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The impact of COVID-19 on sleep quality, degree of stress and routine study of dental students

O impacto do COVID-19 na qualidade do sono, grau de estresse e rotina de estudo de acadêmicos de odontologia

El impacto del COVID-19 en la calidad del sueño, grado de estrés y rutina de estudio de estudiantes de odontología

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Abstract
The COVID-19 pandemic caused abrupt changes in the routine of the world population, which generated adaptive needs that are not always assimilated in a healthy way by everyone. For this reason, reports of disorders, emotional and physical are frequent and with different intensities in the most varied groups. Among the most common manifestations are changes in sleep and the level of stress. The objectives of these study were to evaluate the stress and sleep quality profile of dentistry students after a month of social isolation and the influence of these variables on the study routine. Material and Methods: This is a cross-sectional observational study applied in dental students using Google Forms. The dates were obtained by a socio-demographic questionnaire and assessment instruments on the Pittsburgh Sleep Quality Index, Epworth's Sleepiness Scale, and Cohen's Perceived Stress Scale. Results: About 62.5% of the 136 students evaluated had poor quality of sleep. Their stress levels were high, with a median of 32. The study routine was compromised in 62.5% of the students. Conclusion: The stress induced low quality of sleep and directly interfered with the subjects' study routine, thereby establishing a cause-and-effect relationship.
Keywords: COVID-19; Pandemic, Sleep; Stress; Dental student.

Resumo

A pandemia por COVID-19 causou mudanças bruscas no cotidiano da população mundial, gerando necessidades adaptativas que nem sempre assimiladas de forma saudável por todos. Por esse motivo, os relatos de distúrbios, emocionais e físicos, são frequentes e com intensidades diferentes nos mais variados grupos. Entre as manifestações mais comuns estão as alterações no sono e o nível de estresse. Assim, os objetivos deste estudo foram avaliar o perfil de estresse e qualidade do sono de estudantes de odontologia após um mês de isolamento social e a influência dessas variáveis na rotina do estudo. Material e métodos: foi delineado um estudo observacional transversal aplicado usando o formulário Google. Os dados foram obtidos por meio de questionário sociodemográfico e instrumentos de avaliação do Índice de qualidade do sono de Pittsburgh, escala de sonolência de Epworth e escala de estresse percebido de Cohen. Resultados: Cerca de 62,5% dos 136 alunos avaliados apresentaram sono de má qualidade. Seus níveis de estresse eram elevados, com mediana de 32. A rotina de estudos estava comprometida em 62,5% dos alunos. Conclusão: O estresse induziu a baixa qualidade do sono e interferiu diretamente na rotina do estudo dos participantes, estabelecendo assim uma relação de causa e efeito.

Palavras-chave: COVID-19; Pandemia; Sono; Estrese; Estudante de odontologia.

Resumen

La pandemia de COVID-19 provocó cambios bruscos en la rutina de la población mundial, lo que generó necesidades adaptativas que no siempre son asimiladas de manera saludable por todos. Por ello, trastornos, emocionales y físicos son frecuentes y con diferente intensidad en los más variados grupos. Entre las manifestaciones más comunes se encuentran los cambios en el sueño y el nivel de estrés. Los objetivos de esta investigación fueron evaluar el perfil de estrés y calidad del sueño de los estudiantes de odontología después de un mes de aislamiento social y la influencia de estas variables en la rutina de estudio. Material y métodos: Se trata de un estudio observacional transversal aplicado en estudiantes de odontología utilizando Google Forms. Los datos se obtuvieron mediante un cuestionario sociodemográfico e instrumentos de evaluación del índice de calidad del sueño de Pittsburgh, la escala de somnolencia de Epworth y la escala de estrés percibido de Cohen. Resultados: Aproximadamente el 62,5% de los 136 estudiantes evaluados tenían mala calidad de sueño. Sus niveles de estrés fueron altos, con una mediana de 32. La rutina de estudio se vio comprometida en el 62,5% de los estudiantes. Conclusión: El estrés indujo una baja calidad del sueño e interfirió directamente con la rutina de estudio de los sujetos, estableciendo así una relación de causa y efecto.

Palabras Clave: COVID-19; Pandemia; Sueño, Estrés; Estudiante de odontologia.

