ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 11, Issue, 11, pp. 51863-51868, November, 2021
https://doi.org/10.37118/ijdr.23200.11.2021

RESEARCH ARTICLE OPEN ACCESS

INTERDISCIPLINARY DIAGNOSTIC RESEARCH FOR IDENTIFICATION OF BRUSHISM

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ARTICLE INFO

Article History:
Received 16th August, 2021
Received in revised form
12th September, 2021
Accepted 14th October, 2021
Published online 28th November, 2021

Key Words:
Bruxism. Temporomandibular Joint. Temporomandibular Joint Dysfunction Syndrome. Interdisciplinary.

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ABSTRACT

Introduction: Bruxism is defined as a repetitive activity of the jaw muscles, characterized by clenching, grinding or clenching the teeth and / or tightening or pushing the jaw, with a strong impact on the quality of sleep and life of patients. **Objective:** Investigate the prevalent signs of bruxism in the sample studied through the cooperation of an interdisciplinary team in the areas of Speech Therapy and Dentistry, applying questionnaires, for the diagnosis of bruxism, differentiating from TMD. **Material and Methods:** Twenty individuals with major complaint of bruxism who were not previously treated participated in the study and were submitted to the RDC / DTM questionnaire (Research Diagnostic Criteria for Temporomandibular Disorders: Axis II) with positive responses to stress, anxiety, sleep disorders and sleep bruxism. ; ProDTMMulti questionnaire, which is a protocol for the determination of signs and symptoms of temporomandibular dysfunction (TMD) for multiprofessional centers, the AMIOFE (Orofacial Myofunctional Assessment with Score) protocol, Helkimo index or Craniomandibular Clinical Dysfunction (IDCCM) with Mandibular Mobility Index (IMM) and OHIP 14 (Negative Impact on Quality of Life [Qol]). **Results:** Regarding the assessment of OHIP 14, physical pain and psychological discomfort had major negative impacts on QoL. In the RDC / DTM and ProDTMMulti, most of the sample reported head and face pain, TMJ cracking, teeth grinding, tooth clenching, physical tiredness, and ringing in the ear, which is in agreement with OHIP 14 in the correlation physical domain and psychological disorders. Regarding the IDCCM and IMM presented mild to severe dysfunction, without normality. In AMIOFE the main altered stomatognathic function was chewing and mandibular noises. **Conclusion:** It was concluded that subjects of the sample with symptoms of bruxism showed correlations with morphological and functional alterations of the stomatognathic system, especially with mastication and TMD.

Citation: ***Viviane dos Santos Marques, Arthur Silva da Silveira, Leonardo Pereira Pacheco, Amanda Caldas de Barros et al.*** "Interdisciplinary diagnostic research for identification of brushism*", International Journal of Development Research*, 11, (11), 51863-51868.

INTRODUCTION

The International Classification of Sleep Disorders defines bruxism as "a repetitive activity of the muscles of the jaw, characterized by squeezing, grinding or clenching the teeth and/or squeezing or pushing the jaw"[1–6], usually associated with micro-awakenings with a duration of 3 to 5 seconds, resulting from the rhythmic and non-physiological contraction of the masseters[7], which can generate muscle hyperactivity, fatigue, spasms, myofacial pain and functional changes in the masticatory muscles, with neurophysiological

