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Tempo total e latência do sono de graduandos de medicina*

Total sleep time and latency of medical students

Tiempo total de sueño y latencia de estudiantes de medicina

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RESUMO

Objetivo: Analisar, a partir da actigrafia de pulso, o TTSNM, a latência e o WASO de estudantes de graduação em medicina. **Método:** Estudo de natureza observacional e analítica, amostra constituída por 131 estudantes que preencheram o formulário, o questionário índice de Qualidade do Sono de Pittsburgh (PSQI) e a escala de Sonolência de Epworth (ESE). As associações entre a qualidade do sono e as variáveis qualitativas foram analisadas a partir do teste Qui-quadrado. **Resultados:** Na análise estatística, observou-se valores muito discrepantes registrados nos resultados da actigrafia nas variáveis TTSNM, latência, WASO, número de despertares noturnos. **Conclusão:** Os resultados demonstraram a necessidade da realização de um programa educativo entre os estudantes com vistas a melhoria da qualidade do sono e prevenção de agravos à saúde.

Descritores: Qualidade do sono, Actigrafia, Estudantes de medicina.

ABSTRACT

Objective: To analyze, using wrist actigraphy, the TTSNM, latency and WASO of undergraduate medical students. **Method:** Observational and analytical study, sample consisting of 131 students who completed the form, the Pittsburgh Sleep Quality Index (PSQI) questionnaire and the Epworth Sleepiness Scale (ESE). The associations between sleep quality and qualitative variables were analyzed using the Chi-square test. Results: In the statistical analysis, very discrepant values were observed recorded in the actigraphy results in the variables TTSNM, latency, WASO, number of nighttime awakenings. **Conclusion:** The results demonstrated the need to carry out an educational program among students with a view to improving sleep quality and preventing health problems.

Descriptors: Sleep quality, Actigraphy, Medical students.

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RESUMEN

Objetivo: Analizar, mediante actigrafía de muñeca, el TTSNM, la latencia y el WASO de estudiantes de pregrado en medicina**. Método:** Estudio observacional y analítico, muestra compuesta por 131 estudiantes que completaron el formulario, el cuestionario Pittsburgh Sleep Quality Index (PSQI) y la Epworth Sleepiness Scale (ESE). Las asociaciones entre la calidad del sueño y variables cualitativas se analizaron mediante la prueba de Chi-cuadrado. **Resultados:** En el análisis estadístico se observaron valores muy discrepantes registrados en los resultados de la actigrafía en las variables TTSNM, latencia, WASO, número de despertares nocturnos. **Conclusión:** Los resultados demostraron la necesidad de realizar un programa educativo entre los estudiantes con miras a mejorar la calidad del sueño y prevenir problemas de salud.

Descriptores: Calidad del sueño, Actigrafía, Estudiantes de medicina.

INTRODUCTION

The first systematic scientific approaches to sleep took place in Greece. For Aristotle, sleep was crucial for maintaining perception, which, if used uninterruptedly, would be exhausted. Hippocrates associated insomnia with boredom and sadness. In one of his memorable phrases, he said: "If sleep is a rehearsal for death, waking up is a rehearsal for life" (RIBEIRO, 2019).

However, it was only in the middle of the 20th century that sleep studies began to occupy a more important place in the scientific community. In modern society, sleep deprivation, as well as being a chronic problem, can interfere with different metabolic pathways, such as a reduction in leptin hormone levels and an increase in ghrelin, increasing appetite and, consequently, food intake.

Sleep is a biological function characterized by an interval of time in which the individual has a temporary suspension of voluntary perceptual-sensory and motor activity to environmental stimuli. It also includes a complex interaction of physiological and behavioral systems that are fundamental to memory consolidation, thermoregulation, conservation and restoration of body energy and cerebral energy metabolism. Its occurrence in cycles (sleep-wake) and the natural ability to reverse irreactivity to external stimuli distinguishes sleep from pathological states of loss of consciousness (ALMEIDA, 2016; RIBEIRO, 2020).

Some external factors, such as work demands, curricular requirements, family responsibilities, the use of drugs, irregular lifestyle and personal habits, reduced hours of sleep and asynchrony of the sleep-wake cycle can cause stress, lack of enthusiasm for daily activities, sleep deprivation and/or fragmentation and excessive daytime sleepiness (PURIM, 2016).

