Association between temporomandibular disorders and sleep quality in higher education health students

Associação entre a presença de disfunção temporomandibular e a qualidade do sono em estudantes do ensino superior da área da saúde

Pedro Miguel Nanita Mourato[1], Beatriz Minghelli[1,2]

ABSTRACT

BACKGROUND AND OBJECTIVES: Temporomandibular dysfunction (TMD) may be related to sleep disorders and both factors can impair students' performances. This study aimed to determine the association between TMD and sleep quality in higher education health students.
METHODS: The sample consisted of 203 students, 144 (70.9%) female and 59 (29.1%) male, aged 18 to 46 years (23.7±6.3). The measurement instruments included a sociodemographic questionnaire, the Fonseca Anamnesic Index (FAI) and the Pittsburgh Sleep Quality Index (PSQI).
RESULTS: Of the students who were evaluated by the FAI, 135 (66.5%) were assessed with TMD. Of those who had TMD (135; 100%), 104 (77%) had mild TMD, 21 (15.5%) moderate TMD and 10 (7.5%) severe TMD. The values obtained by the PSQI indicated that 70 (34.5%) students had good sleep quality, 113 (55.7%) had poor sleep quality and only 20 (9.9%) had bad sleep quality. Students with poor sleep quality had 2.89 more probabilities of developing TMD (CI:158–5.32).
CONCLUSION: Data revealed an association between TMD and poor sleep quality in higher education health students. The dissemination of these results among populations subject to great emotional stress, such as higher education students, has proved to be of great importance, so that preventive strategies can be adopted.
Keywords: Epidemiology, Sleep quality, Temporomandibular disorder, University students.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A disfunção temporomandibular (DTM) pode estar relacionada a distúrbios do sono e ambos os fatores podem prejudicar o desempenho dos estudantes. O objetivo deste estudo foi determinar a associação entre a DTM e a qualidade do sono em estudantes do ensino superior na área da saúde.
MÉTODOS: A amostra foi constituída por 203 alunos, 144 (70,9%) do gênero feminino e 59 (29,1%) do masculino, com idades entre 18 e 46 anos (23,7±6,3). Os instrumentos de medida incluíram um questionário sociodemográfico, o Índice Anamnésico de Fonseca (IAF) e o *Pittsburgh Sleep Quality Index* (PSQI).
RESULTADOS: Dos estudantes avaliados pelo IAF, 135 (66,5%) foram avaliados com DTM. Dos que tinham DTM (135; 100%), 104 (77%) tinham DTM leve, 21 (15,5%) DTM moderada e 10 (7,5%) DTM grave. Os valores obtidos pelo PSQI indicaram que 70 (34,5%) estudantes apresentaram boa qualidade de sono, 113 (55,7%) má qualidade de sono e apenas 20 (9,9%) tinham uma péssima qualidade de sono. Estudantes com má qualidade do sono tiveram 2,89 mais chances de desenvolver DTM (IC: 158–5,32).
CONCLUSÃO: Os dados revelaram uma associação entre DTM e má qualidade do sono em estudantes do ensino superior da área da saúde. A divulgação desses resultados com populações sujeitas a grande stress emocional, como os estudantes do ensino superior, revela-se de grande importância para que possam ser adotadas estratégias preventivas.
Descritores: Disfunção temporomandibular, Epidemiologia, Estudantes universitários, Qualidade do sono.

Pedro Miguel Nanita Mourato – https://orcid.org/0000-0001-8368-007X;
Beatriz Minghelli – https://orcid.org/0000-0003-3341-3189.

1. Piaget Institute, Jean Piaget School of Health in Algarve, Silves, Portugal.
2. Insight: Piaget Research Center for Ecological Human Development, Instituto Piaget - Lisboa - Lisboa - Portugal.

HIGHLIGHTS
• The results verified a positive relationship between temporomandibular disorder and poor sleep quality in higher education students. Those with temporomandibular disorders were 2.89 (CI: 1.58-5.32; p≤0.001) more likely to have poor sleep quality.
• Female students were 2.02 more likely (CI: 1.05-3.89; p=0.036) to develop temporomandibular dysfunction and 2.71 more likely (CI: 1.37-5.35; p=0.004) to have poor sleep quality compared to men.
• Students who worked professionally were 4.19 (CI: 1.92-9.17; p≤0.001) more likely to have poor sleep quality, compared to students who did not work.

