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Impacts of covid-19 social distancing on the sleep of health students

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***Keywords*— Sleep Initiation and Maintenance Disorders; SARS-CoV-2; Student Health.**

***Abstract*—** *Introduction: Sleep plays an important role in the balance of the human body. Its deprivation influences the development of cardiovascular, metabolic, psychological, and learning disorders. The restrictions imposed by Covid-19 on social activities affected the routine of many people, including university students, possibly impacting sleep conditions. Objective: To analyze the sleep characteristics of university students in the health area during the Covid-19 social distancing. Methodology: Cross-sectional study with 656 students from two community universities of Santa Catarina. Behavior characteristics were analyzed before and during the pandemic, relating them to sleep. Proportion analysis, crude and adjusted analyzes of the factors associated with sleep problems were performed. Results: 48.8% of the students had sleep problems. Of these, 41% were developed during social distancing. There was an increase in the difficulty to start sleep (42.4%), to stay asleep (29.4%), and dissatisfaction with sleep (36.6%). Sleep time was adequate, but insufficient to feel good for 25.6%. More sleep problems were observed among students that were older (PR=1.17; CI95%: 0.76-1.80), studied at UNOESC (PR=1.87; CI95%: 1.12-3.14), had greater use of social media (PR=2.03; CI95%: 1.21-3.39), had anxiety, sadness, and concern (PR=1.78; CI95%:1.02-3.10), had worse eating habits (PR=1.45; CI95: 1.01-2.07) and consumed alcohol (PR=1.59; IC95%: 0.98-2.58). Conclusion: Proper sleep time did not guarantee satisfaction with sleep. The prevalence of students with sleep problems increased with social distancing. Unhealthy eating habits, alcohol consumption, and social media use increased the risk of these problems.*

I. INTRODUCTION

Sleep is the unconscious condition where sensorial activities, even though suspended, can be stimulated and return the organism to the awaken state. Among its functions, are the reestablishment of the body energy balance, restauration of the immune system, and improvement of the cognitive and psychic systems, which emphasizes the importance of the time dedicated to sleep [1–3]. Sleep deprivation is associated with the risk of developing diverse systemic complications, such as diabetes, cardiovascular diseases, anxiety, low immunity, and learning deficits [4].

Findings suggest that poor sleep quality may be a consequence of exposure to risky situations or behaviors, such as use of alcohol and tobacco, mental illnesses, such as chronic stress, depression, and anxiety, and excessive use of electronic devices, due to screen time and prolonged contact with social network contents [5–7]. Health science students are exposed to most, if not all, of these factors, making them vulnerable to poor quality sleep [6].

Poor sleep quality among students of health sciences was already reported by previous studies [5,7–9], and the high prevalence of sleep disorders in this population shows the importance of investigating this issue in the context of the academic medium [10]. Sleep disorders among students are commonly observed in the transition between high school and college, because of the numerous changes in the daily routine and additional obligations [11].

With the COVID-19 pandemic [12], one of the prevention measures recommended by the World Health Organization was the social distancing [13]. Non-essential activities were suspended, and schools and universities were temporarily closed [14]. Besides the concerns regarding the disease on itself, changes in class schedules, introduction of new teaching methods, restriction of physical activities, and restricted access to some leisure activities were some of the factors that altered the daily routine of the students, having an impact in sleep quality [10].

We hypothesize that students of health sciences, when experiencing all the abrupt changes related to the COVID-19 pandemic, regarding the introduction of new concerns and daily routine, had their sleep quality worsened. Thus, this study aimed to analyze the sleep characteristics of university students in the health area during the Covid-19 social distancing.

II. METHODS

This is a transversal study on university of students aging 18 years or more enrolled in the health-related programs of the Universidade do Oeste de Santa Catarina (UNOESC) or Centro Universitário - Católica de Santa Catarina (Católica SC). The programs included were biology, biomedicine, cosmetology, medicine, nursing, nutrition, odontology, physical education, physiotherapy, psychology, veterinary medicine, and health-related post-graduation programs.

The survey was performed in July, August, and September of 2020, while the students were not having in-person classes due to the restrictive measures. Sample size calculation, considering the population of 4,700 students, confidence level of 95%, with heterogeneous distribution, resulted in a need of inclusion of at least 571 students.