Individuals with sleep disorders may experience significant changes in their body metabolism, physical, mental, and occupational functioning, as well as complaints of excessive daytime sleepiness, cognitive impairment, and reduced performance in daily activities. Poorly slept nights can result in significant losses in memorization capacity, decreased reasoning and strategic planning capacity, and increased attention deficit, leading to reduced academic performance with the possibility of compromised professional training (ALMEIDA, 2016; PATRICK, 2017; OLIVEIRA, 2020).

University students, especially new university entrants, are predisposed to alterations in the sleep-wake cycle due to the demands they are exposed to, such as environmental and social changes, curricular commitments associated with stress due to the demand for high academic performance and the irregular schedules of curricular activities. All these factors tend to reduce the amount of sleep and desynchronize the sleep-wake cycle, which leads to a limitation in the quality of sleep, as it forces them to choose between staying awake to fulfill all their academic tasks or meeting their sleep needs (CARVALHO, 2013; RIBEIRO, 2014; SILVA, 2016; OLIVEIRA, 2020).

Studies show that overweight and obesity in early life can be predictive of overweight and obesity in adulthood. Added to this are the levels of stress experienced during the processes of biological, psychological, cultural, and social development, during which people seek better financial conditions by improving their studies and rising professionally (ONIS, 2015; MARAFANTI, 2018).

Sleep quality is an important parameter in determining the risk of health problems and can be assessed subjectively using two instruments: the first is the PITTSBURGH Sleep Quality Index (PSQI), which refers to the quality of sleep over the last thirty days and provides a severity index (BUYSSE, 1989; BERTOLAZI, 2011; MANZAR, 2016; GARCIA, 2019).

The second subjective sleep analysis tool is the EPWORTH scale (Epworth Sleepiness Scale - ESS), which shows the possibilities of napping in everyday situations, also known as excessive daytime sleepiness (PEREIRA, 2013; OLIVEIRA, 2020). One of the objective assessment instruments is actigraphy, which provides information on sleep in the individual's natural environment, by obtaining various parameters, such as total sleep, total awake and awakening times (RIBEIRO, 2020).

Finally, from the above, medical undergraduates are a group susceptible to sleep disorders because they have a rigorous academic path of studies so that they can assimilate an expressive volume of information, with a full-time curriculum load, extracurricular activities, in addition to stress with the demand for high performance and, added to these factors, the lack of time for social and family activities (KLUTHCOVSKY, 2017; NASCIMENTO, 2020).

Thus, evaluating the quality of sleep and its correlation with risk factors for developing sleep disorders through actigraphy in medical students is of great importance, so that, by clarifying these relationships, it is possible to develop educational, interventional and/or

prophylactic measures to be applied during their training that can contribute to the health, well-being and quality of life of these future health professionals.

Based on the above and considering that medical students may present risk factors for an irregular sleep-wake cycle pattern and poor-quality sleep with a high potential for developing sleep disorders, there is a need for detailed studies on the quality of sleep in this population.

The research question that emerges from the study problem is: What is the total time spent asleep at night in minutes (TTSNM), the latency and the average time awake in minutes after starting nocturnal sleep WASO (Wake After Sleep Onset) of undergraduate medical students? To answer this question, the following objective was set: To analyze the TTSNM, latency and WASO of undergraduate medical students using pulse actigraphy.

The research protocol was approved by the Research Ethics Committee - CEP of the Federal University of the State of Rio de Janeiro - UNIRIO, (CAAE:04956818.0.0000.5285. Opinion: 3.168.630).

METHODS

This study is characterized as observational, as it does not include interventions by the researchers that could alter the natural course of events and/or outcomes. It is analytical because it allows quantitative analyses to be carried out to explain a given phenomenon through statistical inferences, using statistical models and tests (FONTELLES, 2012).

The population of this study consisted of 813 students regularly enrolled from the first to the tenth term of the Medicine course at the School of Medicine and Surgery of the Federal University of the State of Rio de Janeiro (UNIRIO) in 2019. Those enrolled in the last two terms were excluded due to early graduation so that they could enroll in the Federal Government's "More Doctors" Program.

The inclusion criteria were all students regularly enrolled in the first to tenth periods of the UNIRIO Medicine course, aged 18 or over and who signed the Informed Consent Form. Students from the last two periods of their degree were excluded, for the reasons described above.

