



Prevalence of self-reported symptoms of temporomandibular disorders and associated factors in the period of distance learning

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Abstract

Objective Assess the prevalence of self-reported TMD symptoms and anxiety and check the quality of sleep and life during the distance learning period in university students at the University of Brasilia (UnB).

Materials and methods The participants were students from the Health Sciences College and Medicine College at UnB. Self-administered questionnaires were used to evaluate symptoms of TMD, quality of life, and sleep quality. One-way analysis of variance, followed by Bonferroni test, and Kruskal–Wallis test, followed by Dunn’s test, were performed ($P < 0.05$). For qualitative data analysis, the chi-square test was applied ($P < 0.05$).

Results Total 156 students were included; prevalence of TMD, anxiety, sleep disturbance, and poor sleep quality was 73.1%, 84%, 12.8%, and 62.8%, respectively. A greater prevalence of painful TMD was observed in students with severe anxiety ($P = 0.007$). Students with symptoms of painful TMD, severe anxiety, and sleep disorders had statistically worse quality of life.

Conclusions The implementation of distance learning in health courses to replace classroom teaching during the COVID-19 pandemic has impacted TMD prevalence, anxiety, quality of life, and sleep quality.

Clinical relevance Psychological factors are directly associated with TMD symptoms and quality of life, TMD conditions are related to quality of life as well. COVID-19 pandemic and the distance learning in health courses are new situations that can lead to a great impact on mental health and in consequence to TMD conditions and quality of life.

Keywords Temporomandibular disorders · Anxiety · Anxiety disorders · Myalgia · COVID-19

Introduction

An “unknown viral pneumonia” in Wuhan was first notified by the World Health Organization (WHO) in December 2019 [1]. On January 9, 2020, Chinese authorities determined that the surge of pneumonia, later named coronavirus disease 2019 (COVID-19), was caused by a new coronavirus, named severe acute respiratory syndrome coronavirus

2. With the number of cases surging worldwide, the WHO characterized the spread of COVID-19 as a pandemic [2].

In Brazil, the first confirmed case was reported on February 26, 2020, in São Paulo state [3]. Brasília, in the Federal District, reported its first confirmed case on March 5, 2020; the government decreed the stoppage of class and commercial activities from March 12, 2020 [4]. On March 13, 2020, the University of Brasilia (UnB) decided to stop classes and the academic calendar was suspended from March 23. Hence, dental students of UnB started their academic activities in 2020, and the academic calendar was suspended until August 17, 2020. The return to academic activities was brought about using the distance learning modality.

Distance learning is an education modality in which students and teachers are separated, physically or temporally, requiring the use of information technology and means of communication. It requires basic knowledge of technology

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and a device with internet access, such as a computer/laptop, tablet, or cell phone [5]. Due to these requirements, the lack of technology, resources, and internet access can hinder access to classes. In addition, internet quality and students' adaptation to the new teaching modality can affect student health.

Health courses at the UnB are predominantly composed of classroom lessons with theory classes, laboratory sessions, and clinical practice, and distance-learning poses a challenge of limited contact. Given the new reality and the uncertain context, we should investigate possible psychological changes, such as stress, anxiety, decreased sleep quality, and symptoms of temporomandibular disorders (TMDs) among students.

Psychological symptoms can contribute to TMD, interacting with pain modulation networks and decreasing the threshold or altering pain perception in patients with anxiety or depression, although the exact mechanism is unclear [6]. Stress is related to TMD and daytime bruxism [7]. The fear generated by the uncertain pandemic scenario culminates in anxiety disorders that can directly affect sleep quality [8]. Fear can be a TMD predictor, knowing that people who already have dysfunction have their quality of sleep gradually worsened with time [9]. Additionally, TMD is directly associated with a decrease in quality of life [10], making the subject essential.

Therefore, this study aimed to assess the prevalence of TMD self-reported symptoms and anxiety, quality of life, and sleep quality during the implementation of distance learning in the presential courses of the Health Sciences College and Medical College at the UnB.

Materials and methods

This cross-sectional study was performed on students from the Health Sciences College (FS/UnB) and Medicine College (FM/UnB) at the UnB, including courses in dentistry, pharmacy, nutrition, nursing, medicine, and public health. The research was submitted and approved by the Research Ethics Committee of Faculty of Health Sciences under register number 38400920.3.0000.0030.

The minimum sample size of 152 participants was determined based on the students from the assessed course population size (2378 students) using software (Sampsize version 0.6.0), with a precision of 5%, using an estimated prevalence of 12% [11] for TMD, and 95% confidence interval ($P=0.05$).