Correspondence to:
Beatriz Minghelli
E-mail: beatriz.minghelli@ipiaget.pt

INTRODUCTION

Temporomandibular dysfunction (TMD) consists of a group of disorders that affect the masticatory muscles, the temporomandibular joint (TMJ) and the surrounding structures[1,2].

TMD can affect individuals of any age group, but there is a higher prevalence between 20 and 45 years of age mostly in females[1,3-6]. Data indicate that 60% to 70% of the population has at least one sign of TMD at some point in their life[5].

Symptoms mostly reported by individuals with TMD involve muscle and joint fatigue, limitations with or without deviations from mandibular movements, obstruction, alteration of mandibular trajectory, joint noises during mouth opening and closing, fatigue, and weakness associated with the muscles of the face as well as pain complaints in the head, nape, cervical and ear regions[2]. The findings of a study[7] revealed that the pain presented by individuals with TMD impaired work activities (59.09%), school (59.09%) and sleep (68.18%), effecting their quality of life[7].

Regarding the etiology of TMD, this may be multifactorial and may be related to structural, neuromuscular and psychological factors, parafunctional habits, such as bruxism, and traumatic or degenerative injuries[3,8,9]. Other etiological factors involved include the adoption of harmful postures maintained over time, accumulated stress, and sleep disorders[8].

Sleep is essential to maintain homeostasis and optimize multiple physiological functions, including memory consolidation, mood maintenance, hormonal regulation, as well as immune, cerebral, and muscular system recovery[10]. All individuals need to sleep for several hours. This need is not only measured by the number of hours slept but also by the quality of that sleep[4].

Sleep disorders can cause excessive daytime sleepiness, irritability, reduced quality of performance of daily activities, as well as levels of attention and concentration[11].

The relationship between sleep quality and TMD has been the object of study encouraged by a significant portion of individuals with TMD who report periods of poor sleep quality. Since other Brazilian studies about the subject are unknown and, in order to contribute to more knowledge on the university health population, the main objective of the present research was to determine the association between TMD and sleep quality in higher education health students.

METHODS

The present study was descriptive-correlational and cross-sectional. This research was approved by the Piaget Institute Ethics Committee (P15-S26-20/07/2022), the Research in Education and Community Intervention (RECI) research center and the Direction of School of Health Jean Piaget Algarve – Piaget Institute. To carry out this study, all students were informed of the study's objective and were guaranteed confidentiality regarding the data collected. They were also made aware that abandoning the study at any time would not incur any ill will nor prejudice against them.

Population

The population consisted of 298 students enrolled in the undergraduate courses of the School of Health Jean Piaget Algarve, Piaget Institute, located in Silves, southern Portugal. The School of Health Jean Piaget Algarve teaches undergraduate courses in Nursing, Physiotherapy, and Osteopathy.

The inclusion criteria included students of both genders, aged 18 or over, who volunteered to take part in this study.

The sample calculation was determined using an estimated prevalence of TMD (40%) reported in the other study that also used a population from the same educational institution, with a sample error of 5% and a confidence interval of 97%. This approach established the minimum sample size of 180 students[12].

Measurement instruments

The measurement instruments included a sociodemographic questionnaire, the Pittsburgh Sleep Quality Index (PSQI), and the Fonseca Anamnesic Index (FAI). All were applied in a presential classroom setting by the researchers, in a single moment, having been made available online to students via QR code. For students who weren't present on the days of data collection, a link to the questionnaire was sent to their institutional accounts.

Sociodemographic questionnaire

The questionnaire consisted of sociodemographic questions of the population, such as gender, age, the course they attended, the corresponding year of the course, whether they had children, whether they regularly practiced physical exercise (minimum 3 times a week) and whether they were a student worker.

Fonseca Anamnesic Index

FAI is one of the few instruments available in Portuguese to characterize the severity of TMD symptoms. The index consists of 10 questions, each with three possible answers which are "yes", "no", and "sometimes", respectively scored with 10, 0, and 5[13].

This index includes questions about the difficulty in opening the mouth wide, moving the mandibular from side to side, tiredness when chewing, the presence of pain in the TMJ and nape, chewing and headaches, the presence of noises, habits such as tightening or grinding teeth, the perception of malocclusion and the feeling of emotional stress[13].

With the sum of the points assigned, an anamnesis index is obtained that allows classifying individuals regarding the symptom severity: absence of TMD (0 to 15 points), mild TMD (20 to 45 points), moderate TMD (50 to 65) and severe TMD (70 to 100 points)[13].