To standardize data collection, training sessions were held with the members of the research team. An instruction manual explaining all the tools used was drawn up and used at all the training meetings. The training was carried out in a pilot study in which 50 medical students

were selected. This pilot study was also used to standardize the use of the instruments and procedures contained in the method. Data collection took place from May to November 2019.

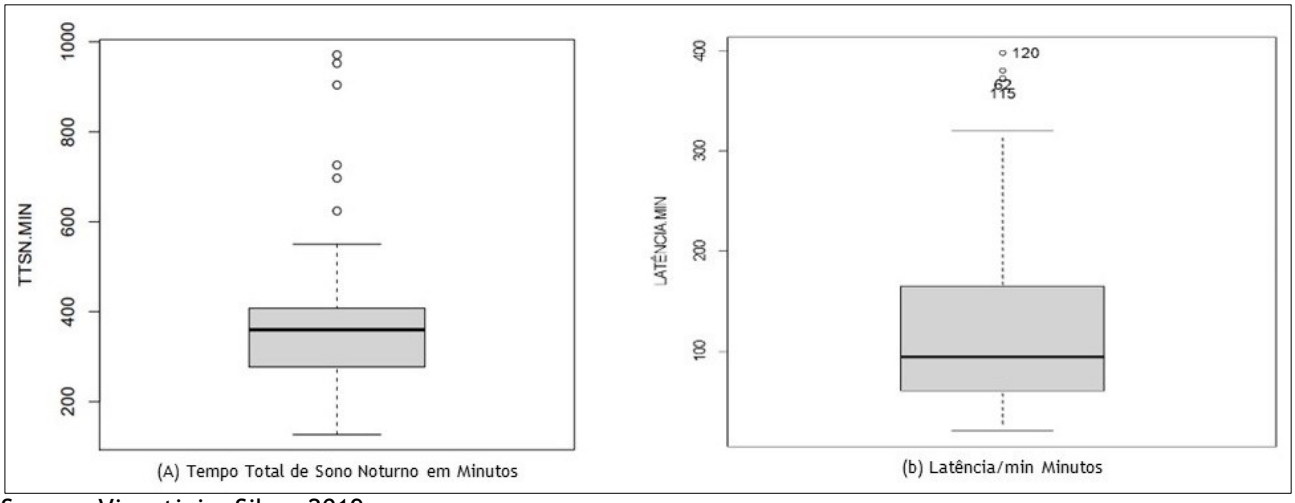
The data collection instruments were an individual identification form with sociodemographic information, and, for the subjective assessment of sleep, two instruments validated and tested in Brazil were used: the PITTSBURGH sleep quality index (PSQI) and the EPWORTH excessive sleepiness scale (ESE). Pulse actigraphy was used for the objective assessment of sleep.

The data was analyzed using statistics. After compiling and organizing the data, all the analyses were carried out using the R statistical environment version 64.4.0.3, which is openly accessible online, using the Rcommander library version 2.7-0 ("A language and environment for statistical computing. R Foundation for Statistical Computing", 2020). The Wilcoxon or Kruskall-Wallis tests were used to analyze possible significant differences between the actigraph measurements, the Pittsburgh Sleep Quality Index, and the Epworth Excessive Daytime Sleepiness Scale, between the categories of the various factors, as the measurements did not have a normal distribution according to the Shapiro Wilk test.

RESULTS

In the statistical analysis, there were very discrepant values recorded in the actigraphy results for the TTSNM, LATENCY and WASO variables. These values, called outliers in statistics, were identified in the boxplots of the TTSNM variables, with six students, and in LATENCY with four students. The records correspond to the average of the 7 days of recordings (Figures 1a and 1b).