involvement, resulting from stress, anxiety, tension and nervousness[7–10] . Bruxism is an involuntary parafunctional habit that presents two circadian manifestations, it can be classified as nocturnal during sleep and diurnal during the waking state[1]. It presents a multifactorial etiology and can be characterized mainly by morphological and functional alterations of the stomatognathic system, with greater relevance in the function related to mastication[2–4]. The basic functions of the stomatognathic system are sucking, chewing, swallowing, breathing and speaking, functional alterations in this system may be present in patients who initiate bruxism[3,4]. Furthermore, when exacerbated, this dysfunction can trigger a pathophysiological imbalance of the stomatognathic system, known as Temporomandibular Disorder (TMD)[11]. Of the parafunctional habits, bruxism is the most cited, reported and diagnosed in the literature[5,11,12.] In the patient's anamnesis, it is extremely important to detect, if there are reports, the origin of the headaches, auditory pain, or the existence of sinusitis and then consider the possibility that it may have originated in the only mobile and synovial joint of the head: the TMJ. In this observation, it is possible to detect the degree of impairment of the TMD[13]. Sleep plays a fundamental aspect in human life, it has an immunological, repairing, energizing, protective function, and bruxism interferes with this routine[14,15]. Among the complaints reported in the literature and by patients, we found difficulty concentrating and paying attention, depression, sadness, anxiety, complaints of headaches, daytime jaw clenching, teeth grinding during sleep, tinnitus, otalgia, physical discomfort in the region of head and neck, and breaking of teeth[1,14]. Deterioration of tooth structure, tooth hypersensitivity to thermal stimuli, orofacial pain, and temporal headache are the most frequent undesirable effects as a result of this disorder[1,14,16] . There are still many controversies about the causes of bruxism, and how sleep plays a fundamental aspect in human life given its function of repairing the body, conserving energy, protecting and immunologically. Bruxism can directly interfere with sleep quality and significantly impact physical and psychological comfort and our well-being[5–7,14]. This research aimed to find the etiological prevalence of bruxism in the researched sample, through an interdisciplinary analysis, with the application of specific assessment protocols used in speech therapy and dentistry, seeking with the interdisciplinary clinical examination to generate a more accurate etiological identification and enable conducts to assist the particularities of each patient, in order to respect individual needs in rehabilitation [12,14–17] .

MATERIAL AND METHODS

The research project is a descriptive, cross-sectional, quantitative and qualitative study. It was submitted and approved by the Research Ethics Committee of the University Veiga de Almeida (UVA), Rio de Janeiro/Brazil, under number 3,688,611. For the research sample, patients from the Speech Therapy and Dentistry service of the UVA Health Center,who signed the free and informed consent form (FICF), were selected, and submitted to the following questionnaires in an interdisciplinary manner: (in annexes) RDC /DTM (Research Diagnostic Criteria for Temporomandibular Disorders: Axis II), with positive responses to stress, anxiety, sleep disorders and bruxism; ProDTMMulti questionnaire (Protocol for determining signs and symptoms of TMD for multi-professional centers); AMIOFE (Orofacial Myofunctional Assessment with Scores), Clinical Craniomandibular Dysfunction Index (IDCCM) and the OHIP 14 (Negative Impact on Quality of Life [Qol]). The first inclusion criteria in the selection of the research participant were the patient presenting positive results for bruxism in the RDC/DTM questionnaire and in the ProDTMMulti questionnaire, in addition to the sample being concentrated in participants between 18 and 59 years old, regardless of gender. Questionnaires made with the multi-team and with filming of the speech-language pathologist clinical exam. Individuals who reported being in orthodontic treatment and/or oral rehabilitation and who presented any pathological clinical condition, who were undergoing neurological or psychiatric treatment or using anxiolytics, antidepressants, antipsychotics and/or any medication that has the potential to interfere with states of stress, anxiety, sleep quality and bruxism were excluded from the sample.. For a better definition of the results of stress perception , in addition to those mentioned above,a self-report perception questionnaire was elaborated, and evaluation made of the type of brush, brushing variation and force used.

RESULTS

The results of this study showed that of the 24 participants evaluated, 83.33% presented the presence of bruxism. After applying the inclusion and exclusion criteria, totaling 20 subjects in the investigated sample. The exclusion of four participants from the sample was justified by the fact that their temporomandibular joint alterations were not correlated with the object of study, which were patients complaining of Bruxism. Data referring to the RDC/DTM (Research Diagnostic Criteria for Temporomandibular Disorders: Axis II) indicated that 90% of patients reported grinding or clenching their teeth while sleeping, 85% reported fatigue or jaw pain upon waking, 80% of the sample reported headache in the last 6 months, other relevant data present in 75% of the participants were auditory discomfort, such as tinnitus and grinding and clenching teeth also during the waking state, 70% of the participants reported clicks in the TMJ and as less significant data was the sample's perception of the presence of noise during chewing with 40% and severe jaw locking preventing feeding, this acute physical discomfort was reported by only 25% of the sample group. In line with the RDC/DTM, the ProDTMmulti identified similar data, the RDC/DTM was applied by the Dentistry team and the ProDTMmulti by the Speech Therapy team, demonstrating similar data for grinding and clenching teeth at night and during the day, in addition to fatigue and pain in the orofacial muscles with the same percentage of 85% and headache with 80%. A fact that differed was the question regarding noise in the jaw, as in the first protocol the question refers to chewing and most patients do not pay attention to this perception. In ProDTMmulti 80% of patients reported noises, as they were associated with movement and patients in general tested their mobility before answering the question, which facilitated perception and reporting. Difficulty in mobilizing the mandible in the mouth opening had the same percentage of 25%, but a relevant fact was that 55% of the sample reported some difficulty chewing. Of the different noises reported in the TMJ, 75% reported snapping and 10% crackling. The auditory symptoms in this protocol are better delineated, they are separated into auditory discomfort (50% of report), otalgia (35%), tinnitus (50%) and sensation of aural fullness in 50%, some research subjects reported more than one symptom.