All students, irrespective of sex, were invited to participate, and they confirmed their participation in the research after reading the informed consent form. Data were collected through an auto-fill online questionnaire administered between October 29, 2020, and December 18, 2020. The

link was sent equally to all students regardless of the course via email to students enrolled in general classes and publicized on social media. Because this is volunteer research, there was no interference from researchers in the choice of participants.

Students undergoing treatment for anxiety were excluded so that any previous history of anxiety did not influence the results.

Assessment of the presence of self-reported TMD symptoms

The questionnaire used to assess self-reported TMD symptoms was the Diagnostic Criteria for Temporomandibular Disorders: Clinical Protocol and Assessment Instruments (DC/TMD) questionnaire [12], containing objective questions about TMD symptoms, which was translated and validated into Brazilian Portuguese [12] and self-administered.

The answered questionnaire was analyzed by a specialist, and the participants were categorized into three groups according to the last 30 days' symptoms: "without TMD," "nonpainful TMD," or "painful TMD." The participants were classified with painful TMD, based on the responses to questions 3 and 5 of the questionnaire related to pain presence and headache, or with nonpainful TMD, based on the responses to questions 8, 9 and 13, related to articular sounds, closed locking, and/or open locking [13].

Anxiety symptoms assessment

The questionnaire used to assess anxiety symptoms was the Generalized Anxiety Disorder questionnaire (GAD 7) of DC/TMD [12], with objective questions about anxiety symptoms, which was translated and validated in Brazilian Portuguese [14] and self-administered. The responses were scored, and their sum was calculated, with scores of 5, 10, and 15 representing cut-off points for mild, moderate, and severe anxiety symptoms, respectively.

Quality of life assessment

The World Health Organization Quality of Life (WHOQoL-bref) questionnaire [15] was used for assessment of quality of life, translated and validated in Brazilian Portuguese [16]. The WHOQoL-bref questionnaire has 26 questions, and responses are scored from 1 to 5 points on a Likert scale, from "very poor" to "very good," "very dissatisfied" to "very satisfied," "not at all" to "an extreme amount," "never" to "always," "not at all" to "extremely," or "not at all" to "completely." The first two general questions correspond, respectively, to quality of life perception and satisfaction with health, and the 24 remaining questions are divided into the following domains: domain I (physical), domain II

(psychological), domain III (social relations), and domain IV (environment). The quality of life score for each domain is calculated as the mean score readjusted on a scale of 100 points, as recommended by WHOQoL group syntax [17].

Quality of sleep assessment

The Pittsburgh Sleep Quality Index (PSQI) questionnaire [18] was used to assess the quality of sleep and sleep disturbances in the last month. The instrument is composed of 19 auto-fill questions and 5 questions directed to the spouse or bedroom partner. The last five questions were not used to calculate the final score; therefore, they were excluded from the questionnaire. The 19 auto-fill questions were categorized into seven components (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction) graded on a scale of 0 (no difficulty) to 3 (severe difficulty). The average scores of all components were summed and participants were classified as having good sleep quality (0–4), bad sleep quality (5–10), and sleep disturbance (> 10).

Students undergoing treatment for anxiety or who had already been treated for anxiety were excluded. This condition was asked at the beginning of the questionnaire. There was no other exclusion criteria.

Statistical analyses

Statistical analyses were conducted using the Statistical Package for the Social Sciences 26, IBM SPSS software (IBM SPSS Statistics 26; IBM Corp.). The normal distribution of data was verified using the Shapiro–Wilk test. For domains I and IV of the WHOQoL-bref, the distribution was normal and homogeneous. A one-way analysis of variance test was performed, followed by the Bonferroni test to

verify the difference between groups. Domains II and III were not normally distributed; the Kruskal–Wallis test, followed by Dunn’s test, was performed to determine which group caused the difference. The chi-square test was used to compare the qualitative data. A *P*-value of less than 0.05 was considered statistically significant.

Results

A total of 224 responses were obtained. After the exclusion of 68 responses (9 students were not in the distance learning process, 49 students fit the exclusion criteria, and 10 students answered the questionnaire twice), 156 responses were included in the study. Thus, there were no data losses or incomplete questionnaires. The mean age was 22.5 ± 3.95 years, and 41 participants were males and 115 females.

