

BRUXISM. MASTICATORY IMPLICATIONS AND ANXIETY

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ABSTRACT

In this study we investigate the phenomenon of bruxism, defined as the act of clenching and/or grinding the teeth, a habit that compromises the orofacial region. It is often associated with emotional aspects, such as anxiety and stress, and may result in alterations to orofacial structures, functional modifications and social repercussions. The aim of this study was to determine a possible association between bruxism and anxiety underscoring the primary complaints related to masticatory function. Eighty volunteers participated in the study. They were divided into bruxers (N=40) and non-bruxers (N=40) of both sexes. The diagnosis of bruxism was made by clinical examination. The Trait-State Anxiety Inventory was used to assess anxiety levels and a questionnaire with structured questions related to daily

activities, focusing on masticatory function (for the bruxism group), was applied to evaluate psychosocial aspects. The results of the study show a significant difference in state anxiety. Mean and standard deviation of state anxiety in the bruxism and non-bruxism groups was 42.7±9.6 and 38.6±8.2 ($p \leq 0.04$), respectively, while trait anxiety had a mean and standard deviation of 44.5±11.0 and 40.7±9.5 ($p \leq 0.11$). The main complaints of bruxers during mastication were facial pain and headache while chewing as well as the presence of clicking sounds in the jaw joint. Findings demonstrate an association between emotional factors such as anxiety and bruxism, resulting in compromised masticatory function.

Key words: Anxiety; Bruxism; Mastication; Stomatognathic System.

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RESUMO

Neste trabalho procuramos estudar o fenômeno do bruxismo, definido como o ato de apertar e/ou ranger os dentes, um hábito prejudicial e destrutivo da região orofacial. O bruxismo é frequentemente associado aos aspectos emocionais, entre os mais ressaltados a ansiedade e o estresse, podendo implicar em alterações das estruturas orofaciais, modificações funcionais e repercussões sociais. Verificar a associação entre bruxismo e ansiedade ressaltando as principais queixas referentes à função mastigatória. Participaram oitenta voluntários, divididos entre grupo com bruxismo (N=40) e sem bruxismo (N=40), do sexo masculino e feminino. O diagnóstico do bruxismo foi realizado através do exame clínico. Para avaliar os níveis de ansiedade empregou-se o "Inventário de Ansiedade Traço e Estado" e para os aspectos psicossociais um questionário com questões estruturadas referentes às atividades diárias, focando a

função mastigatória (para o grupo com bruxismo). Foram evidenciadas diferenças significativas para a ansiedade estado entre os grupos analisados, verificou-se a média e desvio padrão de ansiedade estado no grupo com bruxismo, 42,7±9,6 e sem bruxismo 38,6±8,2 ($p \leq 0,04$) e de ansiedade traço respectivamente 44,5±11,0 e sem bruxismo 40,7±9,5 ($p \leq 0,11$). O relato dos participantes com bruxismo evidenciou como principais queixas durante a mastigação a dor na face ao mastigar, cansaço muscular na face, cefaleia ao mastigar e presença de ruídos articulares. Com base nos resultados evidenciamos uma associação dos fatores emocionais como a ansiedade e o bruxismo e como resultante os pacientes apontam que a função mastigatória encontra-se depreciada.

Palavras-chave: Ansiedade, Bruxismo, Mastigação, Sistema Estomatognático.

INTRODUCTION

Bruxism is a nighttime or daytime parafunctional activity, characterized by clenching or grinding of the teeth¹. It is considered the most harmful and destructive habit affecting the orofacial region^{2,3}, due to the non-functional tooth wear that occurs in

situations not involving mastication, swallowing and phonation⁴. The mandibular movements with no functional purpose observed in bruxism impose an abnormal demand on masticatory muscles, resulting in hyperfunction, generating painful symptoms and decreased coordination⁵ when the

force exerted by the habit exceeds the adaptive capacity of the stomatognathic system⁶.

Tooth grinding involves a sliding movement of occlusal surfaces in eccentric contact, favoring tooth wear. During tooth clenching, the increased tension in centric occlusion, through the isometric contraction of jaw elevator muscles, may cause pain, fatigue and masticatory muscle hypertrophy. The neuromuscular system becomes compromised as a consequence of atypical functional demand imposed on the muscles involved, also affecting mastication⁷.