The FAI questionnaire has a 95% correlation with the Helkimo Anamnestic Index (r =0.6169, p<0.05) and 95% reliability in the application[14]. The simplicity of this index favors its use in epidemiological population studies, although it has only been validated for the Brazilian population and also does not offer a diagnostic classification of TMD[13].

Individuals were also asked if they had a previous diagnosis of TMD and, if so, they had to write if they had undergone any type of treatment.

Pittsburgh Sleep Quality Index

PSQI assesses the quality and sleep disorders during the last month and has been well accepted because it is a simple and

standardized questionnaire[8]. PSQI proved to be useful and viable for the subjective evaluation of the sleep quality in clinical and non-clinical populations[15].

A study[15] demonstrated that PSQI for the Portuguese language (PSQI-PT) is a valid and reliable instrument for evaluating sleep quality. PSQI-PT is easy to understand and respond to, offering the advantage of allowing the adult population to differentiate between the different communities of good and bad "sleepers".

PSQI is composed of 19 questions, organized into 7 components with a classification ranging from 0 to 3 points. PSQI components include the following: subjective sleep quality (C1), sleep latency (C2), sleep duration (C3), habitual sleep efficiency (C4), sleep disturbances (C5), usage of sleeping drugs (C6) and daytime dysfunction (C7)[15,16].

The aggregate of the respective components results in an overall result, ranging from 0 to 21 points, where the highest result corresponds to worse sleep quality. An overall score of up to 4 points indicates good quality of sleep, from 5 to 10 points poor quality of sleep and above 10 points results in bad quality of sleep[17].

An overall PSQI score of more than 5 values shows a diagnostic sensitivity of 89.6% and specificity of 86.5% for the distinction between good and poor sleep quality[17].

Regarding the psychometric data in the validation of the instrument for the Portuguese population, Cronbach's α value for the 7 components was 0.70, which reveals a good internal consistency[15].

Statistical analysis

The data were processed using the IBM Statistical Package for the Social Software Science (SPSS), version 28.

For the analysis of the collected data, descriptive statistics of characterization of qualitative variables were performed through relative and absolute frequencies. The measures of central tendency and dispersion were used to analyze quantitative variables.

The variable "age" was grouped in the variable "age group" taking into account the median value[22].

Binary logistic regressions (Enter method) were applied to test the influence of the variables used in this study on the presence of TMD and poor sleep quality. After that, a final multivariate model (Forward Likelihood Method) was developed, and the confidence intervals (CI) were calculated. The validity, quality of adjustment and predictive capacity of binary logistic regressions were evaluated by the Omnibus test and the Nagelkerke correlation coefficient. The level of statistical significance was established at 0.05.

RESULTS

The total sample collected was 203 students, corresponding to 68% of the population, 12% above the amount needed to obtain representativeness of the population. One hundred and forty-four (70.9%) students were female, aged between 18 to 46 years old (23.7±6.3 years old).

Regarding the course, 97 (47.8%) students attended the nursing course, 95 (46.8%) attended physiotherapy and 11 (5.4%) attended the Osteopathy course. Considering the year of the course, 75 (36.9%) students were in their first year, 52 (25.6%) in their second year, 43 (21.2%) in their third year and the fourth-year students numbered 33 (16.3%).

The data collected showed that 187 (92.1%) students reported having no children and 16 (7.9%) reported having children.

Regarding the practice of physical exercise, 94 (46.3%) students participated in physical exercise at least 3 times a week, while 109 (53.7%) did not.

Concerning their professional practice, 128 (63.1%) students reported that they did not work and 75 (36.9%) worked.

When questioned if they had a diagnosis of TMD, 192 (94.6%) students conveyed that they did not and 11 (5.4%) reported having a diagnosis of TMD, while 8 (72.7%) students did not perform any type of treatment and 3 (27.3%) underwent treatment for TMD.

The values obtained by FAI varied from 0 to 100 (22.49±20.28). Of the students who were evaluated by FAI, 62 (33.5%) students did not present TMD symptoms and 135 (66.5%) were evaluated with a possible presence of TMD symptoms. Of those who had TMD symptoms (135; 100%), 104 (77%) had mild TMD, 21 (15.5%) moderate TMD and 10 (7.5%) severe TMD.