Regarding TMD self-reported symptoms, 26.9% of participants had no symptoms, 19.9% had nonpainful symptoms, and 53.2% had painful symptoms. Additionally, regarding anxiety symptoms, 16% of participants had no symptoms, 37.8% had mild symptoms, 26.3% had moderate symptoms, and 19.9% had severe symptoms. Finally, when considering sleep quality, 24.4% of participants had good sleep quality, 62.8% had poor sleep quality, and 12.8% had some sleep disorders.

The qualitative data analysis (Table 1) demonstrated an association between anxiety symptoms and self-reported TMD symptoms [$\chi^2(6) = 17.549$; $P = 0.007$]. The results showed an increase in the percentage of students experiencing painful TMD symptoms when there was an increase in the degree of anxiety symptoms. Painful TMD symptoms in students were correlated significantly with symptoms of

Table 1 Frequency (percentage) of study participants regarding the association between TMD symptoms and different analyzed variables (Chi-square, $P < 0.05$)

Variables		TMD symptoms			<i>P</i> value
		No TMD	Nonpainful TMD	Painful TMD	
Gender	Male	15 (36.5%)	9 (22%)	17 (41.5%)	0.175
	Female	27 (23.5%)	22 (19.1%)	66 (57.4%)	
Anxiety symptoms	None	10 (40%)	6 (24%)	9 (36%)	0.007*
	Mild	16 (27.1%)	16 (27.1%)	27 (45.8%)	
	Moderate	12 (29.3%)	8 (19.5%)	21 (51.2%)	
	Severe	4 (12.9%)	1 (3.2%)	26 (83.9%)	
Sleep quality	Good	15 (39.5%)	10 (26.3%)	13 (34.2%)	0.081
	Bad	22 (22.4%)	19 (19.4%)	57 (58.2%)	
	Sleep disturbance	5 (25%)	2 (10%)	13 (65%)	
Course period	Beginning	7 (28%)	3 (12%)	15 (60%)	0.411
	Middle	22 (26.8%)	14 (17.1%)	46 (56.1%)	
	Final	13 (26.5%)	14 (28.6%)	22 (44.9%)	

* $P < 0.05$

severe anxiety symptoms ($P < 0.001$) (Table 1). Additional data are given in Online Resource, Tables 1 and 2.

The association between self-reported TMD symptoms and quality of life (Table 2) was investigated, revealing an inverse relationship between self-reported TMD symptoms and WHOQoL-bref domain I score [F (2.153) = 4.780; $P = 0.001$]. That is, students with painful self-reported TMD symptoms had lower values for domain I scores compared to the no TMD group ($P = 0.016$). The results showed a statistically significant difference in self-reported TMD symptoms over domain II [X2 (2) = 8.782; $P = 0.012$]. After pairwise comparison, the results showed a statistically significant difference between the painful TMD group and the no TMD group in terms of domain II scores ($P = 0.032$), with students who presented with self-reported symptoms of painful TMD having lower values of quality of life compared to the no TMD group. No

association was found between self-reported TMD symptoms and domains III [X2 (2) = 4.784; $P = 0.091$] and IV [F (2.153) = 0.916; $P = 0.402$]. Additional data are given in the Online Resource, Table 3.

The association between symptoms of anxiety and quality of life (Table 3) was investigated, and anxiety symptoms were found to be correlated with domain I [F (3.152) = 22.908; $P < 0.001$], domain II [X2 (3) = 53.728; $P < 0.001$], domain III [X2 (3) = 26.099; $P < 0.001$], and domain IV [F (3.152) = 11.426; $P < 0.001$] scores. The results showed that the scores for all domains were statistically lower in students with moderate and severe anxiety symptoms than in those with no symptoms of anxiety (Table 3). Additional data are given in Online Resource, Table 4.

The association between quality of sleep and quality of life (Table 4) was investigated, and sleep quality was

Table 2 The mean values (standard deviation) of TMD symptoms in relation to WHOQoL-bref domains score

WHOQOL-Bref	TMD symptoms		
	No TMD	Nonpainful TMD	Painful TMD
Domain I (Physical)*	67.94 (14.51) ^A	66.24 (15.86) ^{AB}	59.42 (16.54) ^B
Domain II (Psychological)**	61.40 (18.17) ^A	53.56 (17.65) ^{AB}	61.96 (12.25) ^B
Domain III (Social relations)**	60.31 (24.74) ^A	57.93 (21.10) ^A	68.01 (17.09) ^A
Domain IV (Enviromental)*	61.60 (19.24) ^A	59.90 (17.43) ^A	64.91 (15.92) ^A