A fact that differed was the question regarding noise in the jaw, as in the first protocol the question refers to chewing and most patients do not pay attention to this perception, in the ProDTMmulti 80% of patients reported noises, as they were associated with movement and patients in general tested their mobility before answering the question, which facilitated perception and reporting. We also obtained the self-report regarding stress and factors related to Bruxism, observing signs and symptoms, reported by patients and companions.
During the interdisciplinary clinical evaluation of the Mandibular Mobility Index (MMI) slightly reduced mobility was identified in 55% of the subjects, severely reduced mobility in 40% and normal mobility in 5% of the sample. In the analysis of the Helkimo Index or Clinical Craniomandibular Dysfunction (IDCCM) mild dysfunction in 30%, moderate dysfunction in 30%, severe dysfunction between 10-13 points in 25%, severe dysfunction between 14-19 points in 10%, and very severe dysfunction above 20 points in 5% of the sample. As IDCCM is a more thorough examination that does muscle palpation, no participant without some type of dysfunction was identified. The AMIOFE results show the importance of carrying out the functional assessment of the stomatognathic system, in addition to the morphological assessment, in order to identify the core of the dysfunctions that may be correlated with Bruxism. Graph 1 shows the results of the morphological assessment of the AMIOFE, in which the most relevant data was the change in the mandibular postural condition, followed by facial asymmetry, with no specific or permanent differentiation of the case.

Tabel 1. Sample distribution regarding prevalence of war according to dental group

Characteristics		Excluded Group n=18	Test Group n=20
Age (average and DP)		23,57(2,73)	40 (19)
Gender: male/female		7/7	7/13
Age n (%)			
20 -30			7 (14)
30-40			3 (6)
>40			10 (50)
Total number of teeth/(average and DP)		392 /28.71(2.36)	480 / 26.5 (4.2)
Teeth without wear(M/Dp)			
	Incisors	0.35 (0.74)	2 (1.8)
	Canines	0.21 (0.57)	2,4 (1.3)
	Premolars	0.28 (0.46)	1,9 (2.2)
	Molar	0.42 (0.93)	1,9 (2.0)
Teeth with enamel wear			
	Incisors	N/A	5 (1.8)
	Canines	N/A	2.4 (1.3)
	Premolars	N/A	4.45 (1.5)
	Molar	N/A	5.4 (2.2)
Dentim Wear			
	Incisors	N/A	3 (2.2)
	Canines	N/A	3 (1.5)
	Premolars	N/A	2.2 (2)
	Molar	N/A	2.5 (1.8)

Tabel 2. Avaliation Research Diagnostic Criteria for Temporomandibular Disorders: Axis II and Protocol for determining signs and symptoms of TMD for multiprofessional centers

Participants (n=20)	RDC/TMD (%)	ProDTMMulti (%)
Grind or clench teeth while sleeping	95	95*
Muscular fatigue	85	85*
Headache	80	80*
Auditive discomfort	75	75*
TMJ cracking/snapping	70	70*
Noise while chewing	40	40*
Serious Discomfort	25	25*

RDC/DTM - Research Diagnostic Criteria for Temporomandibular Disorders: Axis II. Pro DTMMulti - Protocol for determining signs and symptoms of TMD for multiprofessional centers. *involvement of bruxism in thr two questionnaires.