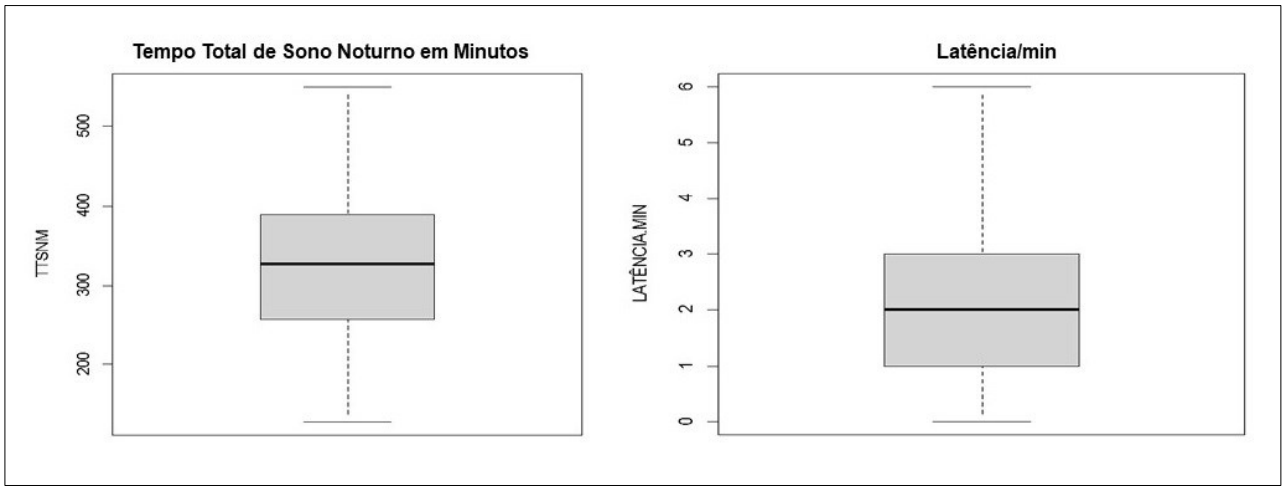
Figure 1 - *Boxplot* of Total Night Sleep Time in Minutes (a) and Latency (b) without report correction showing *outliers*



Source: Vicentini e Silva, 2019

The sleep score graphs, and the actogram recorded light and room temperature. There was no recording of rest and/or movement. All these findings were responsible for the errors found in the data analysis carried out by the software. The values were corrected for both variables and the outliers could be removed, as shown in Figure 2.

Figure 2 - Boxplot of Total Night Sleep Time in Minutes and Latency after correction of values and absence of outliers



Source: Vicentini e Silva, 2019

The convenience sample consisted of 131 students, representing 16.11% of the target population. The data presented in Table 1 shows that 79 (60.31%) were female students, 119 (90.84%) were in the 18-25 age group and 101 (77.1%) were at the beginning of their course.

With regard to behavioral factors, 68 (51.91%) exercised regularly, 99 (75.57%) used public transport and 80 (61.07%) spent more than 30 minutes getting home. 126 (96.18%) were non-smokers, 75 (57.25%) used alcohol, only 10 (7.63%) reported using some form of sleep therapy, 56 (42.75%) used medication that could interfere with sleep and 40 (30.53%) reported having a chronic illness.

The results of the subjective sleep assessment analyzed using the Epworth and Pittsburgh scales presented in Table 3 show that 79 (60.31%) students had excessive daytime sleepiness and in the PSQI 96 (73.28%) were classified as having poor sleep quality.

The described measurements of the actigraphy parameters showed that the average sleep time over the 7 days of the students' TTSNM was 323.81 min (5 hours and 40 minutes), with a very close median (326 min) and a standard deviation of 97 min (1h 37min). It was noted that 75% of these undergraduates had a total sleep time below 420 minutes (7 hours). The average latency time was 2.14 with a standard deviation of 1.51 minutes, while the average number of awakenings was 5.47 with a standard deviation of 3.94, and the WASO was 21.36 with a standard deviation of 17.15 minutes (Table 1).

Table 1 - Average of 7 days of recording actigraphic parameters

Variáveis	Média	*DP	Valor Mínimo	Mediana	Valor Máximo
**TTSNM	323.81	96.93	128	326	550
Latência/Min	2.14	1.51	0.00	2.00	8
WASO/Min	21.36	17.15	0.00	18	67

*DP = Standard Deviation ** TTSNM = Total Night Sleep Time in Minutes
Source: Vicentini e Silva, 2019.

The evaluation of the associations between sociodemographic categories and the Epworth Excessive Daytime Sleepiness scale showed that 60.31% of the sample had Excessive Daytime Sleepiness (EDS), 69.6% female and 46.2% male. The presence of this sleep disorder was observed in 67.5% of undergraduates with a chronic illness and in 42.9% of those without. These differences were statistically significant for both genders and those with chronic illnesses. On the way home, 66.2% of students who spent more than 30 minutes and 51% of those who took less time to get home had EDS. Among undergraduates aged 26-45, 83.3% had EDS and only 58% among those aged 18-25.