Different capital letters indicate difference between groups $P < 0.05$

*One-Way ANOVA and Bonferroni's Test

**Kruskal–Wallis and Dunn's test

Table 3 The mean values (standard deviation) of anxiety symptoms in relation to WHOQoL-bref domains score

WHOQOL-Bref	Anxiety symptoms			
	None	Mild	Moderate	Severe
Domain I (Physical)*	76.71 (12.63) ^A	67.13 (14.20) ^B	60.10 (12.49) ^B	48.27 (14.69) ^C
Domain II (Psychological)**	73.16 (11.72) ^A	62.21 (12.35) ^B	53.04 (14.73) ^C	40.99 (16.94) ^D
Domain III (Social relations)**	74 (19.59) ^A	64.97 (18.55) ^B	57.52 (19.07) ^C	45.43 (22.95) ^D
Domain IV (Enviromental)*	73.25 (12.30) ^A	64.88 (14.69) ^{AB}	57.69 (17.07) ^{BC}	49.89 (19.65) ^C

Different capital letters indicate difference between groups $P < 0.05$

*One-Way ANOVA and Bonferroni's Test

**Kruskal–Wallis and Dunn's test

Table 4 The mean values (standard deviation) of sleep quality in relation to WHOQoL-bref domains score

WHOQOL-Bref	Sleep quality		
	Good	Bad	Sleep disturbance
Domain I (Physical)*	76.69 (12.25) ^A	61.80 (13.55) ^B	43.39 (11.94) ^C
Domain II (Psychological)**	71.05 (9.87) ^A	55.35 (16.04) ^B	41.04 (15.78) ^C
Domain III (Social relations)**	70.61 (18.25) ^A	58.58 (21.48) ^B	51.25 (22.50) ^B
Domain IV (Enviromental)*	69.81 (12.33) ^A	60.29 (17.05) ^{AB}	50.46 (20.20) ^B

Different capital letters indicate difference between groups $P < 0.05$

*One-Way ANOVA and Bonferroni's Test

**Kruskal–Wallis and Dunn's test

found to be correlated with domain I [$F(2,153) = 43.852$; $P < 0.001$], domain II [$X^2(2) = 44.327$; $P < 0.001$], domain III [$X^2(2) = 13.061$; $P = 0.001$], and domain IV [$F(2,153) = 9.233$; $P < 0.001$] scores. For all domains, students with sleep disorders had statistically lower scores compared to students with good sleep quality (Table 4). Additional data are given in Online Resource, Table 5.

Discussion

The hypothesis was accepted because a high prevalence of the studied factors was found. After the suspension of face-to-face classes on March 13, 2020, the academic calendar of the University of Brasilia (UnB) was suspended until August 17, 2020, and the distance learning methodology was adopted subsequently. Therefore, this study was carried out 2 months after the restarting classes remotely and extended until December 2020, at the end of the semester in question.

The results demonstrated a high prevalence (84%) of anxiety symptoms among university students. A recent systematic review showed that the prevalence of anxiety in the general population was 33.7% [19]. A study carried out before the pandemic in medical students in the last year showed a prevalence of 33.8% [20].

Additionally, another study performed on dental students published during the COVID-19 pandemic found the prevalence of anxiety symptoms to be 49.6% [13]. This study was concluded when the academic activities had not yet been resumed. During the pandemic, studies carried out on university students reported a prevalence of anxiety ranging from 21.2 to 30.2% [21–24]. When university employees were included, the prevalence was 35.18% [25]. In addition to these results, a study carried out during the pandemic on general students found the prevalence of anxiety symptoms to be 33.28% [26], and high prevalence of anxiety was noted in the evaluated population.

This study was carried out after the return to academic activities through distance learning, even though courses in the health area predominantly require classes to be usually held in person. These changes in teaching had a negative impact on the students' lives. In a study by Son et al. [27], an interview was conducted with students at a university in Texas, and distance learning was indicated as a stress factor among students. Concerns about their health and the health of close people, difficulty concentrating on many sources of distraction at home, interruptions caused by family members, difficulty in maintaining concentration on the computer screen, and monotonous life affected the academic performance of these students. In addition, the author reported that some factors associated with social isolation are also associated with increasing anxiety, such as lack of sleep patterns,

concerns about academic performance after the transition to the distance teaching model, sudden changes in teaching plans, concerns about ongoing research, uncertainties regarding grades, lack of motivation generating a tendency to procrastinate, changes in dietary patterns, financial difficulties, increased college workload, and depressive and suicidal thoughts [27]. Therefore, in our study population, the prevalence of anxiety symptoms was high. This result is probably explained by uncertainties concerning academic issues, family problems, lack of a favorable study environment, and the COVID-19 pandemic situation in Brazil. All of these factors can influence the symptoms of anxiety, as well as the quality of sleep and life of university students.