Tabela 3. Self-report of stress and bruxism related factors

Self-report	Yes	No	P
Habit of grinding teeth	18	2	
Perception of wear on a tooth	19	1	
Symptoms of stress, tiredness, or anxiety	14	6	
Sleep well	5	15	<0.0001
Habit of putting objects in the mouth	10	10	<0.0001
Hears noises in the joints near the ear	13	7	
Pain in the muscles of the head, face, or neck	20	0	
Presence of a disease	5	15	<0.0001
Continuous use of medication	12	8	
Smoking habit	4	16	<0.0001
Alcohol consumption	12	8	
Gastric problems	12	8	
Consumption of acidic food	17	3	
Mean (standard deviation)	12.4(5.3)	7.6(5.3)	

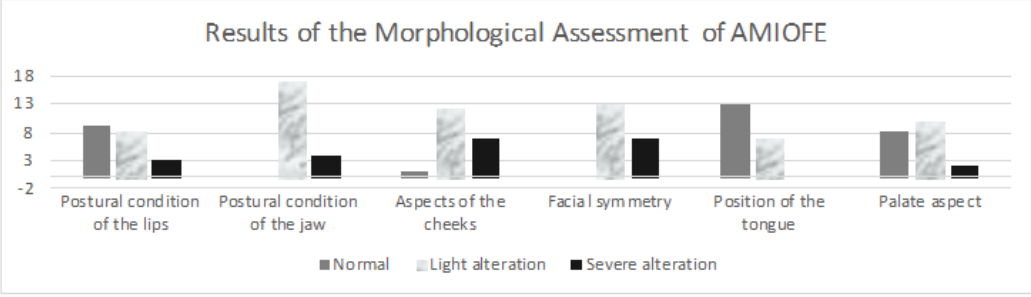

Figure 1. Orofacial Myofunctional Assessment with Scores (AMIOFE) Morphology

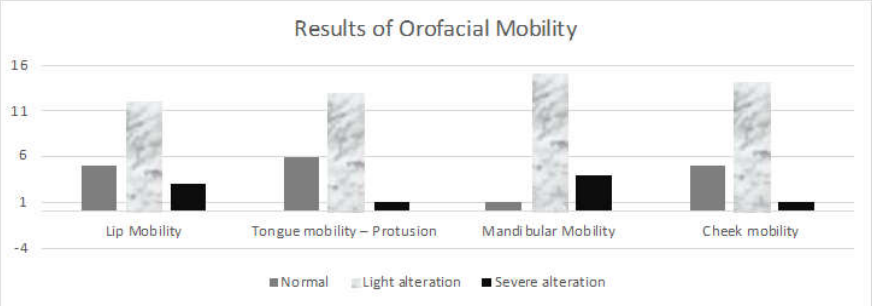

Figure 2. Orofacial Mobility OMES Assessment

Tabela 4. Quality of Life (QoL – M/Dp OHIP) 14 – global Percentual

Domains	Avarage	Desv
Functional	10	0.4
Physical Pain	57.5	1.8
Psychological Disconfort	57.5	0.8
Physical Incapacity	29	0.7
Psychological Incapacity	39.5	0.7
Social Incapacity	12	0.3
Social Disadvantage	19	1.2
OHIP Global	32	0.5

Total percentual por dimensão do questionário Oral Health Profile-OHIP 14

The results of figure 2 of the OMES protocol, referring to orofacial mobility, demonstrate mild dysfunctions prevalent in motor tests. The evaluations of the stomatognathic system showed a prevalence of 95% of patients with nasal breathing, since bruxism has the characteristic of mandibular tightening that would make oral breathing difficult, only one patient had an allergic condition, making nasal breathing difficult. Swallowing solids showed a prevalence of mild alteration, especially in the ejection of the bolus, requiring more than two swallows to effect swallowing. The result of the most relevant functional analysis was the tests related to chewing, 95% of the subjects showed change in chewing function, with chronic unilateral change in 60% of the sample, 35% preferential unilateral and only one participant presented it bilaterally. Mobility analysis found similarity with the protocols previously applied and in the detailed evaluation some type of mandibular noise was identified by the entire sample group. The impact on the investigated quality of life in QoL – M/Sd OHIP 14 – overall Percentage %, shown in Table 4, exhibited greater significance in physical pain and psychological discomfort, with greater negative impacts on QoL because of the interrelationship with sleep bruxism. The higher the score presented in this protocol, the greater the perception of negative impact.