Although bruxism is a frequent habit in adults^{6, 8, 9}, its causal factors are complex and still not fully understood^{2, 10}. Until a few years ago peripheral factors, such as occlusal disorders and anatomical alterations, were the most commonly implicated. However, current research has questioned the action of occlusion on the origin of bruxism, promoting conceptual change that suggests the influence of central and psychogenic factors^{2, 4, 11, 12}. Thus, it is believed that the multifactorial theory may be the most plausible hypothesis^{2, 10, 12-14}.

The influence of emotional factors, such as anxiety, has been widely emphasized, for both triggering and perpetuating bruxism, resulting in an increase in muscle tension caused by emotional stress during moments of anxiety¹⁵, manifesting itself somatically, i.e., a form of body language that cannot be understood by the subject¹⁶. Anxiety is an emotional state triggered by the body, which includes both psychological and physiological components, becoming pathological when exaggerated or disproportional in relation to the trigger. This leads to disruption and failure to perform its role as a psychobiological alarm, with the potential to develop into a pathology when exceeding the individual's adaptive capacity^{17, 18}. Based on this evidence and the non-conclusive data contained in the literature regarding the influence of emotional factors on bruxism, the aim of this study was to determine the association between bruxism and anxiety, underscoring the primary complaints related to masticatory function.

MATERIALS AND METHODS

This is a comparative cross-sectional descriptive study, approved by the Research Ethics Committee at the Federal University of Rio Grande do Norte, Brazil, under protocol No. 065/09. All par-

ticipants provided informed written consent, after being informed of the objectives and methods to be used. Data were collected among all patients with bruxism who sought treatment at the Integrated Care Center for Patients with Stomatognathic Apparatus Dysfunction (CIADE) between April 2009 and April 2011, as part of an extension project for the Occlusion course in the Dentistry Department of the Federal University of Rio Grande do Norte.

The non-probabilistic sample was composed of 80 subjects of both sexes, divided into Group 1 - bruxism and Group 2 - non-bruxism. The inclusion criterion was that only adults would be considered for both groups. Exclusion criteria were individuals with neurological disorders and patients who had undergone orthognathic or disc-condyle complex surgery. For the group with bruxism, individuals who reported clenching/ grinding their teeth, indicating the need for an occlusal splint and pain in the orofacial region, were included. The bruxism group was composed of 40 patients, (37 women and 3 men), mean age 33.4 ± 11.5 years. The non-bruxism group contained 40 individuals, (36 women and 4 men), mean age 36.3 ± 10.1 years.

In addition to clinical examination, bruxism was also evaluated through a self-report instrument, based on a previous study^{19, 20}. The survey asked the following questions: Do you wake up in the morning or during the night clenching or grinding your teeth? (yes/no); Do you feel fatigue or masticatory muscle pain on awakening? (yes/no); Do you wake up in the morning or during the night with your jaws locked? (yes/no); Do you have recent history of chronic dislocation of permanent or temporary restorations? (yes/no); Do you have recent history of noises associated with nocturnal teeth grinding as reported by a third person? (yes/no).

Clinical examination revealed signs and symptoms of bruxism, as reported in the literature²¹, based on the patient's primary complaints. The evaluation was performed by dental students, previously trained and supervised by professors, recording the following: presence of tooth wear (yes/no); dental fractures (yes/no); periodontal trauma (yes/no); masseter and temporal muscle pain (yes/no); muscle hypertrophy (yes/no); restricted mandibular movement (yes/no); sensitivity in head and neck

muscles (yes/no) and joint noise (clicking and/or popping) (yes/no).

A translated and validated Portuguese version²² of the State-Trait Anxiety Inventory (STAI), an instrument developed by Spielberg, Gorsuch and Lusheneem (1964), was used to identify and characterize the anxiety level of participants. It consists of two self-report questionnaires: 1) State-anxiety and 2) Trait-anxiety. The survey, which assesses state-anxiety, consists of 20 statements in which patients indicate how they feel at a particular point in time. The trait-anxiety questionnaire contains 20 items and is designed to determine patient personality characteristics throughout their lives. It is important to point out that this instrument was used in both groups. Moreover, the State-Trait Anxiety Inventory was employed after application of the self-report instrument and assessment of clinical indicators of bruxism, prior to the dental procedure. Thus, intergroup differences in relation to state anxiety may result from administration of the State-Trait Anxiety Inventory after dental consultation.