1. Introduction

Stay at home. This was the most widely reported recommendation in the media in Brazil and the world since the state of pandemic was declared by the World Health Organization on March 11, 2020. The speed of transmission of the virus, the inability of the health system to absorb demand, and especially the lack of effective, scientifically proven treatment, justified such a recommendation. However, this decision carries with it socio-economic impacts of great proportions that, added to the fear imposed by the disease, can significantly interfere with the mental health of the population, emotionally weakening them (Rajkumar, et al., 2020, Ćosić, et al., 2020, Roy, et al., 2020, Mazza, et al., 2020, Ozamiz-Etxebarria, et al., 2020, Marelli, et al., 2021, Pfefferbaum, B, & North, C 2020).

Reports from other pandemics have shown that large and abrupt changes make it difficult for an individual to assimilate, accept, and adapt. Therefore, reactions such as eating disorders, sleep impairment, stress, distress, hallucinations, and even more extreme behaviors such as suicide can manifest themselves in the more vulnerable group (Rajkumar, et al., 2020, Ćosić, et al., 2020, Sprang & Silman 2013, Mengin, et al., 2020, Zhang, et al., 2020, Cellini, et al., 2020, El Morr, et al., 2020, Yuksel, et al., 2021).

Among the many restrictions imposed to curb the progress of COVID-19, higher educational institutions were forced to cancel classes or seek alternatives to replace them, generating effective changes in the routine of academics. Understanding the impact this can have on socio-emotional and cognitive aspects is extremely important for the formulation of future strategies to minimize possible negative effects (Zhang, et al., 2020, Cellini, et al., 2020, El Morr, et al., 2020, Liu, et al., 2020, Araújo 2020, Desai, et al., 2020, Bertolazi, et al., 2009).

This study evaluated the profile of dentistry students from a private educational institution located in the northeastern region of Brazil, in relation sleep quality, stress and study routine after 30 days of social isolation and receiving education remotely. The

hypothesis that was tested was whether dentistry students would present high stress, low quality of sleep, and difficulties in maintaining a study routine.

2. Material and methods

Study design

This study was approved by the research ethics committee of Ceuma University, protocol number 3.893.922, and the instruments used informed the voluntary nature of the individuals' participation and the need for their consent before answering the instruments. A convenience sample with the following inclusion requirements—being a dental student regularly enrolled, receiving online training, and agreeing to the free and informed consent form—was used.

This cross-sectional observational- descriptive study was conducted online between April 22nd and May 1st, 2020. The participants received individuals and answered via online platforms 3 links, containing the following assessment instruments: a socio-demographic questionnaire, sleep quality instruments, a sleepiness scale, and a stress scale. The instruments were made in the Google Forms (https://www.google.com/forms/about)

Socio-demographic questionnaire

Participants answered questions related to the basic sociodemographic profile that include: age, sex, marital status and family income. In addition, all answered questions related to social isolation during the COVID-19 pandemic and questions related to study and sleep routine.

Instruments used (Pittsburgh sleep quality index, Epworth's sleepiness scale and Cohen scale)

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (Bertolazi 2011) together with Epworth's sleepiness scale (Bertolazi, et al., 2009). Sleep quality was considered poor when the sum of the seven components evaluated was greater than five, indicating poor sleep quality in two components or moderate difficulty in more than three components. As for drowsiness, values below 10 indicate little drowsiness; > 10, excessive drowsiness; and > 16, severe drowsiness.

To assess stress, the 17-item Cohen scale (Luft, et al., 2007) was used in the full version of 14 questions, with answer options ranging from 0 to 4 (0 = never; 1 = almost never; 2 = sometimes; 3 = almost always; 4 = always). Because question number 4, 5, 6, 7, 9, 10, and 13 of the questionnaires have a positive connotation, their scores were inverted (4 = never; 3 = almost never; 2 = sometimes; 1 = almost always; 0 = always). All responses were added, with scores ranging from 0 to 56, and high scores meaning high levels of stress.

Statistical analysis

After calculating the absolute and relative frequencies of the answers to each question (Table 1), the significance of the independent variables, age, sex, race, marital status, family income, and number of children were assessed for the probability of having good quality of sleep, or little, excessive, or severe sleepiness. The significance of the same independent variables on the degree of stress—using binary logistic regression with the enter method, multinomial logistic regression, and linear regression with the forward stepwise method—were also assessed after the multinomial categorical predictor variables underwent a dummy transformation.