Table 1 shows the values of the absolute and relative frequencies of the responses concerning the FAI.

PSQI values ranged from 1 to 17 (6.19±2.98). According to the sleep quality assessed by PSQI, 70 (34.5%) students had good

Table 1. Frequency and percentage of Fonseca Anamnesic Index answers

Fonseca Anamnesic Index questions	Fonseca Anamnesic Index answers		
	No	Sometimes	Yes
Do you have difficulty opening your mouth wide?	174 (85.7%)	17 (8.4%)	12 (5.9%)
Do you have difficulty moving your jaw from side to side?	180 (88.7%)	14 (6.9%)	9 (4.4%)
Do you feel fatigue or muscle pain when you chew?	159 (78.3%)	34 (16.7%)	10 (4.9%)
Do you have frequent headaches?	102 (50.3%)	61 (30.0%)	40 (19.7%)
Do you have neck pain or a stiff neck?	138 (68.0%)	40 (19.7%)	25 (12.3%)
Do you have earaches or pain in that area (TMJ)?	167 (82.3%)	28 (13.8%)	8 (3.9%)
Have you ever noticed any noise in your TMJ while chewing or opening your mouth?	147 (72.4%)	28 (13.8%)	28 (13.8%)
Do you have any habits such as clenching or grinding your teeth?	131 (64.5%)	26 (12.8%)	46 (22.7%)
Do you feel that your teeth do not come together well?	155 (76.4%)	19 (9.4%)	29 (14.3%)
Do you consider yourself a tense (nervous) person?	53 (26.1%)	68 (33.5%)	82 (40.4%)

sleep quality, 113 (55.7%) had poor sleep quality and 20 (9.9%) were classified as having bad sleep quality.

Table 2 presents the values of the absolute and relative frequencies of the responses to PSQI.

Table 3 shows the relationship between the occurrence of TMD and gender, age group, year of course, parentality status, physical exercise practice, if one is a student worker, and the sleep quality, obtained by applying the binary model of logistic regression. The final model was considered mathematically valid (Omnibus and Nagelkerke: $p \leq 0,001$, $R_2 = 0.079$).

Table 4 exhibits the relationship between the occurrence of poor sleep quality and gender, age group, year of course, parentality status, physical exercise practice, and if one is a student worker, obtained by applying the binary model of logistic regression. The final model was considered mathematically (valid Omnibus and Nagelkerke: $p \leq 0.001$, $R_2 = 0.108$).

Table 2. Frequency and percentage of Pittsburgh Sleep Quality Index answers

Pittsburgh Sleep Quality Index questions	Pittsburgh Sleep Quality Index answers			
	Mean ± standard deviation	Minimum - Maximum		
1. During the past month, when have you usually gone to bed at night? (C4)	21:15 ± 22:26	20:00 – 06:00		
2. During the past month, how long (in minutes) has it usually takes you to fall asleep each night? (C2)	20 ± 15	1 - 60		
3. During the past month, when have you usually gotten up in the morning? (C4)	08:11 ± 1:34	04:00 – 13:00		
4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spend in bed.) (C3; C4)	07:04 ± 1:21	2 - 12		
5. During the past month, how often have you had trouble sleeping because you…	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
a. Cannot get to sleep within 30 minutes (C2)	54 (26.6%)	55 (27.1%)	55 (27.1%)	39 (19.2%)
b. Wake up in the middle of the night or early morning (C5)	41 (20.2%)	52 (25.6%)	56 (27.6%)	54 (26.6%)
c. Have to get up to use the bathroom (C5)	82 (40.4%)	38 (18.7%)	44 (21.7%)	39 (19.2%)
d. Cannot breathe comfortably (C5)	166 (81.8%)	24 (11.8%)	8 (3.9%)	5 (2.5%)
e. Cough or snore loudly (C5)	151 (74.4%)	26 (12.8%)	11 (5.4%)	15 (7.4%)
f. Feel too cold (C5)	122 (60.1%)	51 (25.1%)	23 (11.3%)	7 (3.4%)
g. Feel too hot (C5)	88 (43.3%)	54 (26.6%)	44 (21.7%)	17 (8.4%)
h. Have bad dreams (C5)	78 (38.4%)	82 (40.4%)	27 (13.3%)	16 (7.9%)
i. Have pain (C5)	137 (67.5%)	39 (19.2%)	10 (4.9%)	17 (8.4%)
j. Other reason(s) (C5)	1 (5.9%)	---	5 (29.4%)	11 (64.7%)
7. During the past month, how often have you taken drugs (prescribed or "over the counter") to help you sleep? (C6)	185 (91.1%)	8 (3.9%)	3 (1.5%)	7 (3.4%)
8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity? (C7)	132 (65.0%)	42 (20.7%)	22 (10.8%)	7 (3.4%)
9. During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done? (C7)	52 (25.6%)	76 (37.4%)	49 (24.1%)	26 (12.8%)
6. During the past month, how would you rate your overall sleep quality? (C1)	Very good	Fairly good	Fairly bad	Very bad
	18 (8.9%)	139 (68.5%)	38 (18.7%)	8 (3.9%)
10. Do you have a bed partner or roommate?	No bed partner or roommate	Partner/roommate in other room	Partner in the same room but not the same bed	Partner in the same bed
	157 (77.3%)	10 (4.9%)	35 (17.2%)	1 (0.5%)
If you have a roommate or bed partner, ask him/her how often in the past month you have had:	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
a. Loud snoring	30 (71.4%)	6 (14.3%)	2 (4.8%)	4 (9.5%)
b. Long pauses between breaths while asleep	36 (85.7%)	5 (11.9%)	1 (2.4%)	---
c. Legs twitching or jerking while you sleep	21 (50%)	7 (16.7%)	5 (11.9%)	9 (21.4%)
d. Episodes of disorientation or confusion during sleep	36 (85.7%)	4 (9.5%)	1 (2.4%)	1 (2.4%)
e. Other restlessness while you sleep	---	---	---	---