A structured questionnaire developed by the researchers was also applied. It contained closed questions related to the masticatory functions in daily activities (only for the bruxism group in order to investigate its implications and face pain symptoms), enquiring about type of teeth clenching and/or grinding and when it occurs (daytime, nighttime or both). Next, subjects were asked how bruxism-related face pain interferes in activities of daily living, (emphasizing masticatory function) such as sleep; appetite /eating; swallowing; speech; restricted mandibular movements and mastication – When chewing, do you experience facial pain, tired facial muscles, headache and joint noise?

Data were transcribed onto a standard patient record and inserted into a data bank for statistical analysis using SPSS 16.0 software. In the descriptive analysis, quantitative variables are presented as mean and standard deviation (sd), while categorical data are depicted in tabular form, as absolute and relative frequency. Student's t-test for independent samples was applied to compare the means of continuous independent variables in relation to the groups. Pearson's chi-square test (X^2) was used to compare differences in the proportion of independent variables to dependent

variables with respect to the groups. A p-value of 0.05 and confidence interval of 95% were adopted for all tests.

RESULTS

Analysis of sociodemographic aspects of the bruxism group demonstrated higher prevalence of women (37 = 92.5%) than men (3 = 7.5%), with mean age and standard deviation of 33.4±11.5, and prevalence of single individuals (18 = 45.0%). The non-bruxism group was composed of 36 (90.0%) women and 4 (10.0%) men, mean age 36.3± 10.1, the majority of whom are married (26=65.0%).

State-trait anxiety data for both groups are shown in Table 1. In relation to the characterization of bruxism with respect to the habit of clenching and/or grinding the teeth and the point in time at which it occurred can be seen in Table 2. Data from clinical examinations of bruxism related to daily functions and activities, (Table 3) showed a significant associ-

Table 1: Distribution of means and standard deviations of anxiety in the bruxism and non-bruxism groups.

STAI	Bruxers (n=40)	Non- Bruxers (n=40)	P
State-anxiety	42.7 ± 9.6	38.6 ± 8.2	0.04*
Trait-anxiety	44.5 ± 11.0	40.7 ± 9.5	0.11

*≤0.05%

Table 2: Characterization of the bruxism group regarding the habit of clenching and grinding their teeth and when the habit occurs.

Type of bruxism	N	%
Clenching	39	97,5
Grinding	26	65,0
Clenching / Situation	N	%
Nighttime and daytime	23	59,0
Nighttime	12	30,8
Daytime	4	10,3
Grinding/ Situation	N	%
Nighttime	18	69,2
Nighttime and daytime	7	27,0
Daytime	1	3,8

Table 3: A significant association between the clinical examination of bruxism and the variables related to daily functions activities.

Clinical Examination Variables	Variables Related to the functions	P
Facets of tooth wear	Mastication	≤0,001
Dental fractures	Mastication	≤0,002
Restricted mandibular movements	Appetite/eating	≤0,01
	speech	≤0,03
Sensitivity in head and neck muscles	Appetite/eating	≤0,01
	Swallowing	≤0,01
	Speech	≤0,01
	Headache while chewing	≤0,01

ation in the following: tooth wear with impaired mastication (≤ 0.001); dental fractures with impaired mastication (≤ 0.002); restricted mandibular movements, influencing appetite/eating (≤ 0.01) and hindering speech (≤ 0.03); sensitivity in head and neck muscles, showing associations with appetite/eating (≤ 0.01), swallowing difficulties (≤ 0.01), speech difficulties (≤ 0.01) and headache while chewing (≤ 0.01).

Based on the accounts of patients with bruxism and the main complaints observed during mastication, significant associations were found for appetite/diet (≤ 0.004), facial pain when chewing (≤ 0.007), facial muscle fatigue (≤ 0.004), headaches (≤ 0.02) and joint noise (≤ 0.001).

DISCUSSION

Several recent studies have sought to determine the relationship between bruxism and emotional aspects, highlighting anxiety^{13, 23, 24} as one of the psychological factors that play an important role in triggering and perpetuating the parafunction. The greater prevalence of women with bruxism can be explained by different theories, including physiological and biological differences among molecular factors related to gender, somewhat associated to “facilitation” of pathologies involving the temporomandibular joint, such as cases of morphological, rheumatic and psychosocial diseases²⁵; as to cognitive level, pain threshold may be lower in women than in men; with regard to social differences, different upbringing between girls and boys may make

it more acceptable for women to externalize pain than men²⁶. Moreover, women are more aware of the need to seek treatment²⁵.