Additionally, the results of the present study demonstrated that students with severe anxiety symptoms showed a greater prevalence for painful TMD self-reported symptoms. According to Bonjardim et al. [28], anxiety cannot be considered an etiological factor of TMD. However, it is associated with the intensity and the presence of TMD signs and symptoms [29].

Su et al. [30], reported a statistically significant association between pain intensity and anxiety, where high pain intensity was associated with severe anxiety. In addition, the group with greater pain-related disabilities also reported severe anxiety. Therefore, greater severity of anxiety symptoms can be associated with more severe self-reported TMD symptoms, and this assessment of psychological factors is important. The UnB provided psychosocial help to students and employees during the COVID-19 pandemic through online psychological assistance [13]. However, at the end of the study, Su et al. [30] concluded that somatization was the best predictor of pain intensity, while depression was the best predictor of pain-related disability.

Their results showed that 53.2% of the patients had painful self-reported TMD symptoms. A study by Medeiros et al. [13] was performed before the return to academic activities, and the prevalence of painful TMD symptoms was 27.4%. The population of this study was only dental students. In another study, carried out on dental medicine students before the pandemic, the prevalence of painful TMDs was reported to be 27.64% [31]. There has been an increase in the prevalence of painful self-reported TMD symptoms among university students after the implementation of distance learning. However, it is difficult to say that this increase is only due to the new teaching method, as we must consider other factors, such as the condition of the COVID-19 pandemic and its impact on all the factors evaluated.

Additionally, a high prevalence of TMD was observed, considering that 73.1% of university students had some self-reported symptoms. In a study carried out before the pandemic, the prevalence of TMD among university students in the dentistry course was 68% [32]. Another study on Turkish dentistry students during the pandemic showed a prevalence

of TMD of 77.5% [21]. Medeiros et al. [13] carried out a study using the same methodology used in the present study, during the COVID-19 pandemic, but in the period before the resumption of activity, evaluating only dental students, reported the prevalence of TMD to be 54.8%. Therefore, we noticed a greater TMD prevalence on the present study considering pre-pandemic literature, however, it is not possible to evaluate how much distance learning impacts in TMD prevalence, considering that it can be influenced by other factors.

A longitudinal study by Asquini et al. [33] was performed with patients at an Italian TMD treatment clinic between pre-pandemic periods and during the pandemic; the prevalence of acute and chronic TMD was 60 and 40%, respectively, among patients with TMD. The authors observed that patients with chronic TMD presented worse results in terms of quality of life, pain intensity, disability, and oral habits. Only the quality of sleep improved with treatment, noting that patients with chronic TMD are more susceptible to stressful events, such as the COVID-19 pandemic.

Comparing the results with other disaster situations, a study was made with patients previously diagnosed with TMD from the School of Dental Medicine of University of Zagreb that accessed the effect of stressful crisis (COVID-19 and an earthquake that occurred right after the start of lockdowns). The Numerical Pain Rating Scale (NPRS) was used to determine the intensity of pain of new self-reported TMD symptoms, varying the number from 0 (no pain) to 10 (worst pain). The earthquake affected patients had a significant increase of NPRS mean score between baseline (2.9) to after COVID-19 pandemic (3.7), and between baseline to after the earthquake (3.5). This study also identified an increase of painful self-reported TMD symptoms compared to previous study from before the pandemic, as discussed previously [34].

In this study, no association was found between sleep quality and self-reported TMD symptoms. However, it is known that pain disrupts sleep, and poor sleep quality exacerbates pain. Therefore, the sleep quality of patients with TMD may worsen over time. Stress is another factor associated with the development of TMD, which, in addition to altering the perception of pain, generates chronic muscle hyperactivity, which can damage temporomandibular joint structures and associated muscles and contribute to the development and evolution of parafunctional habits [35]. Therefore, studies should be conducted to verify the association between TMD and sleep among university students during the implementation of distance learning due to COVID-19.

Despite this, sleep quality was poor in most of the students who participated in the study. Only 24.4% had good sleep quality, while 62.8% had poor sleep quality, and 12.8% had a sleep disorder. Before the pandemic, a study carried

out with 1125 students from a private university in the USA reported the prevalence of good sleep quality to be 34.1%, poor sleep quality to be 38%, and the tendency to have some sleep disorder to be 27% [36]. Other studies on university students in the pandemic period reported an incidence of poor sleep quality of 2% [21] and 34.6% [22].

