Original Research
Occlusion

Temporomandibular disorder and anxiety, quality of sleep, and quality of life in nursing professionals

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Abstract: To evaluate the association between temporomandibular disorder (TMD) and anxiety, quality of sleep, and quality of life in nursing professionals at the *Hospital de Clínicas de Uberlândia* of the *Universidade Federal de Uberlândia* – HCU-UFU (Medical University Hospital of the Federal University of Uberlândia), four questionnaires were given to nursing professionals. The questionnaires were completed by 160 of these professionals. The Fonseca's questionnaire was used to evaluate the presence and severity of TMD, the IDATE was used to evaluate anxiety, the SAQ was used to evaluate quality of sleep, and the SF-36 was used to evaluate quality of life. Forty-one nurses (25.6%) reported having no TMD (Fonseca's questionnaire score ≤ 15), 66 (41.3%) had mild TMD (Fonseca's questionnaire score 20–40), 39 (24.4%) had moderate TMD (Fonseca's questionnaire score 45–65), and 14 (8.8%) had severe TMD (Fonseca's questionnaire score ≥ 70). According to Fonseca's questionnaire, the presence of TMD was associated with trait anxiety, but the TMD severity was associated with state anxiety classification (mild, moderate, severe). The SAQ score differed significantly from Fonseca classification. The Fonseca's questionnaire score correlated negatively with the score of each dimension of the SF-36 (r = –0.419 to –0.183). We conclude that TMD is common among nursing professionals; its presence was associated with trait anxiety, and its severity was associated with state anxiety. Hence, the presence of TMD may reduce quality of sleep and quality of life.

Keywords: Temporomandibular Joint; Quality of Life; Sleep Disorders; Anxiety Disorder.

Introduction

Temporomandibular disorder (TMD) is a generic term for several clinical signs and symptoms that involve the masticatory muscles, the temporomandibular joint, and associated structures.[1,2] TMD has a multifactorial etiology, including parafunctional habits, occlusal disharmony, stress, anxiety, trauma and microtrauma, mandibular instability, postural imbalance, and abnormal physiological conditions.[3,4] An interdisciplinary therapeutic approach is necessary for patients with TMD.

Researchers have studied emotional factors such as depression and anxiety not only as a cause of TMD but also as triggering agents of other signs and symptoms associated with TMD.[5] Although there is no consensus on the main etiological factor of TMD, emotional factors are presumed

to play an important role. In this context, aspects related to ergonomic and organizational issues at the workplace, as well as the level of psychosocial stress, need to be studied. Skeletal muscle disorders related to professional practice may involve a set of heterogeneous disorders that can affect the physiology of muscles, tendons, synovia, joints, vessels, and nerves.[6,7]

The hospital environment is one of the most probable locations to generate psychosocial tension, given the routine of emergencies during which healthcare professionals experience anxiety and distress.[8,9,10,11] The stresses related to the hospital environment are cumulative and progressive, and the resulting health problems can be triggered by several factors, including nightshift work on weekends and holidays, the negative psychological impact of witnessing patient suffering, and the psychological characteristics of the healthcare professionals themselves.[8,12]

Questionnaires can be used to identify possible correlations between TMD and emotional factors. They can be used to detect changes in quality of life, focus on professionals' opinions, allow multidisciplinary approaches, and establish promotion actions, and this information can be used to protect and recover the health of medical personnel.

The aim of this study was to identify the presence and severity of TMD in professional nurses working in a hospital environment and to determine the association between TMD severity and anxiety, quality of sleep, and quality of life.

Methodology

Study sample

The research was conducted at the *Hospital de Clínicas de Uberlândia* of the *Universidade Federal de Uberlândia* – HCU-UFU (University Hospital of the Medicine Faculty at the Federal University of Uberlandia). The survey was conducted on 160 degreed nursing professionals. All these professionals were age ≥18 years and had a minimum experience of 6 months in the hospital. This study was approved by the University Ethics Committee (protocol # 197.746).

