Sleep quality and sleep hygiene in undergraduate students: a comparison between the first and the last year at medical school in Quito, Ecuador

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Abstract:

Aim: to analyze the quality of sleep with the total Pittsburgh Sleep Quality Index PSQI, among the first and last year students of the medical school.

Methods: epidemiologic, observational, and cross-sectional with two cohorts of individuals, performed at the Faculty of Medical Sciences at Central University of Ecuador, in Quito, Ecuador, during 2017. Sample size was of 401 individuals. 239 first year students and 162 last year students (internship), with non-probabilistic sampling. The PSQI was applied in its Spanish version consisting of 19 items.

Results: 81.17% of respondents of first-year are bad sleepers while in the group of last year students are 90.12%. The sleep duration factor has an average of 2.11 with a standard deviation of 0.80; the asymmetry is negative (-0.58), which indicates that the values are grouped to the right of the arithmetic mean, revealing that respondents sleep less than six hours a day.

Conclusion: It found that 90.12% of senior students (internship) and 81.17% of first year students are bad sleepers, 83.26% of first year students and 79.63% of senior year (internship) presented sleep duration of less than six hours, accompanied by night awakenings and daytime sleepiness. 45.61% of the first-year students and 61.73% of the internship perceived poor warm sleep. A moderate correlation value of r=0.549 was obtained between the total PSQI and the daytime sleep dysfunction in the internship students, while the first year students sleep duration reached a correlation of r=0.598.

Keywords: Sleep deprivation; sleep hygiene; medical students; daytime sleepiness; medical school; sleep disorders, circadian rhythm, sleep wake disorders, pittsburgh sleep quality index

Introduction

The medical school is one of the most demanding careers that exist today. Students pass several tests for admission to school and then during it, they are subjected to a permanent requirement that exceeds individual abilities (1). Throughout the years of training, the requirement is increasing and therefore, the capacities are decreasing (2). For example, in Ecuador, the career lasts 6 years distributed in 12 semesters, being the last 2 years of compulsory practice in the hospital called the internship (3). According to current Ecuadorian law, the career of Human Medicine in Ecuador must have a minimum duration of 11,360 hours and a maximum of 12,080 hours, including internship.

Indeed, medical students suffer a higher probability of having poor sleep quality compared to other university students from other careers (5), which, of course, has a negative impact on academic performance, physical and mental health (6) and therefore, quality of life too (7). In addition, poor sleep quality may be related to emotional problems, such as stress, depression and anxiety (8), excessive study load, irregular schedules (9), very extensive study program, high mobility due to hospital locations, strenuous clinical training, pressure significant economic, and everyday life (9). In addition, 25% of students could have some degree of overweight or obesity and altered levels of plasma lipids and blood pressure (10), most likely by sedentary life style in the years at medical school.

However, there is a big difference between education in the first year and the last year of medicine. During the first year, most classes are theoretical and limited to the classroom. In the last year, education is done in the hospital environment, where students must meet with hospital guards every fourth day, and 30-hour days in some cases (11). The last year is a combination between work in the hospital and direct learning in the patient. This is due to the principle that empirical practice strengthens the learning experience, guided by a mentor or tutor (12). In some countries, the internship year is part of the training as a resident physician (13, 14). A comprehensive meta-analysis of observational studies, using the Pittsburgh Sleep Quality Index (PSQI) as a measurement tool, showed that 52.7% of medical students had poor sleep quality, and showed that the prevalence of poor sleep quality was highest in Europe with 65.13%, followed by the Americas with 59.92% (15).

The objective of this study will be to analyze the quality of sleep using the PSQI tool, among the first and last year students of the Faculty of Medicine of the Central University of Ecuador.

Methods

Research design: epidemiologic, observational, and cross-sectional with two cohorts of individuals.

Setting: Faculty of Medical Sciences at Central University of Ecuador, in Quito, Ecuador, during 2017.

Sample size: 401 individuals

Sampling: 239 first year students and 162 last year students (internship), with non-probabilistic sampling.

Participants: first year that exclusively carry out theoretical-practical studies at normal times, and last year students who perform 24-hour hospital guards every fourth day. Participation was voluntary and anonymous to avoid response bias.

