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Worse sleep quality is associated with temporomandibular disorders and parafunctional habits among dental students and professionals

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Abstract This study aimed to assess the association between sleep quality and the presence of temporomandibular disorders (TMD) and parafunctional habits in dental students and professionals during the COVID-19 quarantine. Brazilian dentists, professors, and dental undergraduate and graduate students answered a virtual questionnaire composed of the following instruments: Pittsburgh Sleep Quality Index, Oral Behaviors Checklist, Fonseca Anamnestic Index, and socioeconomic and demographic questions. Questionnaires were available on-line from August to November 2020. The association between the predictor variables and each outcome were assessed using Poisson regression. The sample consisted of 449 participants, 259 (59.5%) of whom had sleep disorders, 352 (78.4%) had TMD, and 311 (69.3%) had parafunctional oral habits. Sleep disorders were associated with higher prevalence of parafunctional oral habits (PR 1.61; 95%CI 1.36-1.91) and TMD (PR 1.16; 95%CI 1.04-1.29). Furthermore, women showed a higher prevalence of TMD in comparison to men, as well as individuals with lower income. Sleep disorders were associated with parafunctional oral habits and TMD in dental students and professionals during COVID-19 quarantine.
Descriptors: Facial Pain. Bruxism. Sleep Quality. COVID-19.

La peor calidad del sueño se asocia con disfunción temporomandibular y hábitos parafuncionales en estudiantes y profesionales de Odontología
Resumen Este estudio tuvo como objetivo evaluar la asociación entre la calidad del sueño y la presencia de disfunción temporomandibular (DTM) y hábitos parafuncionales en estudiantes y profesionales de Odontología durante la pandemia de COVID-19. Odontólogos, profesores y estudiantes brasileños de pregrado y posgrado en Odontología respondieron un cuestionario virtual compuesto por los siguientes instrumentos: Índice de Calidad de Sueño de Pittsburgh, Lista de Verificación de Comportamiento Oral, Índice Anamnésico de Fonseca y preguntas socioeconómicas y demográficas. Los cuestionarios estuvieron disponibles virtualmente de agosto a noviembre de 2020. La asociación entre las variables predictoras y cada resultado se evaluó mediante regresión de Poisson. La muestra estuvo compuesta por 449 participantes, de los cuales 259 (59,5%) refirieron trastornos del sueño, 352 (78,4%) DTM y 311 (69,3%) hábitos orales parafuncionales. Los trastornos del sueño se asociaron con una mayor prevalencia de hábitos bucales parafuncionales (RP 1,61; IC 95% 1,36-1,91) y DTM (RP 1,16; IC 95% 1,04-1,29). Además, las mujeres tenían una mayor prevalencia de DTM que los hombres, así como las personas con ingresos más bajos. Así, los trastornos del sueño se asociaron con hábitos orales parafuncionales y DTM en estudiantes y profesionales de odontología durante la cuarentena por COVID-19.
Descriptores: Dolor Facial. Bruxismo. Calidad del Sueño. COVID-19.

Pior qualidade de sono está associada à disfunção temporomandibular e hábitos parafuncionais entre estudantes e profissionais de Odontologia
Resumo Este estudo teve como objetivo avaliar a associação entre a qualidade do sono e a presença de disfunção temporomandibular (DTM) e hábitos parafuncionais em estudantes e profissionais de Odontologia durante a pandemia de COVID-19. Cirurgiões-dentistas, docentes e estudantes brasileiros de graduação e pós-graduação em Odontologia responderam a um questionário virtual composto pelos seguintes instrumentos: Índice de Qualidade do Sono de Pittsburgh, Lista de Verificação de Comportamentos Orais, Índice Anamnésico de Fonseca e questões socioeconômicas

e demográficas. Os questionários foram disponibilizados online de agosto a novembro de 2020. A associação entre as variáveis preditoras e cada desfecho foi avaliada por meio da regressão de Poisson. A amostra foi composta por 449 participantes, sendo que 259 (59,5%) relataram distúrbios do sono, 352 (78,4%) apresentavam DTM e 311 (69,3%) realizavam hábitos orais parafuncionais. Os distúrbios do sono foram associados à maior prevalência de hábitos orais parafuncionais (RP 1,61; IC 95% 1,36-1,91) e DTM (RP 1,16; IC 95% 1,04-1,29). Além disso, as mulheres apresentaram maior prevalência de DTM em relação aos homens, assim como indivíduos cuja renda era menor. Desta forma, os distúrbios do sono foram associados a hábitos orais parafuncionais e DTM em estudantes e profissionais de Odontologia durante a quarentena da COVID-19.
Descritores: Dor Facial. Bruxismo. Qualidade do Sono. COVID-19.