Questionnaires

Validated questionnaires were used to evaluate the presence and severity of TMD (Fonseca's questionnaire[4,13,14]), state and trait anxiety (IDATE),[14] quality of sleep (SAQ),[15] and quality of life (SF-36).[16,17]

Fonseca's questionnaire[4,13,14] consists of 10 items that evaluate the presence of chewing-related pain of the temporomandibular joint, neck, and head as well as movement difficulties, parafunctional habits, perception of malocclusion, and sense of emotional stress. Each item is scored on a three-point scale: yes (10 points), sometimes (5 points), or no (0 points). The total score was calculated by summing the score for all 10 items and was used to categorize participants as no TMD (0–15 points), mild TMD (20–40 points), moderate TMD (45–65 points), or severe TMD (70–100 points).[4,13,14]

The IDATE index is a self-evaluation questionnaire that consists of two parts: The trait anxiety part (T-IDATE), which evaluates personality, and state anxiety part (E-IDATE), which evaluates current behavior. Each part consists of 20 items, and each item is rated on a four-point scale ranging from 1 (not at all) to 4 (very much). The total score for each part was calculated by summing the score for all 20 items and was used to categorize participants as having mild anxiety (20–30 points), moderate anxiety (31–49 points), or severe anxiety (≥ 50 points).[14]

The SAQ consists of 17 items that evaluate experience of sleep in the past 30 days. Each item is rated on a five-point scale, where 0 represents "never or do not know", 1 represents "rarely", 2 represents "sometimes", 3 represents "often", and 4 represents "always". The total score was calculated by summing the score for all 17 items and was used to classify participants as lacking a sleep disorder (0–17 points) or having a sleep disorder (18–68 points). Individual items are also used to calculate six subscores: insomnia/hypersomnia (items 1, 2 and 3), disorder of sleep timing (items 4 and 8), sleep apnea (items 5 and 6), restlessness (items 7), non-restorative sleep (items 9, 10 and 11), and excessive daytime sleepiness (items 12 and 13). The remaining questions (14, 15, 16 and 17) are related to individual sleep habits.[15]

The SF-36 was used to assess quality of life. The SF-36 consists of 11 items, divided into 8 dimensions: 4 dimensions related to body health (functional ability, physical appearance, pain, and general health) and 4 dimensions related to mental health (vitality, social functioning, emotional, and mental health issues). The score for each dimension ranges from 0% to 100%, with higher scores indicating better quality of life.[9,16,17]

Statistical analysis

All data were tabulated and then analyzed statistically using Pearson's correlation coefficient, chi-square tests via Monte Carlo simulation, and analysis of variance (ANOVA). Pearson's correlation was used to determine the association between the Fonseca's questionnaire score and T-IDATE score, E-IDATE score, and score on each of the 8 domains of the SF-36. Chi-square tests were used to determine the association between the level of trait and state anxiety (mild, moderate, severe) and the Fonseca classification (no TMD, mild TMD, moderate TMD, severe TMD). A one-way ANOVA of Fonseca classification on SAQ score was used to determine the association between TMD severity and quality of sleep.

When the F test of the ANOVA was significant, that is, it had a p-value lower than the nominal value of significance of 0.05, then we rejected the null hypothesis that the results of at least one aspect of the comparison differed from those of the others. The Tukey test was used to check which results differed from each other at the 0.05 significance level.

Results

Of the 160 nurses in our study, 41 (25.5%) had no signs or symptoms of TMD, 66 (41.3%) had mild TMD, 39 (24.4%) had moderate TMD, and 14 (8.8%) had severe TMD. The strengths of the correlations between the Fonseca's questionnaire score and state and trait anxiety (E-IDATE and T-IDATE) score are presented in Table 1. All correlations were statistically significant ($p < 0.05$; but with low magnitude, $r < 0.04$) except for the correlation between E-IDATE score and the Fonseca's questionnaire score.

Chi-square test indicates that TMD severity is independent of the severity of trait anxiety ($p = 0.14$; Table 2).

TMD severity is associated with the severity of state anxiety ($p = 0.0410$; Table 3).

ANOVA indicates that the SAQ score differs according to Fonseca classification (Table 4; Figure 1).

The Fonseca's questionnaire score is negatively associated with the score for each domain of the SF-36 (Table 5).

Table1. Correlations between TMD severity (Fonseca's questionnaire score), state anxiety (E-IDATE score), and trait anxiety (T-IDATE score).