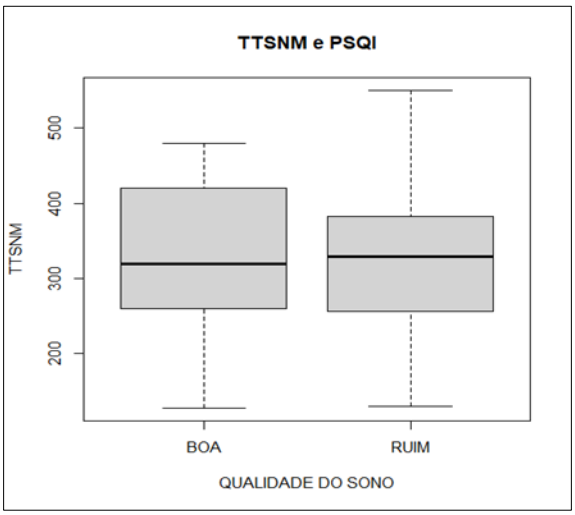
When it came to assessing the associations between sociodemographic categories and the Pittsburgh Sleep Quality Index (PSQI), 73.28% of all participants were classified as having poor

sleep quality. Regarding the use of alcohol, 80% of students who drank alcohol and 64.3% of those who didn't drink had poor sleep quality. Regarding the use of medication that could interfere with sleep, 78.6% of students who used some medication and 48.9% of those who did not use such medication had poor sleep quality. The differences were statistically significant.

It was found that 82.4% of students who took less than 30 minutes and 67.5% of those who took longer to get home had poor sleep quality.

When evaluating total nighttime sleep time in minutes and subjective sleep quality using the Pittsburgh Sleep Quality Index (PSQI), students with good sleep quality had a median of 320 minutes and a mean NMSPT of 325 minutes (SD=102), while those with poor sleep quality had a median of 330 minutes and a mean NMSPT of 324 minutes (SD=96). Both groups had a mean and median below 420 minutes (7 hours) (Figure 3) (Table 1). No statistical differences were found between the medians of the two groups using the Wilcoxon test (p=0.75).

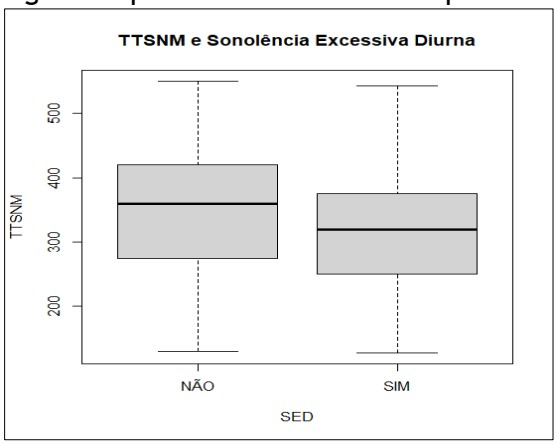
Figure 3 - Boxplot of Total Nighttime Sleep Time in Minutes and Sleep Quality according to the Pittsburgh Index



Source: Vicentini e Silva, 2019.

On the Epworth Sleepiness Scale, students who did not suffer from excessive daytime sleepiness had a TTSNM of 337.21 (SD= 99.20) and a median of 360 while those with EDS had a mean of 315 (SD=95) and a median of 320 minutes. There was no statistically significant difference in the TTSNM of students with or without EDS when the Wilcoxon test was applied (p=0.13). The boxplot in Figure 4 shows the TTSNM and the Epworth Sleepiness Scale of medical undergraduates at the Federal University of the State of Rio de Janeiro.

Figure 4 - Boxplot of Total Night Sleep Time in Minutes and Epworth Sleepiness Scale



Source: Vicentini e Silva, 2019.

Actigraphy provided five parameters that measure different aspects of sleep. The correlation matrix was used to assess how related or complementary these parameters are. The correlations between the variables that assess objective sleep quality showed that sleep efficiency correlates negatively with the number of nocturnal awakenings (-0.62), with WASO (-0.58) and with latency (-0.39). These values indicate that a more efficient sleep has fewer awakenings, shorter WASO and latency. There was a positive correlation between latency and awakenings (0.45) and with WASO (0.39), and between awakenings and WASO (0.53). In additional analyses, there was no significant correlation between the actigraph data and the Pittsburgh and Epworth scales.

