such as depression and anxiety—which are usually pathologies associated with poor SQ [27,28]. This finding indicates that they form a group susceptible to poor SQ and its consequences on academic performance and mental health.

Early-year students were younger and had a higher number of online classes compared to upper-year students. It has been observed that online classes during the COVID-19 pandemic affected the mental health and SQ of medical students, and our results would be consistent with what has been reported in the literature [5,29]. It was found that, for every 1 % increase in online learning modality, students increased their probability of having poor SQ by 2 %, which would explain the higher frequency of poor SQ among early-year students. The juncture in which the study was conducted allowed measuring a percentage of online classes, thereby enabling an evaluaton of its role concerning SQ. This analysis would not be feasible in in-person learning modality. No prior studies were found that investigated the percentage of online classes or any similar indicator. Although the strength of the association between the percentage of online classes and poor SQ was marginal, it was suggested that a sample with greater statistical power could confirm this association.

Belonging to the upper third is an indicator of good academic performance. Evidence suggests that good SQ is associated with better academic performance [30,31]; nevertheless, in our study and in a Peruvian study, no such association was found [13]. A full academic load was associated with poor SQ in a 2016 Peruvian study [32]. In our study, students with a partial academic load—which involved fewer class hours—had a similar percentage of online classes compared to those with a full academic load. This fact may have led to the academic load not being associated with SQ.

As for alcohol and/or tobacco use, these have been associated with a higher rate of poor SQ, as well as alterations in mental health [33,34]. In our study, the lack of association between poor SQ and tobacco use could be explained by the low rate of smokers (10.3 %). No association was found between alcohol use and SQ. In the sample only 1.1 % consumed alcohol three or more times per week, and the amount of consumption was not inquired about, which would have helped to better explore the association between poor SQ and alcohol use. This association that has been reported as significant by other studies [33,35].

Within the sleep parameters, it is important to point out that two out of three students sleep less than seven hours per night, i.e., they do not meet the minimum amount of sleep recommended for their age (seven to nine hours per day) [36]. This finding is repeated in other

studies [21,37] and is alarming because long-term effects are associated with an increased risk of hypertension, type 2 diabetes mellitus, obesity, depression and cardiovascular disease, inter alia [38]. These data support the relevance of seeking solutions to prevent the consequences of not getting enough hours of sleep.

Daytime dysfunction is a consequence of inadequate rest, and we found that 77.1 % of the students had moderate to severe daytime dysfunction, which can result in serious outcomes such as workplace or car accidents [39]. This result may appear contradictory when compared to the rate of students reporting good to fairly good subjective sleep quality (51.6 %). The foregoing reveals that while half of the students considered their SQ to be good to fairly good, three out of four had daytime dysfunction in the moderate to severe range and seven out of 10 were classified as having poor SQ. These findings could be explained by the fact that there are students who underestimate their behaviors prone to poor SQ, and subjectively consider that they sleep well, and do not perceive the need to implement measures to improve their sleep.

The study had the following limitations: we did not perform stratified sampling by year, which would have been the most efficient sample selection for the characteristics of the study population; responses were susceptible to recall bias and social desirability among the participants. Finally, the results cannot be extrapolated to other university student populations because it was a single-center study conducted in a very specific context.

In conclusion, poor SQ is a prevalent condition that affects 7 seven out of 10 medicine students at a private university located in Lima, Peru. Being female was found to be an independent risk factor for poor SQ, regardless of the percentage of online classes. Therefore, it is recommended to study and implement interventions based on sleep hygiene to improve and maintain adequate SQ among university medical students, especially among females.

Acknowledgment: We express our gratitude to Dr. Liesel Ludowieg for her advice and support in conceptualizing the idea and to Dr. Billy Sánchez for his assistance with the pilot test and analysis of the pilot data.

Author contributions: AMO and FRR participated in the study design. Moreover, AMO was responsible for data collection, and AMO and FRR developed the database and conducted the statistical analysis. In addition, AMO prepared the first draft of the manuscript. AMO and FRR then carried out the successive revisions of the manuscript and approved the final version. Both assume responsibility for the published article.

Funding sources: This article was funded by the authors.

Conflicts of interest: The authors declare no conflicts of interest.