INTRODUCTION

The quarantine during the COVID-19 pandemic was a period of fear and uncertainty, which led to an increase in symptoms of stress, anxiety, and depression[1]. Such psychosocial disorders may trigger temporomandibular disorders (TMDs), parafunctional oral habits[2], and changes in sleep quality[3]. TMDs represent multifactorial conditions that affect masticatory muscles, temporomandibular joints (TMJs), and associated structures[4]. Often, psychosocial disorders are associated with the onset, precipitation, or prolongation of TMD pain[2]. As for parafunctional oral habits, sleep bruxism (SB) and awake bruxism (AB) are two of the main side effects of the COVID-19 pandemic[1,5].

The pandemic has also negatively affected sleep quality, which has worsened around 55% in the Brazilian scenario[6]. The increase in depression and anxiety disorders during this period may have influenced the onset of insomnia[7], which may impair the physiological restorative functions that support the homeostasis system, contributing to the development and persistence of chronic pain[8]. Also, poor sleep quality seems to be involved in the etiology of SB[9].

Dentists are heavily exposed to aerosols during dental procedures and are quite susceptible to SARS-CoV-2 contamination[10], resulting in a higher fear of being infected. Furthermore, due to the orientation of social distancing and the suspension of in-person activities at Brazilian universities in 2020, the routine of dental students and professors significantly changed[11]: the distance learning during the pandemic scenario had a negative impact on mental health[12], also affecting sleep quality[13]. Poor sleep quality, in turn, favors the development of TMD[8,14] and SB[9,15].

The impact of sleep disorders on outcomes associated with parafunctional oral habits and TMD are topics that need further scientific investigation. Thus, this study aimed to verify the association between sleep quality and the presence of TMD and parafunctional oral habits among dental professionals and students during the COVID-19 quarantine. The conceptual hypothesis was that there would be an association between these variables.

METHODS

This cross-sectional study was carried out through a virtual questionnaire applied to Brazilian dentists, dental professors, and undergraduate and graduate dental students. Data collection was carried out from August to November, 2020, when the questionnaire was available on Google Forms platform. The questionnaire was widely shared through social networks, email, and WhatsApp messaging application. All dentists (clinicians and professors) as well as undergraduate and graduate dental students were considered eligible.

The sample size was calculated considering a sampling error of 5% and a prevalence of sleep disorders of 43.3% in individuals with TMD, and 28.3% in individuals without TMD[16]. Considering the ratio of unexposed to exposed of 1:1, power of 80%, and adding 20% for possible losses, the minimum sample size required was 418 individuals.

Sleep quality was assessed using the Brazilian version of Pittsburgh Sleep Quality Index (PSQI)[17]. It is a self-applicable questionnaire whose 18 questions are distributed into 7 components: 1) subjective sleep quality; 2) sleep latency; 3)

sleep duration; 4) habitual sleep efficiency; 5) sleep disturbances; 6) use of sleeping medication; and 7) questions about daytime dysfunction. For the analysis, the scores were summed and the individuals were classified according to the absence (score ≤ 5) or presence (score ≥ 6) of sleep disorders.

TMD was assessed using the Brazilian version of Fonseca Anamnestic Index (FAI)[18], an index that assesses the severity of TMD based on its signs and symptoms. It consists of 10 specific questions: 1) "Do you have difficulty opening your mouth wide?"; 2) "Do you have difficulty moving your jaw to the sides?"; 3) "Do you feel fatigue or muscle pain when you chew?"; 4) "Do you have frequent headaches?"; 5) "Do you have neck pain or a stiff neck?"; 6) "Do you have ear aches or pain in that area (temporomandibular joint)?"; 7) "Have you ever noticed any noise in your temporomandibular joint while chewing or opening your mouth?"; 8) "Do you have any habits such as clenching or grinding your teeth?"; 9) "Do you feel that your teeth do not come together well?"; 10) "Do you consider yourself a tense (nervous) person?". Each question has 3 possible answers: "Yes" (10 points), "Sometimes" (5 points), and "No" (0 points), providing a final sum that ranges from 0 to 100 points. For the analysis, the variable was dichotomized into absence of TMD (score < 15) or presence of TMD (score > 15), as recommended in the literature[18].