Bruxism is defined as “an anxiety response to environmental stress”. Emotional factors such as anxiety, fear, frustration and emotional stress are related to muscle hyperactivity^{3, 27}. Strengthening this hypothesis, Manfredini et al. determined that psychological traits such as anxiety, depression and maniacal symptoms, as well as stress sensitivity, show significant differences in individuals with bruxism, whereas occlusal factors showed no significant difference^{12, 28}.

This study demonstrated a relationship between anxiety and bruxism, showing significant state anxiety differences in individuals with bruxism when compared to the control group. State anxiety is characterized as a transitory emotional reaction to everyday stressful events². It consists of an unpleasant feeling of anxiety and stress activated by the autonomous central nervous system²⁹ that can vary in time and intensity³⁰. Increased state-anxiety in individuals with bruxism occurs when nociceptive stimuli reach the central nervous system, and are directed not only to the cerebral cortex, but also to the limbic structures, which assess and influence the painful experience on an emotional level. In other words, pain is caused by complex interactions in the higher centers. It is important to underscore that the face, an essential human structure, is the primary means of eating and communicating, allowing interaction with others to display our emotions, objectives and opinions, as well as providing sources of both physical and emotional gratification and satisfaction. Changes to the orofacial segments associated with pain symptoms may increase insecurity and threaten individual wellbeing. They result in altered body image and can be influenced by psychological aspects, including anxiety³¹. Thus, it is believed that high state-anxiety levels may be related to the presence of pain symptoms. No difference was found for trait anxiety, in contrast to findings in the literature – Da Silva *et al.*³² – which report greater propensity to trait anxiety in bruxers.

Researchers such as Gungormus and Erciyas observed that people who grind their teeth have higher levels of anxiety and depression¹³. Along these lines, Kampe *et al.* found that individuals with bruxism had different personalities from the

normal population, displaying greater tendency towards anxiety, increased vulnerability to psychosomatic disorders and difficulty in social relationships²⁷. However, a study conducted by Manfredini *et al.* showed no association between bruxism and psychopathological anxiety²³. Rompré *et al.* report that levels of anxiety and stress do not differ between control and experimental groups³³. Clinical diagnosis of bruxism has provided a detailed description of psychosocial problems in individuals with bruxism, underscoring psychological issues, stress, anxiety, mood disorders, temperamental and emotional traits, as well as social matters such as work and personal relationships, all of which could have a negative effect on health².

In addition to personality traits, the relationship between living conditions and bruxism has also been explored. It regularly manifests itself in individuals affected by stress, which determines the frequency, duration and severity of the condition³. The literature reports that individuals with sleep bruxism experience greater stress in their daily lives and at work, compromising their physical status and causing them to deal with stressful situations in a negative manner¹⁰. This opinion is also common among patients, who often report increased teeth grinding during sleep and at stressful moments in their life², reacting with negative emotions. Although the relationship between bruxism and stress is still inconclusive, it is suggested that elevated levels of daily stressful events may be a risk factor²³. However, Pierce *et al.* found no significant relationship between electromyographic measurements recorded over 15 consecutive nights and self-reports of stress in individuals with bruxism, demonstrating significance only for eight of the one hundred subjects evaluated³⁴.

Diagnosis of bruxism is complex due to the various assessment criteria, such as self-reports, clinical evaluation, electromyography and polysomnography, with questionnaires being the most widely used method²¹. In this study, self-reports and clinical assessments were adopted as diagnostic criteria. Questionnaires to determine bruxism are generally used in epidemiological studies and clinical situations²¹ owing to their low cost and rapid diagnosis. However, this method does not distinguish between clenching and grinding teeth

during sleep or during the day²³. Polysomnography is the gold standard for diagnosing sleep bruxism, but the method is limited by its high cost. Diagnostic criteria do not clearly distinguish between sleep and daytime bruxism or its severity²³. A recent literature review suggests that self-reports of bruxism may be adequate for detecting conscious teeth clenching during wakefulness, which may be associated with masticatory muscle sensitivity or fatigue, whereas analysis of tooth wear or sleep laboratory recordings are more appropriate for detecting teeth grinding, whose implications may be different from clenching³⁵.

It is important to underscore that anxiety may manifest itself physiologically in different ways, including bruxism, caused by the increase in muscle tension, evidenced by hyperactive masticatory muscles, especially the masseter²⁴. Bruxism is the most harmful and destructive habit to affect the orofacial region, due to the fact that mandibular movements with no functional purpose^{2, 12, 35} cause masticatory dysfunction⁸.