The quality of sleep-in relation to stress level was assessed using the student's t-test.

The discriminating stepwise analysis with the Wilks method was used to identify which of the variables under study allowed discriminating significantly between the groups with good or poor quality of sleep.

Multinomial logistic regression tests were performed to assess whether the variables degree of sleepiness, quality of sleep, and degree of stress influenced the maintenance of a study routine.

Furthermore, it was evaluated whether the degree of sleepiness and the quality of sleep (chi-square test of independence), and the degree of stress (multiple regression test with dummy transformation of independent variables) depended on the questions: “Are you complying with the isolation requirements?,” “Are you able to establish a study routine?,” “During the quarantine period, do you live with anybody?,” “What is your relationship with the people you live with?,” “What functions are included in your routine during this quarantine period?,” "Do you engage in any physical activity?," "Do you visit academic research websites?," "During this quarantine period, do you prefer to spend more time online than be with the people you live with?".

All analyses were performed using IBM SPSS Statistics for Windows software v.26 (IBM Corp., Armonk, NY, USA) using a 5% significance level.

3. Results

Sociodemographic characteristics

A total of 181 students participated in the study; 22 students were excluded for not having answered all the questionnaires, and 23 students were excluded because they belong to the pilot group. The final sample consisted of 136 students, the majority of whom were female (74.3%), with an average age of approximately 21.97 and family income of up to 3 minimum wages 36%. Of the participating students, 88.8% complied with the established isolation, and only 10.3% managed to establish a study. (Table 1).

Table 1. The absolute and relative frequencies of the items in the socio-demographic questionnaire.

1.	Gender	Feminine	101 (74.3%)
		Male	35 (25.7%)
2.	Race	Mixed or brown	61 (44.9%)
		White	60 (44.1%)
		Black	11 (8.1%)
		Yellow	4 (2.9%)
3.	Marital status	Not married	126 (92.6%)
		Married	6 (4.4%)
		Stable union	4 (2.9%)
4.	Family income (monthly)	Up to 1.045	7 (5.1%)
		1.045,00 to 3.135,00	49 (36%)
		3.136,00 to 5.225,00	39 (28.7%)
		5.226,00 to 15.675,00	24.3 (24.3%)
		More than 15.675,00	8 (5.9%)
5.	Comply with isolation requirements	Yes	120 (88.8%)

	More or less	16 (11.8%)
6. Live with	Spouse	11 (8.1%)
	Parents/brother	112 (82.4%)
	Relatives	11 (8.1%)
	Alone	2 (1.5%)
7. Do you take any medication?	Yes	27 (19.9%)
	No	109 (80, 1%)
8. Are you complying with the isolation requirements?	Yes	120 (88.2%)
	More or less	16 (11.8%)
9. Are you able to establish a study routine?	Yes	14 (10,.3%)
	More or less	79 (58.1%)
	No	43 (31.6%)
10. During the quarantine period (due to the COVID-19 pandemic) you live with:	Spouse	11 (8.1%)
	Parents/brother	112 (82.4%)
	Relatives	11 (8.1%)
	Alone	2 (1.5%)
11. In total, how many people live with you during the quarantine period?	1 to 5	120 (88.1%)
	6 to 10	16 (12,.7%)
12. During the pandemic period, describe your relationship with the people with whom you live:	Remains the same	86 (63.2%)
	I live alone	2 (1.5%)
	Much better	17 (12.5%)
	Improved a little	20 (14.7%)
	It got a little worse	11 (8.1%)
13. Do you engage in any physical activity while in quarantine?	Sometimes	7 (5.0%)
	No	89 (65.4%)
	yes	40 (29.4%)
14. Describe your sleeping quarters?	Good	40 (2.4%)
	Very Good	79 (58.1)

	Too bad	2 (1.5%)
	Reasonable	14 (10.3%)
	Bad	1 (0.7%)
15. How often do you neglect school, household, or work tasks to stay connected to the Internet longer?	Sometimes	67 (49.3%)
	Often	28 (20, 6%)
	Never	14 (10.3%)
	Rarely	27 (19.9%)
16. Have you ever been deprived of physiological needs (such as sleep, food, urination or defecation) to stay connected to the Internet longer?	Sometimes	38 (27.9%)
	Often	9 (6.6%)
	Never	49 (36.0%)
	Rarely	40 (29.4%)
17. During this quarantine period, do you prefer to spend more time online than be with the people you live with?	No	96 (70.6%)
	Yes	40 (29.4%)
18. Do other people (friends/family) complain about the amount of time you stay connected to the Internet?	No	90 (66.2%)
	Yes	46 (33.8%)

Source: Authors.