Specific methods and measures: The Pittsburgh Sleep Quality Index PSQI was applied in its Spanish version consisting of 19 items. The questionnaire provides an overall sleep quality score and partial scores for seven dimensions of sleep. The overall PSQI score has a range of 0 to 21 points where a score greater than five indicates that the respondent has poor sleep quality, higher score, worse quality of sleep, and is therefore classified as poor sleeper, and a lower score or equal to five indicates that they have good sleep quality, so it is qualified as good sleeper. The PSQI has internal consistency and a reliability coefficient (Cronbach's alpha) of 0.83 for its seven components. PSQI differentiates poor from good sleep by measuring seven domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, and sleep disturbances, use of sleep medication, and daytime dysfunction over the last month. Scoring of the answers is based on a 0 to 3 scale, whereby three reflect the negative extreme on the Likert Scale. A global sum of 5or greater indicates a poor sleeper. An update to the scoring: if 5J is not complete or the value is missing, it now counts as a 0 (16, 17).

Variables: PSQI in the first and last year students. Dimensions of sleep: subjective quality of sleep, latency, duration, usual efficiency, disturbances, use of sleeping medication, daytime dysfunction.

Biases avoidance: the evaluators received training to standardize and unify the application of the test.

Statistical methods: data was incorporated into an Excel® 2016 program sheet; The statistical analysis was carried out with the Minitab-15 program, obtaining measures of central tendency (mode, median, average), standard deviation, asymmetry, minimum value and maximum value, to characterize the behavior of the dimensions of sleep. The correlation was based on the Mann Whitney test that allowed determining if the samples are different. A level of statistical significance of $p \leq 0.05$ was considered.

Ethical criteria: It obtained Informed consent from all individual participants included in the study.

Results

Table 1 shows that the Mann Whitney test showed differences in the medians calculated for the PSQI of the two groups, with a significance level of $\alpha=0.05$ and $p \leq 0.05$, so they were considered as different populations.

Table 1. Results of the Mann-Whitney test to determine differences in the PSQI observed in both study groups

	n=	Median	W-calculated	p	α
PSQI first year	239	8	43188	0.000	0.05
PSQI last year	162	9			

Source: surveys
Elaboration: authors

Table 2 shows that the total PSQI in first year students reveals that 81.17% of respondents are bad sleepers while in the group of last year students is 90.12%, according to the PSQI point greater than 5. The analysis based on average statisticians, standard deviation, median, mode, asymmetry, minimum value and maximum value, determined that the dimensions of sleep with greater dispersion with respect to the mean and that tended high scores correspond to sleep disorders. For the group of first-year students, the factors of greatest dispersion and highest score correspond to the duration of sleep with a mean of 2.17 and standard deviation of 0.90, so the values tend to the value maximum of 3 and a mode of 3. Negative asymmetry (-1.04) indicates that the data of this factor are grouped more to the right over the average value, demonstrating that respondents sleep less than six hours a day. Other factor that has statistical significance is daytime sleep dysfunction with a mean of 1.37, standard deviation of 0.92 and a mode of 2 that tend to high scores, for which students presented more than once a week drowsiness during the day.

With respect to the last year students, it is observed that the sleep duration factor has an average of 2.11 with a standard deviation of 0.80, so that the values furthest from the average are those that tend to maximum value and a frequent value of fashion 2 which characterizes high scores; the asymmetry is negative (-0.58), which indicates that the values are grouped to the right of the arithmetic mean, revealing that respondents sleep less than six hours a day. Daytime sleep dysfunction has a mean of 1.71, standard deviation of 0.82 and mode of 2, inferring that in this group, students had drowsiness more than once a week. The subjective quality of sleep has an average of 1.65 standard deviation of 0.89 and mode of 2, with the tendency to a maximum value, detecting the perception of a bad and very bad quality of sleep.

Table 2. Sleep dimensions of the total PSQI survey, observed in both groups studied

	First-year students							Last year- students						
	M	SD	Me	Mo	As	Mi	Ma	M	SD	Me	Mo	M	Mi	Ma
Subjective sleep quality	1.36	0.88	1	1	0.08	0	3	1.65	0.89	2	2	-0.03	0	3
Sleep latency	0.83	0.81	1	0	0.60	0	3	1.29	0.88	1	1	0.18	0	3
Sleep duration	2.17	0.90	2	3	-1.04	0	3	2.11	0.80	2	2	-0.58	0	3
Usual sleep efficiency	0.64	0.97	0	0	1.42	0	3	0.52	0.90	0	0	1.66	0	3
Sleep disturbances	1.15	0.49	1	1	0.34	0	2	1.41	0.63	1	1	0.94	0	3
Use of sleeping medication	0.34	0.78	0	0	2.35	0	3	0.47	0.85	0	0	1.76	0	3
Daytime dysfunction	1.37	0.92	1	2	0.05	0	3	1.71	0.82	2	2	-0.18	0	3