The pandemic caused sleep problems, such as irregular patterns, poor quality, higher prevalence of insomnia, longer hours of sleep, and later wake-up time [27, 37, 38]. Those irregularities can be associated with the development of depression [39–41], however, there is no consensus in the literature regarding a causal relationship. Some authors consider sleep and depression to be bi-directionally related [42]. Brooks et al. [43] stated that traumatic events, such as the COVID-19 pandemic, lead to psychological stress and anxiety symptoms that affect sleep quality. According to Son et al. [27], 86% of students reported a disturbance in their sleep pattern, of which 36% described it as severe, and 50% of the participants described that they slept later or woke up later than they did before the pandemic [27].

The quality of life score in this study was lower across all domains compared to a study carried out with 134 dental students in March 2020 [5]. Of the four domains, the most affected was the psychological, which was also observed in the previous study.

The results of this study regarding quality of life and TMD are consistent with those presented in the literature. Students with painful TMD showed a decrease in their quality of life, with a statistically significant decrease in the values for domains I and II, compared to the group without TMD, which is expected, considering the inverse relationship between the duration and intensity of pain and quality of life, in addition to the disability generated by TMD [44]. The change in domains I and II in patients with painful TMD can be explained, as domain I (physical), including pain, discomfort, energy and fatigue, sleep and rest, dependence on medication or treatment, and ability to work, is directly affected by painful conditions; and domain II (psychological) includes positive and negative feelings, learning, memory, and concentration, which are also affected by painful conditions in some way. No difference was observed in the quality of life in the physical, social relations, and environment domains when comparing patients with nonpainful TMD to patients without TMD; a difference was observed only in the psychological domain.

Associating quality of life and quality of sleep, students with better quality of sleep had a better quality of life in all domains. There was a statistically significant decrease in the quality of life values when there was sleep disturbance. Among the participants with sleep disorders, the psychological domain was the most affected. According to Roman et al. [45], sleep deprivation and sleep disorders can lead to desensitization of serotonin receptors, leading to greater

vulnerability to psychopathologies, such as depression. In addition, poor sleep quality is a risk factor for depression [46, 47]. All evidence demonstrates the reason for the poor quality of sleep and the change in the quality of life observed in the psychological domain. People who have insomnia also experience fatigue, irritability, anxiety, depression, difficulties in completing tasks, cognitive difficulties, accidents, poor performance at work, and significantly poorer quality of life [48].

In this study, the quality of life score was lower when the level of anxiety was higher. According to a systematic review and meta-analysis, anxiety disorders negatively impact several areas of life, contributing to a worse quality of life regardless of severity. In addition, the authors observed worse scores for general quality of life in anxious patients compared to the control group [49]. Anxiety disorders have a greater impact on social life [50, 51] and, when associated with social isolation, it can explain the great impact of anxiety on the domain of social relationships.

In a study involving medical students, by Gan et al. [52], the prevalence of anxiety was 33%, and the average scores for all domains were lower than those obtained in this study. These lower values are probably due to the current context of the COVID-19 pandemic and the implementation of distance learning, mainly affecting the psychological domain. In another study conducted before the pandemic, on Brazilian university students of dentistry [53], the physical domain was the worst-scoring domain, followed by the psychological domain, as 37.6% of the students reported being extremely anxious, 11.3% reported having difficulty sleeping, and 18.4% reported that they often had difficulty sleeping.

There are some limitations to this study. First, the results cannot be generalized for all university students, since each course and university have different programs. In addition, it cannot be determined how much the current situation of the pandemic influences the results; hence, it is not possible to attribute these changes to only the distance learning modality. Second, due to social distance, no clinical examination was conducted this way only subjective symptoms were considered.

Conclusion

This study found a high prevalence of self-reported TMD symptoms, particularly painful TMD and anxiety, and poor quality of sleep and quality of life, with the score of the psychological domain of the WHOQoL being the most affected.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s00784-022-04743-z>.

Declarations

Ethics approval and consent to participate The research was submitted and approved by the Research Ethics Committee of the Faculty of Health Sciences of the University of Brasilia (UnB) under register number 38400920.3.0000.0030. The participants of the study received the informed consent written and confirmed their participation in the research after reading the informed consent form.

Conflict of interest The authors declare no competing interests.

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