Table 1 - Analysis of the TTSNM and PSQI of UNIRIO students over 7 days

*PSQI	Média	***DP	Valor Mínimo	Mediana	Valor Máximo
BOA	325	102	128	320	480
RUIM	324	96	130	330	550

*PSQI; Pittsburgh Sleep Quality Index **DP= Standard deviation
Fonte: Vicentini e Silva, 2019

DISCUSSION

In recent years, the high prevalence of EDS and poor sleep quality found in the university population has occupied significant space in scientific-academic discourse (HANGOUCHE et al., 2018). In this study, Epworth indices showed that 60.31% of students had values considered

pathological for excessive daytime sleepiness, with a higher prevalence in females (69.6%), corroborating the results of these authors.

According to the authors, excessive daytime sleepiness is particularly common in university students, with a prevalence ranging from 24% to 39%, and in their results the overall EDS was 36.3%, with 43% in female students. This result is compatible with another study which points out that medical students comprise a population particularly prone to sleep-related problems (ALSAGGAF et al., 2016).

A survey of 800 medical undergraduates from various institutions in Brazil showed that 48.1% of the students obtained scores considered pathological and 10.3%, very severe for EDS (FIEDLER, 2008). The result obtained with medical students from the Federal University of Paraíba reveals that 81.6% of the participants obtained high scores on the SES considered to be severe (OLIVEIRA et al., 2020).

In a meta-analysis of Brazilian studies, the prevalence of excessive daytime sleepiness was 46.1% and 51.5% of students had poor sleep quality (PACHECO et al., 2017). As a rule, these students have inadequate sleep habits, caused by an excess of activities, little importance given to the biological aspects that affect the learning process, or an excessive preoccupation with non-academic activities, such as parties and group celebrations, which are very common behaviors among university students (FIEDLER, 2008).

As mentioned, the causes of EDS can have exogenous and/or endogenous origins and it was possible to observe in this study that 66.2% of the students who spent more time getting home from university and 59.6% who used public transport had high scores for EDS, situations that could imply a reduction in night-time sleep so that they could meet the academic demands they are subjected to during their training, as well as other extracurricular and family commitments.

Huang et al. (2013) identified EDS in 35% of new nursing students and highlighted sleep latency and subjective sleep quality as possible causes. The authors point to the short duration of night-time sleep and irregularities in the sleep-wake cycle as factors that make these students more vulnerable to developing EDS.

In this study, the duration of sleep measured by the actigraph showed a total night-time sleep time in minutes of 323.81 minutes (5 hours and 40 minutes) and sleep efficiency of 90.36%. These results were in line with a study carried out at a higher education institution in the south

of Santa Catarina with university students from various courses, including medicine, who also showed an average daily sleep time of six hours and fifty minutes and high sleep efficiency (> 85%).85%), a result that the author attributed to the fact that the population was young and, even with few hours of sleep, could have an efficient sleep (FONSECA et al., 2016).

Among students with EDS, TTSNM was 315 minutes (5 hours and 25 minutes) and among students without EDS, 337.21 minutes (6 hours and 2 minutes). It is necessary to consider whether this association is direct, i.e., sleeping little at night predicts intense sleep during the day, or whether other factors, such as daytime consumption of sleep-stimulating drugs, could also influence this association.

These values were lower than the results found by Garcia (2019) in postgraduate nursing students, with a sleep duration of 368.8 minutes (6 hours and 14 minutes). The literature shows that health students have shorter hours of sleep and a higher frequency of EDS when compared to those from other areas (RIBEIRO, 2020).

It is worth noting that the sleep times found in this study were also below those recommended by the American Academy of Sleep Medicine and Sleep Research Society guidelines for so-called "sufficient sleep" of at least seven to nine hours of sleep a day, which may represent an important risk factor for the development and/or worsening of metabolic and cardiovascular disorders (PARUTHI et al., 2016).

Another study showed less than 6 hours of sleep per night, and the author draws attention to the chance of a high percentage of body fat and an increase in abdominal circumference and, consequently, an increase in BMI, as a predictor of overweight and obesity, and possible generators of health problems (NASCIMENTO et al., 2020).

Overweight and obesity represent one of the most important public health problems in Brazil and worldwide. Data from the Ministry of Health show that one in five people in Brazil is overweight and the prevalence of the disease rose from 11.8% in 2006 to 19.9% in 2016 and, although the obesity rate increases with age, the indicator in the 25-44 age group is 17% (PACHECO et al.; GRANDNER, 2017).