Parafunctional habits were assessed using the Brazilian version of Oral Behaviors Checklist (OBC) [19], composed of 30 questions about the frequency of certain parafunctional oral habits during sleep and during waking hours. Responses are collected on a Likert scale from 0 to 4 according to frequency: never (0), less than 1 day a month (1), 1 to 3 days a month (2), 1 to 3 days a week (3), and 4 to 7 days a week (4), providing a final sum that ranges from 0 to 120 points. Individuals were classified as having parafunctional habits if the score was > 16 points, as recommended in the literature[19].

The degree of social distancing during the COVID-19 pandemic was assessed using a question from the "Epi-Covid Brasil" national survey: "Regarding the social distance being recommended by health authorities, that is, staying at home and avoiding contact with other people, how much do you think you are making?". Possible answers: practically isolated (0); enough (1); more or less (2); little (3); very little (4)[20]. For the analysis, the variable degree of social distancing was dichotomized into: very isolated (0 and 1), more or less (2), or little isolated (3 and 4).

The demographic and socioeconomic variables collected were gender (female and male), age, skin color (white and non-white), income, and family crowding (one or more people per room in the house). Age was collected in years and later categorized into tertiles: "19 to 21 years", "22 to 28 years" and "29 to 60 years". Family monthly income was collected in Reais (Brazilian currency; 1.00 US dollars corresponds to 5.24 Reais) and later dichotomized according to the Brazilian minimum wage (BMW) into >1 BMW (US$ 231,30) or <1 BMW (US$ 231,30) per month.

Data were analyzed using the STATA 14.0 program (StataCorp. 2014. Stata Statistical Software: Release 14.0. College Station, TX: StataCorp LP). A descriptive analysis of the demographic, behavioral, and clinical characteristics of the sample was performed. Two outcomes were considered: presence of parafunctional habits (0 = no; 1 = yes) and presence of TMD (0 = no; 1 = yes). The association between the predictor variables and each outcome was assessed through unadjusted and adjusted Poisson regression analysis with robust variance. The predictor variables that presented a value of $p < 0.20$ in the unadjusted analysis were included in the adjusted model, for both outcomes. A significance level of 0.05 was considered in the adjusted model. Results are presented as prevalence ratio (PR) with a 95% confidence interval (95% CI).

The study protocol was approved by the Research Ethics Committee of the Federal University of Santa Maria, under opinion number 4203759 (CAAE: 34721820.0.0000.5346). All participants signed an informed consent form.

RESULTS

The sample consisted of 449 individuals. Table 1 presents the demographic, socioeconomic, behavioral, and clinical characteristics of the participants. Most individuals (59.9%) fulfilled a high level of isolation during the evaluated period (August to November 2020). Furthermore, a high prevalence of sleep disorders (59.5%), parafunctional habits (69.3%), and TMD (78.4%) was observed.

Table 1. Sample distribution according to demographic. socioeconomic. behavioral. and clinical characteristics (n=449).

Variables	n	%
Demographic and socioeconomic data		
Sex		
Female	332	73.9
Male	117	26.1
Age (in years)		
19-21	154	36.7
22-28	141	33.6
29-60	125	29.7
Skin color		
White	366	81.5
Non-white	83	18.5
Monthly income		
≥1 Brazilian minimum wage	408	96.2
<1 Brazilian minimum wage	16	3.8
Family crowding		
<1 person per room	429	95.5
≥1 person per room	20	4.5
Occupation		
Undergraduate student	303	67.9
Graduate student	72	16.1
Professor	25	5.6
Clinician	46	10.3
Behavioral and clinical characteristics		
Social distancing in the pandemic		
Very/quite isolated	97	59.9
More or less	184	27.4
Little isolated	57	12.7
Sleep disorder		
Absent	176	40.5
Present	259	59.5
Outcomes		
Parafunctional habits		
Absent	138	30.7
Present	311	69.3
Temporomandibular disorder		
Absent	97	21.6
Present	352	78.4

Valores inferiores a 449 são devidos a dados ausentes.