		T-IDATE score	E-IDATE score	Fonseca's questionnaire score
T-IDATE score	Pearson's correlation coefficient	1	0.375	0.268
	p-value		< 0.001	0.001
E-IDATE score	Pearson's correlation coefficient	0.375	1	0.096
	p-value	< 0.001		0.228
Fonseca's questionnaire score	Pearson's correlation coefficient	0.268	0.096	1
	p-value	< 0.001	0.228	

Table 2. Association between the Fonseca classification and trait anxiety classification.

		Fonseca classification				Total
		Mild TMD	Moderate TMD	Severe TMD	No TMD	
Trait anxiety classification	Mild anxiety	5.6%	2.5%	1.3%	7.5%	16.9%
	Moderate anxiety	26.3%	18.1%	5.6%	16.3%	66.3%
	High anxiety	9.4%	3.8%	1.9%	1.9%	16.9%
Total		41.3%	24.4%	8.8%	25.6%	100.0%

*p-value test chi-square (Monte Carlo simulation) = 0.142.

Table 3. Association between Fonseca classification and state anxiety classification.

		Fonseca classification				Total
		Mild TMD	Moderate TMD	Severe TMD	No TMD	
State anxiety classification	Mild anxiety	4.4%	3.8%	2.5%	3.8%	14.4%
	Moderate anxiety	27.5%	13.1%	3.1%	20.0%	63.8%
	High anxiety	9.4%	7.4%	3.1%	1.9%	21.8%
Total		41.3%	24.4%	8.8%	25.6%	100.0%

*p-value test chi-square (Monte Carlo simulation) = 0.041.

Table 4. Results of ANOVA of SAQ score and Fonseca classification.

F.V.	D.F.	Sum Squares	Mean Square	F	p-value
TMD	3	1915.509137	638.5030457	8.196469375	0.0000435

*Analysis of variance.

Table 5. Association between the Fonseca's questionnaire score and the score on each domain of the SF-36.

	SF-36 Domain							
	Functional ability	Physical limitation	Pain	General health	Vitality	Social aspect	Emotional limitation	Mental health
Pearson's correlation coefficient	-0.183	-0.223	-0.339	-0.296	-0.419	-0.403	-0.333	-0.342
p-value	0.022	0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

*Estimate Pearson's correlation without p-values.

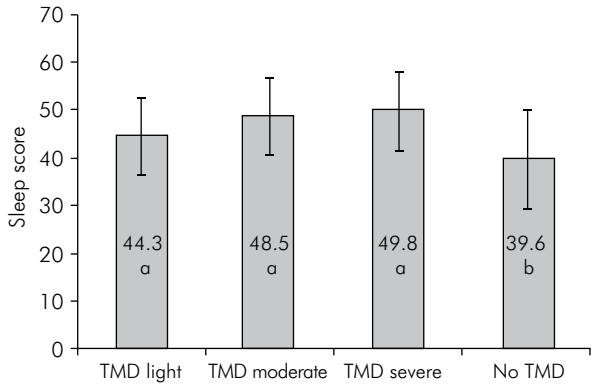

Figure 1. Correlation between the mean SAQ score and the degree of TMD.

Discussion

TMD includes a group of clinical changes that affect the masticatory muscles, temporomandibular joint, and associated structures. It is estimated that 50–70% of the worldwide population shows signs or symptoms of TMD at some stage of their life, and at any given time 20–25% of the population has TMD symptoms.[18] A large number of scales and questionnaires have been used to diagnose and evaluate TMD severity. An anamnestic index is the most appropriate diagnostic tool for use in epidemiologic research, as it involves the whole population.[19]

In this study we used questionnaires to assess the presence and degree of TMD and anxiety and evaluate the quality of sleep and quality of life of professional nurses working in a hospital, and we assessed the association between TMD and each of these variables. Fonseca's questionnaire was used to evaluate TMD. This index was chosen over others, such as the Research Diagnostic Criteria, because the objective of this study was not to diagnose TMD but rather to evaluate the existence and severity of TMD. According to this questionnaire, 74.5% of the study sample had some degree of TMD, indicating that TMD is common in this population, *i.e.*, compared with the estimated 20–25% of the worldwide population noted above. The reasons for the high incidence of TMD may be associated with the characteristics of the nursing profession and the hospital work environment.[10,11,20]

The hospital where the study was conducted attends to a regional demand for healthcare that exceeds its physical capacity. As a result, its nurses

perform their activities under arduous physical and psycho-emotional conditions capable of generating an environment of stress for most of their work hours. Although our present study could not determine the specific etiologic factor(s), previous studies have established that stress is an etiological factor of TMD.[10,11,20] According to these reports, stress may act as agent of somatic hyperactivity of the masticatory muscles, triggering muscle and/or joint changes accompanied by pain and functional limitations.