In this study, 61.9% of the students classified as obese and 75% of those who had increased abdominal circumference measurements had EDS, in line with the data found in a study carried out in Chile with nutrition students, in which the authors established an association

between few hours of sleep and the risk of obesity (DURÁN-AGÜERO; SEPÚLVEDA; GUERRERO-WYSS, 2019).

The author points to the short duration of sleep and the stimulus to increase consumption of foods rich in carbohydrates and fats, and less protein and low-quality diets. It is worth mentioning that many students come from other states/municipalities and live alone, which sometimes makes them consume food that is easily accessible or does not require much time to prepare. In addition, there is a lack of and/or irregular physical exercise.

In recent years, the increase in sleep disorders among university students, especially those studying medicine, may be related to the stress-generating situations with which they are constantly confronted, leading to anxiety and, as a consequence, EDS and poor sleep quality (GALVÃO et al., 2017).

The possible consequences of sleep deprivation, whether intentional due to inadequate time management or involuntary due to irregular sleep patterns, include excessive daytime sleepiness, memory lapses, emotional instability, and impaired school performance (CHOUEIRY et al., 2016).

The preparation of health professionals demands a high level of physical and emotional stress in their daily lives from the moment they are trained, which makes them more susceptible to developing and/or worsening chronic non-communicable diseases (CNCDs) and Burnout Syndrome (MOREIRA; SOUZA; YAMAGUCHI, 2018).

One factor brought up in this study refers to CNCDs: 30.53% of all participants had some form of illness, with 67.5% having EDS. Despite not being ranked, the prevalence was higher than the results found by Ribeiro (2020), distributed among diabetics (2%), hypertensive patients (1%), cholesterolemia (1%) and heart disease (1%), which justifies his sample due to the young age of most of the participants, where a high prevalence of these diseases is not expected.

Regarding subjective sleep quality, 73.28% of all participants assessed by the Pittsburgh sleep quality index had high scores indicating poor quality, corroborating the study by Nascimento et al. (2020) in which 63.3% of medical students had poor quality sleep.

Total nocturnal sleep time assessed by actigraphy showed that students classified as having good quality had a TTSNM of 325 minutes (5 hours and 42 minutes), while those with poor quality reached 324 minutes (5 hours and 40 minutes).

In this study, students (80%) who reported drinking alcohol showed poor sleep quality and this association was statistically significant. These findings are consistent with a study in which 20.1% of participants who drank alcohol had poor sleep quality (GALVÃO et al., 2017).

However, this association was not established in this study, since changes in sleep quality caused by alcohol usually occur over the long term, even if the individual has stopped drinking for prolonged periods (ZARGHAMI et al., 2015).

Another study showed a significant relationship between excessive alcohol consumption and poor sleep quality among university students, since many drink alcohol as a strategy to relieve stress and anxiety (ARAÚJO et al., 2014). Although alcohol is seen as a sleep-inducing substance, its excessive intake is related to insufficient or poor-quality sleep, which can result in drowsiness during academic activities, as well as cognitive, emotional and motor impairments (GALVÃO et al., 2017).

A relevant association found in this study was between the use of medication that could interfere with sleep and the sleep quality index. The majority (78.6%) of the students who took medication had poor sleep quality. These figures were higher than those found by Zarghami (2015) in medical students in northern Iran who took sleep medication.

One factor that could be considered is the time spent by students returning home from college, which, combined with the need to do their homework, would delay their going to bed and, consequently, lead to sleep deprivation. There was no statistically significant difference between students who spent a lot or a little time getting home, but the majority (82.4%) of those who took more than 30 minutes to get home had poorer sleep quality.

CONCLUSION

There was a high prevalence of excessive daytime sleepiness in the group studied, with a predominance of females and those with chronic non-communicable diseases. In addition, the poor quality of sleep shown by the students is associated with demographic and behavioral factors, such as the intake of alcohol and medication which can interfere with sleep.

The high prevalence of daytime sleepiness in the group studied, as measured by the Epworth score (60.31%) and the duration of sleep measured by the actigraph, which achieved a total nighttime sleep time in minutes of 323.81 minutes (5 hours and 40 minutes) and sleep

efficiency of 90.36%, considered satisfactory, contradict the premise that adequate sleep time (hours of sleep) is directly proportional to its efficiency.

The results suggest that daytime sleepiness negatively influences the perception of quality of life and the teaching environment. In addition, the different sleep patterns identified in actigraphy reinforce the importance of preventive and guidance measures, perhaps interventionist, for medical students.

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