M=mean; SD= standard deviation; Me=median; Mo=mode; As=asymmetry; Mi=minimum; Ma=maximum
Source: surveys **Elaboration:** authors

Table 3 shows that the percentage frequency results obtained in each of the dimensions of the dream show that the subjective quality of sleep was perceived as quite bad and very bad by 54.94% of respondents of the last year, in contrast to 56.07% of first year students who estimated their sleep quality as very good and quite good. In the sleep latency, 18.41% of first-year students and a higher percentage of 30.86% of students of the last year indicated falling asleep between 31 and 60 minutes; while 2.51% of the first year and 8.64% of the last year took more than an hour. In the duration of sleep a significant alteration is observed in both samples, 41% of students of the first year and 45.06% of the last year slept at most between 5 to 6 hours, while 42.26% of the first semester and 34.57% of the Last year he slept less than 5 hours. Sleep efficiency exceeding 75% was present in 83.68% of freshmen and in 85.80% of last year. In the dimension of sleep disturbance, 20.92% of the first semester and 30.25% of the internship presented awakenings once or twice a week and, waking up more than three times a week characterized 6.17% of internship students. Low percentage values presented the respondents in the use of sleeping medications, being 5.02% of the first semester and 8.64% of internship students who used them once or twice a week, while 4.60% of respondents in the first semester and 4.94% of the internship used it more than three times. Disorder with significant percentages presented sleep dysfunction during the day where 45.68% of internship students and 34.73% of students in the first semester had drowsiness once or twice a week, while 16.05% of respondents at boarding school and 10.88% in the first semester had drowsiness more than three times a week.

Table 3. Percentages of students in the first and last year in the respective sleep dimensions; cohort A, fist-year (n = 239), cohort B, last-year (n = 162)

(%)		very good	really good	pretty bad	Very bad
Sleep dimensions	A	17.57	38.49	34.31	9.62
	B	9.26	35.80	35.80	19.14
		it sleeps in <15 min	16-30 min	31-60 min	It sleeps in >60 min
Sleep latency	A	40.17	38.91	18.41	2.51
	B	19.14	41.36	30.86	8.64
		More than 7 hours	6-7 hours	5-6 hours	< 5 hours
Sleep duration	A	8.37	8.37	41.00	42.26
	B	3.09	17.28	45.06	34.57
		>85%	75-84%	65-74%	<65%
Usual sleep efficiency	A	62.34	21.34	6.69	9.62
	B	68.52	17.28	7.41	6.79
		never in the last month	Less than one time in the week	1 or 2 times a week	3 or more times a week
Sleep disturbances	A	5.44	73.64	20.92	0.00
	B	1.23	62.35	30.25	6.17
		never in the last month	Less than one time in the week	1 or 2 times a week	3 or more times a week
Use of sleeping medication	A	79.92	10.46	5.02	4.60
	B	71.60	14.81	8.64	4.94
		never in the last month	Less than one time in the week	1 or 2 times a week	3 or more times a week
Daytime dysfunction	A	19.67	34.73	34.73	10.88
	B	6.79	31.48	45.68	16.05

Source: surveys
Elaboration: authors

Table 4 shows the correlation coefficients between sleep factors and the total PSQI, among the first and last year students.

	First-year students		Last-year students	
Studied factors	r	p≤0.05	r	p≤0.05
Subjective sleep quality	0.598	0.000	0.549	0.000
Sleep latency	0.556	0.000	0.548	0.000
Sleep duration	0.501	0.000	0.533	0.000
Usual sleep efficiency	0.481	0.000	0.488	0.000
Sleep disturbances	0.464	0.000	0.479	0.000
Use of sleeping medication	0.445	0.000	0.452	0.000
Daytime dysfunction	0.33	0.000	0.41	0.000