Data were collected using a self-applied online questionnaire, containing questions on sociodemographic information (institution, university program, age, sex, marital status, profession, work status under the restrictive measures), and habits before and during the pandemic (duration of self-isolation, daily time in contact with social media platforms, feelings of anxiety, sadness, or concern, eating habits, and use of alcohol). The outcome consisted of sleep characteristics (difficulty to initiate sleep, difficulty in maintaining sleep, time to wake up, (in)satisfaction with current sleep quality, sleep duration, sleep hours needed to feel well, and sleep-related problems). The questionnaire was elaborated in Google Forms and an invitation was sent to the students via e-mail alongside an electronic document presenting the study and the Free and Informed Consent Form.

Data analysis was performed using Stata 13. Initially, variables were subjected to a descriptive analysis, including averages and standard deviations of numeric variables, as well as proportions of categorical variables. Raw and adjusted analysis of the factors associated with sleep problems were performed using Poisson regression with robust error variance. For this, we used three hierarchical levels to control for confounding factors. In the first level were included demographic variables (sex, age, skin color, and work); in the second level, academic information (university and course); and in the third level, behaviors during the pandemic (distancing time, daily time in social media platforms, anxiety, concern, eating habits, alcohol consumption, and physical activity). Variables were inserted in the model using backward selection, one level at a time, being maintained variables with $p < 0.20$.

III. RESULTS

In total, 723 questionnaires were answered. From these, 67 were excluded, as five refused to participate, 53 were not enrolled in health-related programs, and nine were less than 18 years old. This way, the final sample had 656 respondents.

Most participants (82.5%, n=541) studied at UNOESC, while the remaining (17.5%, n=115) studied at Católica SC. The average age was of 23.8 (±6.6) years old, 87.8% (n=578) reported to have white skin, and 84.8% (n=556) were female (Table 1).

Table 1. Characteristics of the participants regarding sex, age, and skin color.

Variable	n	%
Sex		
Female	556	84.8
Male	100	15.2
Age (completed years)		
18 to 19	159	24.2
20 to 21	178	27.1
22 to 23	119	18.1
24 or more	200	30.5
Skin color		
White	576	87.8
Brown	69	10.5
Black	11	1.7
Total	656	100.0

Students were enrolled in 13 undergraduate and post-graduate health-related programs. Psychology was the most prevalent program (31.5%, n=207). The vast majority of the participants (97.1%, n=637) reported to have adhered to social distancing. For 67.2% (n=441) this period lasted two months or more. Among the students, 47.9% (n=314) had a job, and 39.3% (n=258) reported to use social media platforms in an average of 3-4 hours per day, with seven hours or more being reported by 18.7% (n=123) (Table 2).

Table 2. Sample characteristics concerning undergraduate or post-graduate program, work, social distancing, and daily time using social media platforms.

Variable	n	%
Undergraduation or post-graduation program		
Biomedicine	33	5.0
Biology	11	1.7
Cosmetology	1	0.1
Physical Education	39	5.9
Nursing	73	11.1
Pharmacy	36	5.5
Physiotherapy	37	5.6
Medicine	88	13.4
Veterinary Medicine	26	4.0
Post-graduation	25	3.8
Nutrition	41	6.2
Odontology	39	5.9
Psychology	207	31.5
Work		

No	342	52.1
Yes	314	47.9
Daily use of social media platforms		
Up to 2 hours	110	16.8
3-4 hours	258	39.3
5-6 hours	165	25.2
7 hours or more	123	18.7
Total	656	100.0

When it comes to their perceptions, 83.7% (n=549) of the students reported an increase in anxiety, sadness, or concern, and 37.4% (n=245) answered that their eating habits worsened during the pandemic. To 20.9% (n=137) of the participants the alcohol consumption decreased during this period, while it increased to 13.9% (n=91) (Table 3)

Table 3. Occurrence of self-reported anxiety, sadness, or concern, eating behavior, and alcohol consumption among students during the COVID-19 pandemic.