C1 = Subjective sleep quality; C2 = Sleep latency; C3 = Sleep duration; C4 = Habitual sleep efficiency; C5 = Sleep disturbances; C6 = Use of sleeping drugs; C7 = Daytime dysfunction

Table 3. Relationship between TMD and modifiable and non-modifiable risk factors

Variables	Odds Ratio$_{crude}$ (CI 95%); p-value	Odds Ratio$_{adjusted}$ (CI 95%); p-value
Gender (male*) female	2.51 (1.33-4.72); 0.004	2.02 (1.05-3.89); 0.036
Age group (until 22 years old*) ≥ 23 years old	1.15 (0.67-2.01); 0.627	---
Year of course (first years - 1st and 2nd years*) last years - 3rd and 4th years	1.55 (0.88-2.75); 0.133	---
Have children (no*) yes	1.33 (0.48-3.71); 0.589	---
Practice of physical exercise (yes*) no	1.25 (0.72-2.17); 0.436	---
Worked (no*) yes	1.77 (0.99-3.15); 0.053	---
Sleep quality (good quality*) poor quality	2.89 (1.58-5.32); ≤0.001	---

* Class reference

Table 4. Relationship between the presence of poor sleep and modifiable and non-modifiable risk factors

Variables	Odds Ratio$_{crude}$ (CI 95%); p-value	Odds Ratio$_{adjusted}$ (CI 95%); p-value
Gender (male*) female	3.31 (1.76-6.22); ≤0.001	2.71 (1.37-5.35); 0.004
Age group (until 22 years old*) ≥ 23 years old	1.53 (0.84-2.79); 0.166	---
Year of course (first years - 1st and 2nd years*) last years - 3rd and 4th years	1.35 (0.74-2.49); 0.329	---
Has children (yes*) no	1.53 (0.55-4.30); 0.419	3.636 (1.02-12.95); 0.047
Practice physical exercise (yes*) no	1.05 (0.59-1.88); 0.862	---
Worked (no*) yes	3.83 (1.92-7.65); ≤0.001	4.19 (1.92-9.17); ≤0.001

* Class reference

DISCUSSION

This study found that students who had TMD symptoms were 2.89 (CI: 1.58–5.32; p≤0,001) more likely to have poor sleep quality than those who did not. Several studies corroborate this association[6,18-20].

A systematic review[6] found that 7 studies reported a significant association between the presence of TMD and sleep quality (p<0.05). In a study[18] the prevalence of poor sleep quality was high and it was observed that there is a strong relationship between sleep disorders and TMD (p<0.001). Another study[19] that used the PSQI as an assessment instrument observed that sleep quality was associated with the presence of facial pain (p=0.001) in 79.4% of the 126 participants enrolled. This high prevalence between poor sleep quality and TMD was higher in patients who reported having face pain (97.3%) than those who did not (71.9%).