BIBLIOGRAPHIC REFERENCES

1. Contreras A. Sueño a lo largo de la vida y sus implicancias en salud. Rev médica Clín Las Condes [Internet]. 2013;24(3):341–9.
2. Nadeem A, Cheema MK, Naseer M, Javed H. Comparison of quality of sleep between medical and non-medical undergraduate Pakistani students. J Pak Med Assoc. 2018;68(10):1465–70.
3. Carrillo-Mora P, Barajas-Martínez KG, Sánchez-Vázquez I, Rangel-Caballero MF. Trastornos del sueño: ¿qué son y cuáles son sus consecuencias? Rev Fac Med Univ Nac Auton Mex [Internet]. 2018;61(1):6–20.
4. Azad MC, Fraser K, Rumana N, Abdullah AF, Shahana N, Hanly PJ, et al. Sleep disturbances among medical students: a global perspective. J Clin Sleep Med [Internet]. 2015;11(01):69–74.
5. Meo SA, Alkhalifah JM, Alshammari NF, Alnufaie WS, Algoblan AF. Impact of COVID-19 pandemic on sleep quality among medical and general science students: King Saud University Experience. Pak J Med Sci Q [Internet]. 2022;38(3):639-44.
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 [Internet]. 1989;28(2):193-213.
7. Wang F, Biró É. Determinants of sleep quality in college students: a literature review. Explore J Sci Heal [Internet]. 2021;17(2):170-7.
8. Mittal R, Su L, Jain R. COVID-19 mental health consequences on medical students worldwide. J Community Hosp Intern Med Perspect [Internet]. 2021;11(3):296–8.
9. Hassan E, Ali S, Barone N, Alam P, Thibaudeau S. The effect of COVID-19 on medical students' education and wellbeing: a cross-sectional survey. Can Med Educ J [Internet]. 2021;12(3):92-97.
10. Neponuceno H de J, Souza BDM, Neves NMBC. Transtornos mentais comuns em estudantes de medicina. Rev Bioét [Internet]. 2019;27(3):465–70.
11. Soto M, Raúl N. El sueño, transtornos y consecuencias. Acta méd peru [Internet]. 2009;26(1):4-5.
12. Rao WW, Li W, Qi H, Hong L, Chen C, Li CY, et al. Sleep quality in medical students: a comprehensive meta-analysis of observational studies. Sleep Breath [Internet]. 2020;24(3):1151–65.
13. Espinoza-Henriquez R, Diaz-Mejia E, Quincho-Estares ÁJ, Toro-Huamanchumo CJ. Ansiedad y calidad de sueño en estudiantes de medicina: ¿Existe una relación con la anemia? Rev habanera cienc médicas [Internet]. 2019;18(6):942–56.
14. Olarte-Durand M, Roque-Aycachi JB, Rojas-Humpire R, Canaza-Apaza JF, Laureano S, Rojas-Humpire A, et al. Mood and sleep quality in Peruvian medical students during COVID-19 pandemic. Rev Colomb Psiquiatr [Internet]. 2021.
15. Allende-Rayme FR, Acuña-Vila JH, Correa-López LE, De La Cruz-Vargas JA. Academic stress and sleep quality during the COVID-19 pandemic among medical students from a university of Peru. Rev Fac Med Univ Nac Colomb [Internet]. 2021;70(3):e93475.
16. Ministerio de Educación. Orientaciones para la implementación del retorno gradual a la presencialidad y/o semipresencialidad del servicio educativo superior universitario, en el marco de la emergencia sanitaria por la COVID-19 2022 [Internet]. Lima: MINEDU; 2022. Available from: https://repositorio.minedu.gob.pe/handle/20.500.12799/7759
17. Luna-Solis Y, Robles-Arana Y, Agüero-Palacios Y. Validación del Índice de Calidad de Sueño de Pittsburgh en una muestra peruana. Rev An Salud Ment [Internet]. 2015;31(2):23-30.