Variable	n	%
Increased feeling of anxiety, sadness, or concern in comparison to the pre-pandemic period		
No	107	16.3
Yes	549	83.7
Perceived changes in the quality of the eating habits in comparison to the pre-pandemic period		
Started to eat better (more fruits and vegetables, more home-made meals, etc.)	119	18.1
Started to eat worse (more caloric, industrialized, and frozen meals, more sweets, snacks, etc.)	245	37.4
No changes	292	44.5
Consumption of alcoholic beverages in comparison to the pre-pandemic period		
Does not consume alcohol	218	33.2
Alcohol consumption increased	91	13.9
Alcohol consumption decreased	137	20.9
No changes	210	32.0
Total	656	100.0

Concerning sleep-related outcomes, 42.2% (n=278) of the participants noticed a greater difficulty to initiate sleep during the pandemic, and 29.4% (n=193) reported increased difficulty maintaining sleep in this period. For 41.0% (n=269) of the students, during the pandemic it was less common to wake up early, and 36.6% (n=240) became more unsatisfied with their sleep quality. Average sleeping hours during weekdays was of 7.3 hours, increasing to 9.2 hours in the weekends. Hours of sleep were considered as 'always sufficient' and 'almost always sufficient' to 42.7% of the participants (n=280). Problems related to sleep were referred by 48.8% of the students. Of these, 28.8% (n=189) reported to already suffer from these problems prior to the pandemic, while 20.0% (n=131) developed these issues during the period (Table 4).

Table 4. Sleep characteristics of the students during the COVID-19 pandemic

Comparing to the period prior the pandemic...	**Less** *n (%)*	**Same** *n (%)*	**More** *n (%)*
Difficulty to initiate sleep	93 (14.2)	285 (43.4)	278 (42.4)
Difficulty in maintaining sleep	153 (23.3)	310 (47.3)	193 (29.4)
Waking up earlier than usual	269 (41.0)	252 (38.4)	135 (20.6)
Unsatisfaction with sleep quality	160 (24.4)	256 (39.0)	240 (36.6)
Duration of sleep	**Time that usually goes to bed** *Average (SD)*	**Time that usually gets up** *Average (SD)*	**Duration of sleep** *Average*
Weekdays	23.4 (1.5)	7.7 (1.7)	7.3 horas
Weekends	24.3 (1.7)	9.5 (1.7)	9.2 horas
Hours of sleep to feel well	**Never/rarely** *n (%)*	**1-4 times per week** *n (%)*	**Almost always** *n (%)*
Usually sleeps the necessary number of hours to feel well	168 (25.6)	208 (31.7)	280 (42.7)
Problems related to sleep	**None** *n (%)*	**Yes, already had before** *n (%)*	**Yes, started during the pandemic** *n (%)*
Feels that has sleep-related problems	336 (51.2)	189 (28.8)	131 (20.0)

The highest prevalence of sleeping problems was observed among students that increased alcohol consumption during the COVID-19 pandemic (27.5%) (Table 5). Following adjusted analysis of the factors associated with sleeping problems, the risk of developing these problems was increased for students aging 22 years or more (PR=1.17; CI95%: 0.76-1.80); UNOESC students (PR=1.87; CI95%: 1.12-3.14); that spent 7 daily hours or more interacting with social media platforms (PR=2.03; CI95%:1.21-3.39); that reported increase in feeling anxiety, sadness, or concern during the pandemic (PR=1.78; CI95%:1.02-3.10); that developed worse eating habits (PR=1.45; CI95%: 1.01-2.07); and that increased alcohol consumption during the pandemic (PR=1.59; CI95%:0.98-2.58) (Table 5).

Table 5. Raw and adjusted analysis of the factors associated with sleep problems developed during the COVID-19 pandemic.

Level	**Variable**	**Prevalence of sleep-related problems developed during the COVID-19 pandemic (%)**	**Prevalence ratios (CI95%)**	
			Raw	Adjusted
1st	Sex		p=0.428	p=0.403
	Male	17.0	1.00	1.00
	Female	20.5	1.21 (0.76-1.92)	1.22 (0.77-1.92)
	Age (completed years)		p=0.009	p=0.001
	18 to 19	20.7	1.00	1.00