Another systematic review[20] found a 4.45 times increased odds ratio of TMD prevalence for individuals who presented poor subjective sleep quality. A study[21] compared sleep quality between patients with chronic temporomandibular disorder and healthy controls and verified that the PSQI scores were significantly higher in the patients (6.25±2.77) than in healthy controls (3.84±2.29) and poor sleep was significantly more prevalent in the patient group (56.9%) than in healthy controls (22.2%).

The association between pain and sleep can be seen from the perspective of linear or circular models. In the presence of acute pain, the pain can lead to unsatisfactory sleep, but sleep can return to normal when this pain is resolved, following a linear model. However, in chronic pain, poor sleep is followed by a day of intense and variable pain and, consequently, sleep does not lead to repair and the restorative benefit of sleep is not achieved, being classified as a circular model[6].

Poor sleep quality in individuals with TMD (compared to healthy controls) may predispose them to increased negative outcomes in pain processing at the level of the central nervous system[22]. Altered sleep can lower pain thresholds and increase sensitivity[6]. Regarding the data acquired by the FAI in this study, 66.5% of the students were evaluated with the presence of TMD symptoms. According to the research[18] conducted on 200 students from public and private schools in Minas Gerais State, aged between 18 and 19 years, 35.5% of the students had TMD. With similar data, a study conducted in Singapore with students aged between 18 and 30 years[23] obtained a 41.8% total prevalence of TMD. Another study[5], whose sample included 306 students at courses of Physiotherapy, Nursing, Pharmacy and Clinical and Public Health Analyses from the same location as this study, with ages between 18 and 43 years, showed that 37.3% of the students in the sample indicated a presence of TMD. A study[8] obtained a higher prevalence of TMD, with 60.5% in 212 higher education students, demonstrating results similar to those of the present study.

In this study, the severity of TMD was also evaluated, showing that most students presented mild dysfunction (77%), and only a small group (7.5%) obtained severe TMD results. Similar data were found in other studies[19,20,22]. In a reference study[23], 32.4% of the students had mild TMD, 9.4% had moderate TMD and 58.2% did not present any symptoms. In the data from another study[24], 50.9% presented mild TMD, 21.8% moderate TMD and 0.9% severe TMD. Yet another study[25], with a sample of 303 students inserted, 50.2% witnessed mild TMD, 33.0% moderate and 6.6% severe.

When compared to men, women had an odds ratio of 2.51 (95% CI: 1.33-4.72; p=0.004) for TMD. A study conducted on 1,493 Portuguese college students[26], found that, as compared with men, women had an odds ratio of 1.9 (95% CI: 1.53-2.46; p≤0.001) for TMD. Another study[27] revealed that the number of students with the highest presence of TMD was female compared to males.

The high prevalence of TMD in women can be explained by physiological characteristics, in particular by hormonal variations and connective and muscle tissue structures, the greater sagging of these tissues, related to estrogen levels, which explain that these tissues have a lower capacity to support operating pressure leading to TMD[5,19,27,28]. Another explanation for obtaining these results could be that the amount of the female sample (70.9%) was significantly higher than the male sample (29.1%).

Data from this study indicated that through the PSQI, 65.6% of the students reported poor sleep quality (PSQI≥5). Other studies present similar results[29-31]. A study[29] composed of 457 students from the Rabat School of Medicine and Pharmacy in Morocco, reported that 58.2% of the students had poor sleep quality (PSQI≥5). Another study[31], conducted in a population similar to the present study, observed that 37.2% of students had good sleep quality, 52% had poor sleep quality, and 10.8% had a severe sleep disorder. At a medical school in Pakistan, 512 (64.2%) students reported poor sleep quality (PSQI≥5) and its negative impact on academic performance. The studies referred to in the previous paragraph included students of health courses who are continually under high pressure and academic stress. Proper sleep is essential to promote learning and memory processes. Sleep disorders are common in students and worsen their academic performance[30].

Compared to students who did not work, students who performed some professional practice at the same time as they attended higher education were 3.83 more likely to have poor sleep quality (CI: 1.92–7.65; p≤0.001). A study[32], composed of 213 students, showed equivalent results when demonstrating that 76.5% of student workers had poor sleep quality.

Poor sleep quality may be the result of changes that occur in higher education students, since they are consequences of biological, psychological and social changes common to the academic cycle, which, in turn, are related to changes in circadian rhythm, autonomy to choose bedtime, academic pressure and the use of new technologies and social networks[19].