Sleep profile

Most students had poor sleep quality (62.5%; see Table 2). The variables that significantly differentiated people with good sleep quality from those with poor sleep quality were, in decreasing order: sleep quality, sleep latency, sleep efficiency, sleep disturbance, medication use, and daytime dysfunction. The only variable that did not discriminate between groups was the variable sleep duration.

Logistic regression with the predictors of sex, race, marital status, family income, and number of children revealed that only gender had a significant effect on the participants' probability of having good sleep quality ($p = 0.020$). The chance of having good quality of sleep decreased by 64.2% when the participant was female (Exp [B] = 0.358). Regarding daytime sleepiness, 58.8% reported little sleepiness regardless of gender.

Multinomial logistic regression revealed that gender, race, marital status, family income, and number of children did not influence the variable degree of sleepiness ($p > 0.05$).

Table 2 shows the absolute and relative frequencies (%) of the answers to the questions regarding the degree of sleepiness and quality of sleep.

Stress

The mean value of the stress level was 31.42 (7.72) and the median was 32. Logistic regression analyses of sex, race, marital status, family income, and number of children revealed that only the predictors sex (coefficient = -4.37; p = 0.003) and age (coefficient = -0.004; p = 0.042) had an effect on the degree of stress.

An analysis of the coefficients indicated that the degree of stress was, on average, 4.37 lower when the participant was male versus female, and the greater the age, the less stress the participant had. However, the effect of sex on the degree of stress (0.68) was greater than the effect of age (0.32).

Table 2. Absolute and relative frequencies of the answers to the question on the degree of sleepiness and sleep quality.

Sleep quality	Poor sleep quality	85 (62.5%)
	Good sleep quality	51 (37.5%)
Degree of sleepiness	Little sleepiness	80 (58.8%)
	Excessive sleepiness	51 (37.5%)
	Severe sleepiness	5 (3.7%)

Source: Authors.

The relationship between stress and sleep

The results showed that the average stress level of people with poor sleep quality was 33.69 (≠ 7.50); and for people with good sleep quality, 27.63 (± 6.55). There was a significant difference between these averages (p < 0.001), indicating that stress influenced the quality of sleep.

The relationships among stress, sleep, and study routine

The multinomial logistic regression test showed that only the degree of stress influenced study routine (p = 0.008), with a chance ratio of 1.101. This indicates that the chance of establishing a routine increased by 10.1% for each unit of decrease in the degree of stress. The results revealed that the student who was unable to establish a study routine (p = 0.006) and preferred to stay online instead of interacting with the people with whom he lived (p = 0.001), the degree of stress was significantly higher. Likewise, people who just studied had significantly more intense sleepiness and excessive sleepiness (p = 0.012) (Table 3).

Table 3. Relationship between the degree of sleepiness, sleep quality, and the degree of stress and other issues and their respective p values

Issues	Degree of sleepiness	Sleep quality	Degree of stress
	p	p	p
"Are you complying with the isolation requirements?"	0.058	0.582	0.416
"Are you able to establish a study routine?"	0.596	0.276	0.006*

"During the quarantine period do you live with anybody?"	0.912	0.170	0.698
"What is your relationship with the people you live with?"	0.058	0.706	0.152
"What functions are included in your routine during this quarantine period?"	0.012*	0.381	0.313
"Do you engage in any physical activity?"	0.098	0.743	0.987
“Do you access academic research websites?”	0.422	0.845	0.500
"During this quarantine period, do you prefer to spend more time online than be with the people you live with?"	0.409	0.244	0.001*

Source: Authors.

4. Discussion

The hypothesis that dental students in social isolation would experience an increase in their stress index, impaired sleep quality, and changes in their study routine was confirmed. This result, although expected, draws attention because the majority of the sample group consisted of young and single people without children, who lived with their parents and have good personal relationship with them, and whose family income was above the minimum wage, which, according to Brazilian Institute of Geography and Statistics (IBGE, 2019) sources, is interpreted as an indicator of well-being from a monetary perspective.