	20 to 21	11.2	0.54 (0.32-0.90)	0.51 (0.31-0.85)
	22 to 23	26.1	1.26 (0.82-1.93)	1.17 (0.76-1.80)
	24 or more	23.5	1.13 (0.76-1.68)	1.13 (0.76-1.67)
	Work	21.9	p=0.192	p=0.126
	No		1.00	1.00
	Yes	17.8	0.81 (0.60-1.11)	0.78 (0.57-1.07)
2nd	University		p=0.029	p=0.017
	Católica SC	12.2	1.00	1.00
	UNOESC	21.6	1.78 (1.06-2.98)	1.87 (1.12-3.14)
	Undergraduation or graduation program		p=0.326	p=0.644
	Medicine	25.0	1.29 (0.83-2.00)	1.16 (0.76-1.77)
	Nursing	23.3	1.20 (0.74-1.95)	1.19 (0.74-1.91)
	Psychology	16.4	0.85 (0.57-1.26)	0.83 (0.56-1.14)
	Post-graduation	28.0	1.44 (0.73-2.84)	0.96 (0.47-1.96)
	Other	19.4	1.00	1.00
3rd	Time practising social distancing		p=0.443	p=0.536
	Up to three weeks	23.7	1.00	1.00
	1 month	18.4	0.78 (0.44-1.36)	0.81 (0.47-1.40)
	2 months or more	19.1	0.80 (0.56-1.14)	0.82 (0.57-1.17)
	Daily use of social media platforms		p=0.197	p=0.037
	Up to 2 hours	15.5	1.00	1.00
	3 to 4 hours	21.3	1.38 (0.84-2.27)	1.52 (0.94-2.44)
	5 to 6 hours	17.0	1.10 (0.63-1.91)	1.28 (0.75-2.20)
	7 hours or more	25.2	1.63 (0.96-2.78)	2.03 (1.21-3.39)
	Feeling more anxious, sad, or concerned in comparison to the period prior to the pandemic		p=0.020	p=0.042
	No	11.2	1.00	1.00
	Yes	21.7	1.93 (1.11-3.37)	1.78 (1.02-3.10)
	Perception of the quality of the eating habits in comparison to the period prior to the pandemic		p=0.018	p=0.044
	No changes were perceived	15.4	1.00	1.00
	Started to eat better	20.2	1.31 (0.84-2.05)	1.23 (0.79-1.92)
	Started to eat worse	25.3	1.64 (1.16-2.32)	1.45 (1.01-2.07)
	Alcohol consumption in comparison to the period prior to the pandemic		p=0.037	p=0.039
	Does not consume alcohol	21.6	1.00	1.00

Unchanged	13.8	1.56 (1.02-2.38)	1.56 (1.02-2.38)
Alcohol consumption increased	27.5	1.99 (1.24-3.2)	1.59 (0.98-2.58)
Alcohol consumption decreased	21.9	1.59 (1.00-2.52)	1.38 (0.98-2.19)
Practice of physical activity		p=0.768	p=0.848
Yes	19.5	1.00	1.00
No	20.4	1.05 (0.77-1.43)	0.97 (0.72-1.31)

IV. DISCUSSION

Sleep has a singular relevance in the daily routine of university students, given its role in many health aspects and, particularly relevant in this case, intellectual activity. Good quality sleep favors better physical and cognitive conditions, such as attention, memory, and learning, so crucial in this period of life [1,3,4,15]. However, in general, low quality sleep has high rates among university students, and these rates became even higher during the COVID-19 pandemic [10].

Results from our study showed that almost half of the students had sleeping problems, and one fourth reported that these problems started with the pandemic. More than two thirds of the students stayed two or more months at home, following the restrictive measures recommended to contain the pandemic. In this period, some daily behaviors like sleeping, eating, drinking alcoholic beverages, and interacting with social media platforms, for many students, were negatively affected.

In agreement to what was observed by Du et al. [16], students included in our study were emotionally affected by the pandemic, as shown by the self-reported increase in anxiety, sadness, and concerns. Similar effects were also reported by other studies including university students of health sciences during the COVID-19 pandemic [17–19]. Bashir et al. [17], for example, observed the same kind of impact in the mental health of university students of health sciences, mainly in anxiety and depression levels, which can have a negative impact in sleep quality [18,20]. This association was observed in our study, as sleeping problems were increased almost twofold among students who reported increased anxiety, sadness, or concern.

During social isolation, the perceived diet quality worsened for more than one third of the sample, and for one fourth there was an improvement. Students that reported a decrease in the perceived quality of their eating habits mentioned an increase of more caloric, industrialized, and frozen meals, more sweets, and more snacks. The ones that answered that the quality of their eating habits improved, reported an increase in the intake of fruits, vegetables, and meals prepared at home. According to Ogilvie and Patel [21], even though there is an association between eating habits and sleep, the relationship of causality between the two factors is not clear. Moreover, the authors conclude that experimental studies, even though small, already point towards sleeping problems and hedonic eating. Interestingly, our study showed that changes in diet, for the better or for the worse, were found to increase the risk for sleeping problems.