DISCUSSION

By definition, Sleep Bruxism is not a disease, but a parafunctional dysfunction[11,18-23]. The International Classification of Sleep Disorders defines Sleep Bruxism as an oral activity characterized by grinding or squeezing teeth during sleep, usually associated with micro awakenings lasting 3 to 5 seconds, resulting from the rhythmic and non-physiological contraction of the masseters2. which consequently generates muscle hyperactivity, fatigue, spasm, myofascial pain and functional changes in masticatory muscles, with neurophysiological involvement, resulting from stress, anxiety, tension and nervousness[21–24]. Furthermore, when exacerbated, this dysfunction can trigger a pathophysiological imbalance of the stomatognathic system, known as Temporomandibular Disorder [25]. The study demonstrated a significant association between muscle pain and bruxism. The symptoms of bruxism include pain and tinnitus in the ear, pain in the neck, jaw and face muscles due to the effort made by the masticatory muscles, cracking when opening and closing the mouth, sleep disorders, which are in agreement with studies of Tuz Hh et.al.[26] Some of these symptoms, such as: noise and pain in the joints near the ear, in the muscles of the head and neck, were reported by 75% of the sample[26].

As one of the most frequently reported symptoms, Fernandes et al. reported that facial muscle pain on waking up, that is, after exercise, is associated with overload mechanisms caused by parafunctional bruxism habits, which wear out the masticatory system, making it a risk factor for the onset of TMD[2,8]. In the condition of bruxism, we have clearer intraoral signs, with abfraction, enamel cracks, tooth fracture, enamel and dentin wear, tooth mobility and migration, mandibular and maxillary torus, among others[25]. Some authors suggest that patients who do not report pain in the masticatory muscles may have adapted to overload and, once they have done so, become more resistant to fatigue[2]. TMD can be defined as a set of disorders involving masticatory muscles, temporomandibular joint (TMJ) and its adjacent structures. Its etiology is multifactorial[2,13,27]. Signs frequently reported are muscle and TMJ sensitivity to palpation, limitation or incoordination of jaw movements, and joint noises. As for symptoms, there are pain in the face, TMJ and masticatory muscles, headache, tinnitus, ear fullness and dizziness[2,13]. Such disorders are related to common symptoms between pain and limited mouth opening. This pain can be chronic, persistent or transient, depending on risk factors. In order for the joint to function correctly, the TMJ itself, dental occlusion and neuromuscular balance must act harmoniously together[28]. The results obtained in the RDC/DTM and ProDTMMulti questionnaires corroborate the data in the literature, 90% of the participants reported grinding or squeezing their teeth while sleeping, 85% had fatigue or jaw pain when waking up, 80% had headaches, 75% had auditory discomfort , 70% said they had clicks in the TMJ and only 40% had noises (crackling) during chewing. Headache is a symptom that often appears associated with TMD. Primary headaches, such as migraine and tension-type headache, for example, have been associated with TMD in several epidemiological surveys[27,29].

According to population studies of TMD and headache, it was found that individuals with TMD symptoms are 1.8 to 2 times more likely to also have headache8. Epidemiological studies in adults indicate that there is an association between headache and TMD and that these two conditions have similar signs and symptoms[27,29,30]. In 2013, it was observed that sleep bruxism per se did not increase the risk of primary headache, but when associated with a painful TMD, the chances of having chronic migraine, episodic migraine and episodic headache by type of tension increased significantly[15]. Of the auditory symptoms presented in this research, 50% of the individuals reported hearing discomfort, 50% tinnitus, 50% sensation of aural fullness and 35% otalgia, and some research subjects reported more than one symptom. The findings corroborate the literature, as several studies mention the occurrence of such symptoms in individuals with bruxism[20,31–35]. The

TMJ exhibits complex functioning dynamics, it is present in the region of the two mandibular condyles (right and left), located in front of the external acoustic meatus. It allows movement of the jaw when opening and closing the mouth, chewing, swallowing and speaking and is the only joint in the body in which both sides work simultaneously, which guarantees rotational and translational movements13. Any change can affect the bone positioning of the maxilla and mandible and the alignment of teeth, which in turn can cause ear pain, interference with aural fullness, tinnitus, dizziness, neck pain and headache[36]. These auditory alterations can be explained, since the trigeminal nerve (cranial nerve V) has 3 branches: ophthalmic, maxillary and mandibular, thus innervating both the tensor tympani muscle and the palatine tensor palate muscle. Thus, any pressure or pain in the structures innervated by it can alter the auditory function and create sensations[13,37]. Currently, polysomnography is considered the gold standard for diagnosing SB, however, polysomnographic studies are still costly, inaccessible and require specialized equipment and professionals, which makes its use impossible in population studies[7–10,38]. For this reason, the criteria adopted for the diagnosis of SB for the present study were proposed by the American Academy of Sleep Medicine (2005) and are mainly based on the report of teeth grinding at night, added to one or more of the following symptoms: 1) Abnormal wear of teeth; 2) Pain, fatigue and discomfort in the muscles of mastication and jaw lock upon waking up; 3) Hypertrophy of the masseter muscle in the maximum forced contraction2. However, for Bader and Lavigne (2000), Lavigne et al. (2008) and Cortese et al. (2013), this method of assessment may have limitations in diagnosing the disorder, as it is extremely subjective and subject to misinterpretation[30,31,33], since the wear of dental surfaces, for example, can affect 40% of the population considered healthy, and does not grind or clench teeth and may appear due to other factors such as onychophagia, parafunctional habits (biting objects and biting nails), acid regurgitation, unilateral chewing and dietary factors[3].