Apparently, the subjects of this study were less susceptible to adverse effects, not only because of what was previously reported, but also because they had prior knowledge of what could happen, since the transmission of COVID-19 was only considered community spread in Brazil on March 20, 2020 (Jesus, et al., 2020), unlike in Europe, where several countries had increasing rates of the contamination curve. However, this was not enough to shield the psycho-emotional well-being of the studied group, as demonstrated by the high stress rate (median at 32). These findings are common among several other studies related to COVID-19 (Ćosić, et al., 2020, Roy, et al., 2020, Sprang & Silman, 2013, Mengin, et al., 2020, Zhang, et al., 2020, Cellini, et al., 2020, El Morr, et al., 2021, Ni, et al., 2020, Zhang & Ma, 2020)).

By contrast, another study carried out in China indicated a low stress rate (Kaparounaki 2020). The authors emphasized that the study was carried out in a city that was not an epicenter and that data collection was carried out less than a week after the lockdown was decreed in Wuhan (epicenter of the epidemic); therefore, there was little time for the stress index to increase (Kaparounaki 2020).. It is also noteworthy that the age group (37.7 years) was higher than the group in this study, and only 31.6% of the sample was composed of students. These factors may have contributed to a greater maturity to face atypical situations. This fact was also observed in this study because the older the student, the lower was the stress.

In a pandemic situation, stress is considered natural and expected (Roy 2020, Mazza 2020), but it should not be underestimated, since a sharp increase can trigger other changes. The results of this study showed that increased stress led to poor quality of sleep of the evaluated students (Table 3). This result was also observed in other surveys carried out with

university students during the pandemic (Marelli, et al., 2021, Cellini, et al., 2020, Fu 2020). This is alarming, given the importance of sleep for an individual's physical and emotional balance.

It has been proven that low-quality sleep, which weakens the immune system, alters the body's metabolism, favors daytime sleepiness, and decreases cognitive ability (Zhang & Ma 2020). However, in this study, it was not possible to observe a direct relationship with daytime sleepiness, which for most was little (58.8%), nor with study routine, since the quality of sleep did not significantly interfere with these two variables. Perhaps this is because the study was conducted after the first month of isolation, when there was not enough time for this association to be confirmed. However, it was observed that students whose daily activity was basically to study had significantly more severe drowsiness and excessive sleepiness (Table 3). Given that it may be linked to the fact that the dynamism of the routine has been compromised, which contributed to a greater body inertia that induces greater sleepiness.

However, stress was shown to directly interfere with students' study routine ($p = 0.008$). This is understandable, considering that the curricular guidelines for health courses are divided into theoretical and practical content. Thus, students were significantly affected by the implementation of remote education, a new methodology for them and which partially restored the academic routine (Desai, 2020). This generates discomfort and adaptation needs, which seems to have contributed to greater stress and made it difficult to maintain the study routine. It was also evidenced that the students who reported preferring to stay online more than with the family and those who said they were unable to maintain a study routine had a higher degree of stress (Table 3), which leads to infer that the greater family proximity and the maintenance of activities are important in the control of stress.

Within the sample, the most vulnerable group was the female group, which showed greater susceptibility to stress and sleep disorders. This is a frequent finding in similar studies (Mazza, et al., 2020, Marelli et al 2021, Mengin et al 2020, Zhang, et al., 2020). Perhaps this is because women are naturally more concerned and have a greater tendency to let themselves be affected by the present events, as well as to project future situations that create anguish and lead to anxiety.

This cross-sectional study limits the interpretations and fails to assess whether the results have improved or worsened over time mainly because the current scenario shows that despite the existence of several vaccines, Pandemic remains strong, because the supply is much lower than the demand already that the world population needs to be vaccinated. Added to this are the presence of different strains, which show to be more transmissible, and which affect young individuals more effectively. For this reason, a second stage of the research is being developed to reevaluate this group after 1 year of the pandemic and thus obtain more information, which allows us to suggest or even build strategies that help to strengthen this population in the face of this and other pandemics.

4. Conclusion

In conclusion dentistry students showed high stress, poor sleep quality and a difficulty in maintaining a study routine, however only stress was able to directly interfere with sleep and study routine, establishing a cause-and-effect relationship.

Despite the results found and the validity of the selected sample, similar studies should be applied using similar or comparable scales in large samples of the population with low or medium / income configurations of undergraduate public school students and graduate and high school students from different countries and nationalities

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