Staying at home influenced alcohol consumption for more than half of the sample. Use increased for 20.8% and reduced for 31.3% of the students who already drank alcohol. Cases of reduction can be explained by social drinkers, who mainly consumed alcohol during social events such as parties and gatherings in general. On the other hand, people who usually drank at home now had even more time in this environment, favoring the habit. In another study with university students made before the pandemic, hazardous alcohol use was associated with sleeping problems in 35.4% of the participants [22].

Results show that an expressive number of students (48.8%) reported sleeping problems. After the start of the pandemic, a large portion of the students (42.4%) started experiencing more difficulty to initiate sleep, and 29.4% expressed more difficulty to maintain sleep. Similar findings were observed in Nursing students in Spain during the same period [10]. These symptoms are part of what characterizes as insomnia [23], which may have contributed with the unsatisfaction with sleep quality reported by more than one third of the participants. Insomnia may cause impairments in cognitive functions, as it increases chances of mistakes and accidents and affects quality of life [23].

During the pandemic, 29.4% of the students reported an increased difficulty maintaining sleep. A study performed before the pandemic aiming to evaluate sleeping disorders in university students in the extreme South of Brazil identified that 12.7% of the students had difficulty maintaining sleep [22]. It is important to highlight that, from the students that reported having sleeping problems, 41% started to notice them during social distancing. Accordingly, decreased sleeping quality in students during the pandemic were found in studies performed in China, Ireland, Malaysia, The Netherlands,

South Korea, Taiwan, and The United States of America [18].

Concerning the duration of sleep, the number of slept hours considered as adequate for a young adult is of [7-9] hours 24. In a study by Tang et al. 25, The average reduction in sleeping duration was identified as the second most significant predictor for developing depression and post-traumatic stress disorder (PTSD). In the majority of the countries included in the study by Du et al. 18, less of seven hours of sleep was observed in more than 25% of the students of health-related programs during the pandemic. The average sleeping time of the participants included in our study was adequate, even though one fourth considered that did not sleep enough to feel well and more than one third reported unsatisfaction with current sleep quality.

After adjusted analysis, sex and physical activity were not identified as risk factors for sleeping problems. These findings differ from other studies performed during the same period, as Du et al. 18 identified that women were more prone to develop sleeping problems and Romero-Blanco et al. [10] found that practicing physical activities favored better sleeping quality. It is worth mentioning, however, that there is no consensus on the impact of sex and physical activity in sleeping problems among university students. Findings from a study performed in Portugal showed that even though women practiced less physical activities than men, they had better sleeping quality [26]. In a study in Brazil, the probability of sleeping less than recommended was 21% less likely among physically active university students in comparison to their sedentary counterparts, and women had increased risk of daytime sleepiness and waking up at night [22].

Concerning age and university, students aging 22 to 23 years old and studying at UNOESC was associated with greater risk of developing sleep-related problems during social distancing. In the same way, significant differences were observed when considering time connected to social media. Excessive use of internet, notably of social media and before sleeping time, were consistently associated with poorer sleeping quality [27–30]. Overall, the available data suggests that the more time spent exposed to social media, the greater the risk of developing sleeping problems.

Alcohol consumption during social distancing was significantly associated with sleeping problems. This association was also observed in another study, where university students that consumed alcohol had a significant decrease in sleeping quality before and during social distancing [10]. It is likely that alcohol consumption interfered in the sleeping quality of students of health sciences overall, and that sleeping problems were more prevalent among those who started drinking at home more often during the pandemic.

Despite the relevance of the subject, we cannot stablish a causal relationship between the outcomes. Also, as the responses are subjective, it is not impossible that some confusion and interpretation biases are present.

V. CONCLUSION

This study showed that during social distancing, due to the COVID-19 pandemic, students of health sciences had adequate sleeping time, even though there were negative impacts in daily routine and satisfaction with sleep. Subjective unsatisfaction with sleep affected a significant part of the participants.

One fourth of the students said to have developed sleeping problems during the pandemic and reported that sleeping time was not enough to feel well. Self-reported increase of feeling anxiety, sadness, or concern, were associated with worse sleeping quality.

No associations were found between sleeping problems during the pandemic and practice of physical activity, sex, time in social distancing, work, and college program. On the other hand, eating habits, alcohol consumption, feeling anxiety, sadness, or concern, time spent using social media, university, and age had an association with sleeping problems during the COVID-19 pandemic.

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