Table 2 shows the unadjusted and adjusted analysis between the predictor variables and parafunctional habits. In the unadjusted analysis, family crowding, occupation, and the presence of sleep disorders were significantly associated with the occurrence of parafunctional habits ($p<0.05$). In the adjusted analysis, individuals who had sleep disorders during the quarantine had a 61% higher prevalence of parafunctional habits (PR 1.61; 95%CI 1.36-1.91). The other variables were not associated with the outcome.

Table 2. Unadjusted and adjusted association between predictor variables in the presence of parafunctional habits, using Poisson regression with robust variance (n=449).

Variables	Unadjusted PR* (CI 95%)	p-value	Adjusted PR* (CI 95%)	p-value
Demographic and socioeconomic data				
Sex				
Female	1.00		-	
Male	0.93 (0.80-1.08)	0.664		
Age (in years)				
19-21	1.00		1.00	
22-28	1.14 (0.99-1.31)	0.061	1.13 (0.98-1.30)	0.070
29-60	0.87 (0.73-1.05)	0.157	1.09 (0.86-1.39)	0.432
Skin color				
White	1.00		1.00	
Non-white	1.12 (0.97-1.28)	0.113	0.94 (0.81-1.10)	0.501
Monthly income				
≥1 Brazilian minimum wage	1.00		-	
<1 Brazilian minimum wage	0.98 (0.70-1.37)	0.926		
Family crowding				
<1 person per room	1.00		1.00	
≥1 person per room	1.24 (1.02-1.50)	<0.05	1.12 (0.91-1.38)	0.273
Occupation				
Undergraduate student	1.00		1.00	
Graduate student	0.71 (0.56-0.90)	<0.01	0.74 (0.53-1.03)	0.079
Professor	1.11 (0.90-1.36)	0.319	1.12 (0.85-1.49)	0.397
Clinician	0.99 (0.82-1.21)	0.997	0.91 (0.70-1.19)	0.529
Behavioral and clinical characteristics				
Social distancing in the pandemic				
Very/quite isolated	1.00			
More or less	1.05 (0.91-1.21)	0.488	-	
Little isolated	1.12 (0.94-1.32)	0.188		
Sleep disorder				
Absent	1.00		1.00	
Present	1.65 (1.41-1.93)	<0.01	1.61 (1.36-1.91)	<0.01

PR, prevalence ratio; CI, confidence interval. *Reference category: absence of parafunctional habit.

The association between predictors and TMD prevalence is shown in Table 3. Sex, age, income, occupation, and sleep disorders were significantly associated with TMD prevalence (p<0.05). After adjustment, the presence of sleep disorders (PR 1.16; 95%CI 1.04-1.29), and individuals with a monthly family income of less than 1 BMW (PR 1.15; 95%CI 1.01-1.31) were associated with a higher prevalence of TMD during the COVID-19 quarantine. Considering gender, TMD was 17% less prevalent in men (PR 0.83; 95% CI 0.72-0.95) than in women.

Table 3. Unadjusted and adjusted association between predictor variables in TMD prevalence, determined using Poisson regression with robust variance (n=449).

Variables	Unadjusted PR* (CI 95%)	p-value	Adjusted PR* (CI 95%)	p-value
Demographic and socioeconomic data				
Sex				
Female	1.00		1.00	
Male	0.80 (0.70-0.92)	<0.05	0.83 (0.72-0.95)	<0.05
Age (in years)				
19-21	1.00		1.00	
22-28	1.03 (0.92-1.14)	0.570	1.05 (0.95-1.17)	0.315
29-60	0.85 (0.74-0.98)	<0.05	0.92 (0.74-1.14)	0.467
Skin color				
White	1.00		-	
Non-white	0.97 (0.86-1.11)	0.758		
Monthly income				
≥1 Brazilian minimum wage	1.00		1.00	
<1 Brazilian minimum wage	1.19 (1.03-1.36)	<0.05	1.15 (1.01-1.31)	<0.05
Family crowding				
<1 person per room	1.00		-	
≥1 person per room	1.08 (0.89-1.31)	0.384		
Occupation				
Undergraduate student	1.00		1.00	
Graduate student	0.81 (0.68-0.98)	<0.05	0.89 (0.67-1.17)	0.417
Professor	1.07 (0.92-1.25)	0.332	1.11 (0.89-1.38)	0.327
Clinician	0.85 (0.69-1.04)	0.118	0.95 (0.75-1.22)	0.739
Behavioral and clinical characteristics				
Social distancing in the pandemic				
Very/quite isolated	1.00			
More or less	1.02 (0.91-1.15)	0.611	-	
Little isolated	1.12 (0.99-1.27)	0.068		
Sleep disorder				
Absent	1.00		1.00	
Present	1.21 (1.08-1.35)	<0.01	1.16 (1.04-1.29)	<0.01