The present study also verified that, on average, students slept seven hours a day, which meets the recommendations of several studies. In a meta-analysis that included 35 articles, with a follow-up of 2.8 to 25 years, most studies recommend 7 to 8 hours of daily sleep, although in this meta-analysis the mean values are between 6 and 9 hours of daily sleep[33]. These recommendations are in line with the recommendations of the Portuguese National Sleep Foundation which state that 8 hours or more per night are ideal for adolescents[19]. The negative effect of a period of sleep deprivation associated with stress levels still becomes a risk factor for the development of TMD[30].

Although the measurement instruments used are reliable and validated for the population, a limitation of the present study was the lack of specificity that a health professional can bring in their evaluation so that the diagnosis is correct, as a more detailed evaluation of the signs and symptoms of TMD is necessary, in addition to other complementary diagnostic tests. Therefore, further studies are suggested to cover a larger sample of this population.

CONCLUSION

The data from this study revealed an association between TMD and poor sleep quality in the sample of higher education health students. The data also revealed high prevalence values for the presence of TMD and poor sleep quality in the analyzed sample.

A greater understanding of these conditions is necessary among populations exposed to high levels of stress, such as university students, it is of considerable importance to increase screening in these populations in order to establish prevention strategies and early treatments.

ACKNOWLEDGMENTS

AUTHORS' CONTRIBUTIONS

Pedro Miguel Nanita Mourato
Statistical Analysis, Data Collection, Conceptualization, Research, Methodology, Writing - Preparation of the original
Beatriz Minghelli
Statistical Analysis, Conceptualization, Methodology, Writing - Review and Editing, Supervision

REFERENCES

1. Daher C, Cunha L, Ferreira A, Souz, A, Rêgo T, Araújo M et al. Limiar de dor, qualidade do sono e níveis de ansiedade em indivíduos com disfunção temporomandibular. Rev CEFAC. 2018;20(4):450-8.
2. Sather R, Breder A, Aguiar M, Dias T, Pereira S. Disfunções temporomandibulares: revisão de literatura. UNIFACIG. 2020;6.
3. Pereira K, Andrade L, Costa M, Portal T. Sinais e sintomas de pacientes com disfunção temporomandibular. Rev CEFAC. 2005;7(2):221-8.
4. Medeiros S, Batista A, Forte F. Prevalência de sintomas de disfunção temporomandibular e hábitos parafuncionais em estudantes universitários. Rev Gaúcha Odontol. 2011;59(2):201-8.
5. Minghelli B, Kiselova L, Pereira C. Associação entre os sintomas da disfunção temporo-mandibular com factores psicológicos e alterações na coluna cervical em alunos da Escola Superior de Saúde Jean Piaget do Algarve. Rev Port Saúde Pública. 2011;29(2):140-7.
6. Dreweck F, Soares S, Duarte J, César P, Conti R, Canto G et al. Association between painful temporomandibular disorders and sleep quality: a systematic review. J Oral Rehabil. 2020;47(8):1041-51
7. Oliveira A, Bermudez C, Souza R, Souza C, Dias E, Castro C, et al. Impacto da dor na vida de portadores de disfunção temporomandibular. J Appl Oral Sci. 2003;11(2):138-43.
8. Özdinç S, Ata H, Selçuk H, Can HB, Sermenli N, Turan FN. Temporomandibular joint disorder determined by Fonseca anamnestic index and associated factors in 18-to 27-year-old university students. Cranio. 2020;38(5):327-32.
9. Pinto A, Oliveira A, Neto D, Lins F, Santos J, Sousa M. Estresse psicológico e disfunções temporomandibulares: revisão integrativa. Open Braz Dent J. 2021;1(1):1-12.

10. Yap AU, Cao Y, Zhang MJ, Lei J, Fu KY. Temporomandibular disorder severity and diagnostic groups: Their associations with sleep quality and impairments. Sleep Med. 2021;80:218-25.

11. Luccas G, Lira C, Guedes K, Silva L, Stechman-Neto J, Corrêa C. Disfunção temporomandibular e sono: revisão integrativa de literatura. Arch Health Invest. 2021;0(5):794-800.