Source: surveys
Elaboration: authors

Discussion

Sleep quality

It found that 90.12% of senior students (internship) and 81.17% of first year students are bad sleepers. 83.26% of first year students and 79.63% of senior year (internship) presented sleep duration of less than six hours, accompanied by night awakenings and daytime sleepiness. Sleep hygiene is a matter of vital importance in university students. In general, to maintain an adequate sleep it is recommended to avoid products that contain caffeine at least four hours before bedtime, nicotine at least one hour before bedtime or if you wake up at midnight, and alcohol in the hours to go to sleep. Also, avoid copious meals immediately before going to bed, as well as avoid going to bed hungry. It also recommend to avoid intense exercise in the two hours before going to bed, keep the bedroom quiet and tidy, trying to make the bed as comfortable as possible, and avoid extreme temperatures in the bedroom, noise and lights throughout the night, and allocate the bed only to sleep, as well as maintain regular sleep-wake schedules. Of course, medical students not follow these recommendations for maintaining adequate sleep, as it should. The medical career demands long schedules, demands a lot of intellectual effort, and above all, inadequate schedules in the race make it difficult to schedule sleep-wakefulness.

Performance and sleep

The high scores obtained in the duration of sleep and in the dysfunction of sleep during the day contribute to the high scores of the total PSQI, where more than 80% of the students in the two samples were bad sleepers. There are studies that show that in the medical staff with sleep deprivation there is a deficit in their attention, concentration and reaction, which puts patients at risk. Loss of sleep and night guards have consequences in the area of individual health, physical, mental and social well-being. It has also been described changes in mood, depression, difficulty in learning, decrease in motor skills. Therefore, students with fatigue and drowsiness did not have adequate academic performance. Frequently, they attended the semester with low grades and sometimes became depressed, which aggravated their sleepiness, creating a vicious circle.

There is a difference between the students who start the career and those who finish it; in the year of internship. At the beginning of the career, most students only have theoretical and practical classes at the university's facilities, in a study environment, without contact with patients. During the internship, 90% of the work is healthcare, that is, inside the hospital, where they take 24-hour shifts every 4 days, and attend the intermediate days to cover the medical care practice. Forced sleep deprivation is greater during internship. Perhaps for many, this overstress is an integral part of the training, which is false, since consequently the performance of the student's decreases.

On the other hand, student performance also has to do with the university environment. Classical universities like ours do not have adequate facilities for new changes in life practices. In fact, many of the classrooms are old, the seats uncomfortable, and there is an over population of students. This added to the forced deprivation

of sleep makes the student's final performance limited and poor, compared to students from other countries.

Challenges for medical education

University students are a population group whose life practices are different from other strata of the population. The consumption of alcohol, tobacco and caffeine is very common among them, and the schedules are usually chaotic due to the classes, to the nighttime of study or frequent parties. As for the environment in the bedroom, many of them live in university residences, or share a room with other students, which entails noise and other alterations. Due to this lifestyle, for many of them it is difficult to change some habits of those contemplated in sleep hygiene, either due to lack of predisposition or impossibility of change.

For the Ecuadorian university there are several challenges to face to change this situation. The first is the redistribution of the workload and the reorganization of hospital practices. This implies to maintain adequate standards in medical education. Second, the changes also involve improving the infrastructure of classrooms and study environments, generating more comfortable and adequate learning spheres at the changing pace of modern life. Finally, there should be more information on sleep hygiene for students, which implies on the one hand self-discipline and, on the other hand, adaptability and flexibility.

Limitations

This research had some limitations, inherent to the instrument used. The results obtained from the questionnaires are based on a subjective assessment of the respondent. Sleepiness and sleep quality are subjective variables and are subject to individual variability, being able to even confuse drowsiness with fatigue. Specific information on the number of guards and/or daytime naps performed was not recorded in the questionnaire. The PSQI is a subjective measure of sleep. Self-reporting by individuals though empowering, may be able to reflect inaccurate information if the individual has difficulty understanding what is written, or cannot see or physically write out responses.

Conclusion

It found that 90.12% of senior students (internship) and 81.17% of first year students are bad sleepers. 83.26% of first year students and 79.63% of senior year (internship) presented sleep duration of less than six hours. accompanied by night awakenings and daytime sleepiness. 45.61% of the first-year students and 61.73% of the internship perceived poor warm sleep. A moderate correlation value of r=0.549 was obtained between the total PSQI and the daytime sleep dysfunction in the internship students, while the first year students sleep duration reached a correlation of r=0.598.

Authors' contribution

The research protocol and its design, data collection, critical analysis, discussion, writing and approval of the final manuscript were made by all authors who contributed equally to the entire process. The corresponding author represents the group of authors.

Availability of data and materials

The data that support this manuscript are available upon request to the corresponding author.

Consent for publication

The institutions cited in this document gave their consent to use your information.

Interest conflict

The authors declare no conflict of interest.

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