RP, razão de prevalência; IC, intervalo de confiança. *Categoria de referência: ausência de DTM.

DISCUSSION

This study assessed the association of sleep quality with TMD and parafunctional oral habits. The conceptual hypothesis was accepted, confirming that sleep disorders are associated with a higher prevalence of parafunctional oral habits and TMD in dentists, dental students and professors during the COVID-19 quarantine. Furthermore, individuals with lower monthly income were more likely to have TMD. To our knowledge, this is the first study to investigate the association between these factors in this population.

Most of the participants in this study reported sleep disorders (259, 59.5%), corroborating previous studies that found high prevalence of this condition in their respective samples, ranging from 45% to 57.2%[21-23]. Before the onset of the pandemic, these values ranged between 41%[14] and 43.3%[16]. During the quarantine, the concern about the COVID-19 virus and poor sleep quality was significantly prevalent and may have negatively affected the quality of life of Brazilian dentists[24].

Those individuals who presented sleep disorders had a 61% higher prevalence of parafunctional oral habits. It is known that poor sleep quality is associated with a higher prevalence of parafunctional habits[15], with individuals diagnosed with SB presenting higher PSQI scores when compared to controls[25]. Low-quality non-restorative sleep facilitates SB due to its superficiality, as SB episodes mostly occur during micro-arousals[26]. This finding may be associated to excessive exposure to cell phone and computer screens[27], a habit that has increased during the pandemic due to social distancing and remote activities. Likewise, healthcare professionals who reported longer screen use were associated with a greater tendency for sleep disorders and anxiety[28].

Individuals who had sleep disorders also had a higher prevalence of TMD, corroborating other studies assessing this association during the pandemic[29,30]. Individuals diagnosed with TMD have significantly higher PSQI scores when compared to individuals without TMD[30], showing its impact on sleep quality. A recent meta-analysis found that patients with chronic pain also have a higher prevalence of sleep disorders[31], with non-restorative sleep being an important predictor of musculoskeletal pain[32].

Socioeconomic features also played a role in these associations. Those who had a monthly income of less than 1 BMW showed a higher prevalence of TMD during the quarantine. Low-income families had more difficulty facing the pandemic period[33]. The need for social distancing, as well as the closure of non-essential businesses, led to layoffs and bankruptcy of establishments. In Brazil, there was a greater reduction in family income among the poorest, as well as many informal workers lost their jobs, causing concerns and reflecting on physical health[34]. Furthermore, due to changes in the Brazilian labor legislation, the proportion of informal and self-employed workers - those most affected by the pandemic - has increased considerably. Therefore, it is possible to state that the pandemic worsened social inequalities, which may be associated to TMD.

The strengths of this study include its large sample size and the use of validated instruments to measure the assessed factors during the quarantine period of the COVID-19 pandemic. As limitations, we can point out the use of the FAI questionnaire, which has high sensitivity but little specificity[35], which may overestimate the prevalence of TMD. In addition, the OBC questionnaire was used to collect the parafunctional habits variable. However, only its total score was considered in the statistical analysis, which did not allow isolated associations between each parafunctional oral habit and psychosocial disorder. Finally, future studies are suggested to assess causality. The results of this study should be used as a starting point for further studies aimed to develop psychological interventions to minimize the consequences of the COVID-19 pandemic.

CONCLUSION

The presence of sleep disorders was associated with parafunctional oral habits and TMD among dental students and professionals during the COVID-19 quarantine. Moreover, women and individuals with lower monthly income were more likely to have TMD.

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