Because anxiety has its basis in emotional response and manifests to varying degrees, it seems plausible that this psycho-emotional trace is endemic in healthcare professionals. This supports previous reports that nursing professionals experience stress or anxiety owing to specificities of the working environment.[5,10,20,21] However, approximately one-quarter of the participants in our survey that had some degree of anxiety did not have TMD, indicating that the presence of anxiety alone does not necessarily trigger TMD.

In the present study, anxiety was evaluated using the IDATE questionnaire. Participants were stratified according to IDATE score (mild, moderate, or high anxiety) and the Fonseca's questionnaire score (TMD severity). Among our study's participants, the presence of anxiety as a personality trait (IDATE-T) correlated positively with the presence of TMD, confirming its role as an etiological factor of this type of pathology in the temporomandibular joint.[1,2,3,7,8,14,16,19] On the other hand, when Fonseca's questionnaire score and TMD severity were associated with the severity of trait and state anxiety, only state anxiety (IDATE-E) correlated positively with TMD severity, indicating that, once present, the variation in TMD severity is mainly determined by an individual's state of anxiety and not by their personality.

The hospital is a high-stress work environment, and the characteristics of this type of workplace and the consequent emotional factors have been implicated as etiologic agents of TMD.[5,8,10,11,12,21,22] The results of the IDATE questionnaire in our study support the high prevalence of TMD in this population and indicate that, among nursing professionals working in a hospital, the control of state anxiety should receive the same attention as trait anxiety because the trait appears to play a role mainly as an etiological agent whereas the anxiety state has a more psychosomatic impact on TMD severity (Tables 1, 2 and 3).

We found a clear negative association between TMD and SAQ score among the nurses in our study. Increased severity of TMD correlated with poorer sleep quality (Table 4). Typically, the most common sleep disorders are sleep difficulty and/or awakening and frequent interruptions during nocturnal sleep. These changes are caused mostly by symptoms of pain, common in TMDs and any emotional disorder such as stress and anxiety, among others.[7,8,9,13,15,17] Among the three emotional impactors, namely sleep quality, stress and anxiety, it is difficult to determine which is cause and which is effect. Moreover, as shown in Figure 1, a statistically significant difference ($p < 0.05$) was only observed when comparing sleep quality among individuals without TMD and those with TMD regardless of its severity, which allowed us to conclude that the mere presence of TMD was sufficient to impact sleep quality.

In light of the association between TMD and state anxiety and quality of sleep, we expected a negative association between TMD severity and all domains of the SF-36, [16,22] even with mild TMD. Our present results support this expectation, as quality of life decreased as TMD severity increased. Our results are also consistent with the literature.[5,6,9,10, 12,16,17,20,22] Because quality of life is directly related to the physical, psychological, and social perception of the environment in which a person lives, it is straightforward to realize that the hospital workplace could negatively impact the normal life expectations of nurses. Indeed, the workload often covers nighttime periods, thereby limiting social activities, time spent with family members, and time available for sleep; moreover, the workload does not often coincide with the weekend, and the on-duty psychological impact of secondarily experiencing patient suffering makes nurses extremely vulnerable to psychological disorders. Among these disorders, anxiety and stress may trigger signs and symptoms of TMD; in particular, this may manifest as pain, muscle hyperactivity, and inflammatory and/or degenerative changes of the temporomandibular joint. This triad of TMD/stress/anxiety affects sleep quality, gradually reducing the productive capacity

of the individual and affecting their quality of life in a progressively negative cycle.

Our results suggest that nursing professionals working in a hospital environment are susceptible to TMD and also to a negative psycho-emotional trait and state (*i.e.*, high anxiety level), impaired quality of sleep, and low quality of life.

Conclusion

Our results show that TMD is common among nursing professionals. Trait anxiety was associated with presence of TMD, and state anxiety was associated with TMD severity. TMD severity was inversely related to quality of life, and the presence of TMD was negatively associated with quality of sleep, regardless of TMD severity.

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