12. Schaeffer R, Mendenhall W, Ott L. Elementary Survey Sampling (4th ed). California: Duxbury Press; 1990.

13. Chaves T, Oliveira A, Grossi D. Principais instrumentos para avaliação da disfunção temporomandibular, parte I: índices e questionários; uma contribuição para a prática clínica e de pesquisa. Fisioter Pesq. 2008;15(1):92-100.

14. Nomura K, Vitti M, Oliveira AS, Chaves TC, Semprini M, Siéssere S, Hallak JE, Regalo SC. Use of the Fonseca's questionnaire to assess the prevalence and severity of temporomandibular disorders in Brazilian dental undergraduates. Braz Dent J. 2007;18(2):163-7.

15. Del Rio João KA, Becker NB, de Neves Jesus S, Isabel Santos Martins R. Validation of the Portuguese version of the Pittsburgh Sleep Quality Index (PSQI-PT). Psychiatry Res. 2017;247:225-9.

16. Smyth C. The Pittsburgh Sleep Quality Index (PSQI). Medsurg Nurs. 2003;12(4):261-2.

17. Buysse D, Reynolds C, Monk T, Hoch C, Berman S, Kupfer D. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res 1989;28(2):193-213.

18. Drabovicz P, Salles V, Drabovicz P, Fontes M. Assessment of sleep quality in adolescents with temporomandibular disorders. J Pediatr. 2012;88(2):169-72.

19. Araújo E, Silveira M, Júnior A, Silva S, Heimer M. Associação entre qualidade do sono e Dor facial em adolescentes: um estudo preliminar. Braz J Develop. 2021;7(6):55880-94.

20. Roithmann C, Silva C, Pattussi M, Grossi M. Subjective sleep quality and temporomandibular disorders: Systematic literature review and meta-analysis. J Oral Rehabil. 2021;48(12):1380-94.

21. Lee Y, Auh Q, An J, Kim T. Poorer sleep quality in patients with chronic temporomandibular disorders compared to healthy controls. BMC Musculoskelet Disord. 2022;23(1):246.

22. Ribeiro-Dasilva MC, Goodin BR, Fillingim RB. Differences in suprathreshold heat pain responses and self-reported sleep quality between patients with temporomandibular joint disorder and healthy controls. Eur J Pain. 2012;16(7):983-93.

23. Natu V, Yap A, Su M, Ali N, Ansari A. Temporomandibular disorder symptoms and their association with quality of life, emotional states and sleep quality in South-East Asian youths. J Oral Rehabil. 2018;45(10):756-63.

24. Chaves P, Oliveira F, Damázio L. Incidence of postural changes and temporomandibular disorders in students. Acta Ortop Bras. 2017;25(4):162-4.

25. Paulino M, Moreira V, Lemos G, Silva P, Bonan P, Batista A. Prevalence of signs and symptoms of temporomandibular disorders in college preparatory students: associations with emotional factors, parafunctional habits, and impact on quality of life. Cien Saude Colet. 2018;23(1): 173-86.

26. Minghelli B, Morgado M, Caro T. Association of temporomandibular disorder symptoms with anxiety and depression in Portuguese college students. J Oral Sci. 2014;56(2):127-33

27. Jain S, Chourse S, Jain D. Prevalence and severity of temporomandibular disorders among the orthodontic patients using Fonseca's Questionnaire. Contemp Clin Dent. 2018;9(1):31-4.

28. Alahmary A. Association of Temporomandibular disorder symptoms with anxiety and depression in saudi dental students. Open Access Maced J Med Sci. 2019;7(23):4116-9.

29. Hangouche A, Jniene A, Aboudrar S, Errguig L, Rkain H, Cherti M, et al. Relationship between poor quality sleep, excessive daytime sleepiness and low academic performance in medical students. Adv Med Educ Pract. 2018;9:631-8.

30. Maheshwari G, Shaukat F. Impact of Poor Sleep Quality on the Academic Performance of Medical Students. Cureus 2019;11(4): e4357.

31. Minghelli B. Sleep disorders in higher education students: Modifiable and non-modifiable risk factors. North Clin Istanb. 2022;9(3):215-22.

32. Amaral K, Galdino M, Martins J. Qualidade do sono e trabalho entre estudantes de técnico em enfermagem. Rev Bras Enferm. 2021;74(6):e20201285.

33. Shen X, Wu Y, Zhang D. Nighttime sleep duration, 24-hour sleep duration and risk of all-cause mortality among adults: a meta-analysis of prospective cohort studies. Sci Rep 2016;22(6): 21480.