A study carried out by Felício et al.[24] indicates that the abnormal demand of the masticatory muscles due to bruxism not only causes pain, but can also contribute to changes in the TMJ, triggering TMD. Therefore, bruxism can lead to muscle hyperactivity, which results in pain in the masticatory muscles and for this reason, the stomatognathic system can perform compensations to allow mastication, phonation and swallowing efficiently and comfortably. However, this can have a negative long-term effect, as such compensations can contribute to the progression and perpetuation of TMD. In 2018, Magalhães et al. [39] conducted a study with individuals with TMD and reported that 58.2% had at least one otological symptom and 52% of individuals with TMD had sleep bruxism, and these bruxist individuals had twice more chances of developing TMD. According to Berger et al.[40] and Magalhães et al.[39], bruxism compromises the masticatory system and is, consequently, considered an important etiological factor in TMD. In 2017, Reissmann et al. [41] found that bruxism is associated with a higher incidence of painful TMD. Huhtela et al. [42] also related the presence of bruxism to pain and TMJ dysfunction, with women who reported bruxism with a higher level of pain and lower work capacity due to pain. Carlsson et al. [42] carried out a longitudinal study with the aim of analyzing possible risk factors for the development of TMD. The results showed that sleep bruxism increases the risk of individuals presenting signs and symptoms of TMD by 5.3 times, this risk being increased to 7.7 times when it is associated with other parafunctional activities. Therefore, the authors concluded that sleep bruxism appears to be a risk factor for the development of TMD, but more conclusive studies need to be done. In general, Sleep Bruxism has been widely studied as a risk factor and/or perpetuation of TMD[5,44]. When sleep bruxism and daytime clenching occur separately, they increase the risk of painful TMD symptoms. When they act simultaneously, the risk is even greater[45].

In 2017, a systematic review showed that sleep bruxism may be associated with myofascial pain, arthralgia, and joint pathological conditions such as disc displacement and joint noises. Although the evidence is currently not conclusive and does not provide information according to the type of bruxism (sleep and/or wakefulness bruxism), it is possible to suggest that bruxism would be associated with TMD[55]. stomatognathic system and TMJ, result from muscle contraction for a long time and non-physiological force applied on the occlusal surface[46]. It is extremely important to highlight the interdisciplinary work between dentists and speech therapists in the treatment of Sleep Bruxism, since the simultaneous intervention adds to the results of assessment, diagnosis and treatments. Since form and function are closely related, the dentist makes corrections related to morphology and the speech therapist adjusts the orofacial muscles and stomatognathic functions[6,47]. Symptom assessment together with multidisciplinary teamwork is essential for a correct therapeutic indication. Speech-language pathologists, dentists, orthodontists, and, in addition to oral and maxillary patients, psychologists, otolaryngologists, neurologists, physiotherapists and pain clinicians must, in association, analyze probable causal factors and, each in their area of expertise, jointly interfere[13].

CONCLUSION

The findings allowed, in an interdisciplinary way, to discover the prevalence of causes for the occurrence of Bruxism in the researched sample group. As for the OHIP 14 assessment, reported discomforts, physical pain and psychological discomfort have greater negative impact on Qol because of the interrelationship of TMD with bruxism. As for the questions on bruxism in the RDC/DTM, most reported discomforts such as snapping in the TMJ, grinding teeth, clenching, physical fatigue, headaches and tinnitus, which is in agreement with the OHIP 14 in the physical domain and psychological disorders impacting Qol. As for the IDCCM and IMM, they presented mild and severe dysfunction, without the presence of normality. The entire sample in the AMIOFE presented mandibular noises. The sample, as a whole, showed a correlation between bruxism and morphological and functional alterations of the stomatognathic system, specifically with chewing and with TMD.

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