18. Machado-Duque ME, Echeverri Chabur JE, Machado-Alba JE. Somnolencia diurna excesiva, mala calidad del sueño y bajo rendimiento académico en estudiantes de Medicina. Rev Colomb Psiquiatr [Internet]. 2015;44(3):137-42.
19. Flores-Flores D, Boettcher-Sáez B, Quijada-Espinoza J, Ojeda-Barrientos R, Matamala-Anacona I, González-Burboa A. Calidad del sueño en estudiantes de medicina de la Universidad Andrés Bello, 2019, Chile. Rev médicas UIS [Internet]. 2021;34(3):29-38.
20. Vilchez-Cornejo J, Quiñones-Laveriano D, Failoc-Rojas V, Acevedo-Villar T, Larico-Calla G, Mucching-Toscano S, et al. Salud mental y calidad de sueño en estudiantes de ocho facultades de medicina humana del Perú. Rev Chil Neuro-Psiquiatr [Internet]. 2016;54(4):272–81.
21. Solis Facho GV. Uso de dispositivos móviles de pantalla y la calidad de sueño en estudiantes de la facultad de medicina humana en una universidad peruana [Internet]. Universidad Ricardo Palma; 2021. Available from: http://repositorio.urp.edu.pe/handle/URP/4351
22. Liza Puican RJ. Factores relacionados a mala calidad de sueño en estudiantes de Medicina Humana de la Universidad Nacional Pedro Ruiz Gallo, 2022 [Undergraduate thesis]. Perú: Universidad Nacional Pedro Ruiz Gallo; 2022. Available from: http://repositorio.unprg.edu.pe/handle/20.500.12893/10223
23. Ergin N, Kılıç BB, Ergin A, Varlı S. Sleep quality and related factors including restless leg syndrome in medical students and residents in a Turkish university. Sleep Breath [Internet]. 2022;26(3):1299–307. research. Psychiatry Res [Internet]. 1989;28(2):193–213.
24. Ahmed-Salama A. Sleep quality in medical students, menoufia university, Egypt. EFMJ [Internet]. 2017;1(1):1-21.
25. Nowakowski S, Meers J, Heimbach E. Sleep and women's health. Sleep Med Res [Internet]. 2013;4(1):1-22.
26. Mehta N, Shafi F, Bhat A. Unique aspects of sleep in women. Mo Med [Internet]. 2015;112(6):430-4.
27. Albert PR. Why is depression more prevalent in women? J Psychiatry Neurosci [Internet]. 2015;40(4):219-21.
28. Jia Q, Qu Y, Sun H, Huo H, Yin H, You D. Mental health among medical students during COVID-19: a systematic review and meta-analysis. Front Psychol [Internet]. 2022;13:846789.
29. Chang W-W, Shi L-X, Zhang L, Jin Y-L, Yu J-G. The mental health status and associated factors among medical students engaged in online learning at home during the pandemic: a cross-sectional study from China. Front Psychiatry [Internet]. 2021;12:755503.
30. 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 [Internet]. 2022;26(120):1.
31. Asia, Waseem S, Hidayat M, Usman R, Haq M, Abedeen Z. Effects of sleep quality on cardiovascular system, anxiety, and academic performance in medical and dental students in Peshawar, Pakistan. Pak J Med Health Sci [Internet]. 2022;16(7):724–5.
32. Vasquez-Chacon M, Cabrejos-Llontop S, Yrigoin-Perez Y, Robles-Alfaro R, Toro-Huamanchumo CJ. Adicción a internet y calidad de sueño en estudiantes de medicina de una Universidad peruana, 2016. Rev habanera cienc médicas [Internet]. 2019;18(5):817–30.
33. Mesquita G, Ferreira S, Rossini S, Soares E, Reimão R. Effects of tobacco and alcohol consumption on sleep quality of university students. Neurobiologia [Internet]. 2010;74(1):19-27.
34. Bogati S, Singh T, Paudel S, Adhikari B, Baral D. Association of the pattern and quality of sleep with consumption of stimulant beverages, cigarette and alcohol among medical students. J Nepal Health Res Counc [Internet]. 2020;18(3):379–85.
35. Sanchez SE, Martinez C, Oriol RA, Yanez D, Castañeda B, Sanchez E, et al. Sleep quality, sleep patterns and consumption of energy drinks and other caffeinated beverages among Peruvian college students. Health [Internet]. 2013;05(08):26–35.
36. Hirshkowitz M, Whiton K, Albert SM, Alessi C, Bruni O, DonCarlos L, et al. National Sleep Foundation's sleep time duration recommendations: methodology and results summary. Sleep Health [Internet]. 2015;1(1):40-3.
37. Javaid R, Momina AU, Sarwar MZ, Naqi SA. Quality of sleep and academic performance among Medical University Students. J Coll Physicians Surg Pak [Internet]. 2020;30(8):844-8.
38. Institute of Medicine (US) Committee on Sleep Medicine and Research. Sleep disorders and sleep deprivation: an unmet public health problem [Internet]. Washington (DC): National Academies Press (US); 2006. Available from: https://pubmed.ncbi.nlm.nih.gov/20669438/
39. Medic G, Wille M, Hemels ME. Short- and long-term health consequences of sleep disruption. Nat Sci Sleep [Internet]. 2017;9:151-61. 24. Ahmed-Salama A. Sleep quality in medical students, menoufia university, Egypt. EFMJ [Internet]. 2017;1(1):1-21.

Corresponding author:
Andrea Magaly Martin Osorio
Address: C/ Mártir José Olaya 162, Miraflores. Lima, Perú.
Telephone: +51 945 595 510
E-mail: andrea.martin@alum.udep.edu.

Reception date: June 16, 2023
Evaluation date: July 7, 2023
Approval date: July 26, 2023

ORCID iDs
Andrea Magaly Martin-Osorio https://orcid.org/0000-0003-0358-3312
Franco Romaní-Romaní https://orcid.org/0000-0002-6471-5684