A large proportion of complaints from individuals with bruxism are related to the masticatory function, since the association between clinical data and psychosocial aspects of daily activities shows a significant correlation with chewing disorders. It is important to note that mastication occurs via interaction between morphological aspects of orofacial structures, muscle and joint functional capacity, as well as food characteristics³⁶. The bilateral pattern of chewing favors the health of orofacial structures²⁵. This indicates that constant bruxism generates alterations in the normal physiological process of masticatory muscles⁴. It is a parafunctional habit that threatens the integrity of oral structures, since the force exerted exceeds the adaptive capacity of the masticatory system and the functional equilibrium of the stomatognathic system may be altered, causing a series of signs and symptoms⁶, highlighting alterations in dental structures, joint noise and facial pain. The altered mastication observed implies that persistent bruxism prolongs the excitability of afferent nociceptors of the masticatory and facial muscles, resulting in sensitization. This increases the painful stimulus, particularly in areas close to the oral cavity and those related to chewing. As such, it is believed that bruxism can be detrimental to

the masticatory function⁸. It is also a risk factor for temporomandibular dysfunctions (TMD)^{12, 23, 35}. Some authors have analyzed the association between bruxism, symptoms of temporomandibular dysfunction and pain, hypothesizing that bruxism may be one of the causes⁸, and a contributing factor for TMD⁴. A recent systematic literature review on the relationship between bruxism and temporomandibular dysfunction showed a positive association between them, based on clinical diagnostic or self-report methods, whereas quantitative methods for bruxism diagnosis – polysomnography and electromyography – demonstrate low association for TMD symptoms³⁵.

Implications that patients report during mastication corroborate the findings of Sutin *et al.* who found that individuals with bruxism complained of joint noise and chewing difficulties³⁷. In order to investigate the relationship between bruxism and craniofacial pain and masticatory symptomatology, Ciancaglini *et al.* demonstrated a complex association among the variables analyzed, underscoring difficulty with opening the mouth, joint noise, sensitivity or mandibular muscle fatigue and pain during mandibular movements⁸. Pizolato *et al.* analyzed maximum bite force in patients with temporomandibular dysfunction and bruxism, reporting that the presence of pain in the facial region is related to marked functional compromise⁴. It is believed that distribution of muscle strength in the teeth and temporomandibular joints of individuals with bruxism may result in tooth wear as well as hyperactivity and masseter muscle hypertrophy⁴.

Modification in orofacial muscles and the stomatognathic functions of chewing, swallowing and speaking characterize an orofacial myofunctional disorder. This may be associated with causal factors of the dysfunctions, provoking an imbalance in the functioning of the temporomandibular joint. It may also be the result of nociceptive stimulation caused by occlusion and/or the temporomandibular joint, which may provoke compensatory muscle behavior that can aggravate or perpetuate the problem²⁵. Alterations in mastication and other orofacial behavior may provoke a significant change in mechanical load of one temporomandibular joint (TMJ) or the other.

TMDs involve changes in stomatognathic functions as well as in lip and tongue position owing to the presence of nociceptive stimuli, triggered by occlusion and/or TMJ. These modifications are considered a compensatory or adaptive response, aimed at facilitating masticatory function and preserving structures in order to minimize pain and avoid discomfort. Unilateral mastication in individuals with TMD causes irregular movement, such as slowness, altered direction of movement and increased pain when chewing, where individuals opt for the side with greater masticatory efficiency²⁵. It is important to note that unilateral mastication in patients with TMD involves considerable risk of pain and increased signs and symptoms of dysfunction. Furthermore, compromised mastication occurs if functional adaptation exceeds structural and functional tolerance of TMJ, which may trigger dysfunction³⁸.

Bruxism causes changes in stomatognathic functions and structures, negatively affecting wellbeing when painful symptoms are present. As stated in research by Macfarlane *et al.* on orofacial impact, the most prominent effects resulted in consulting a dentist or doctor, taking medication, sleep disturbances and changes in eating habits. In addition to more severe behavioral impacts, we also highlight the inability to work, need for bed rest and reduced social contact, where patients reported a less satisfactory life²⁶, negatively affecting their emotional health.

In conclusion, individuals with bruxism displayed significant differences in state anxiety, in contrast to the non-bruxism group, showing an association between emotional factors and bruxism. The masticatory function in patients with bruxism was reduced, which may be the result of hyperactivity of the masticatory muscles caused by increased muscle tension. Due to the sample size and type of study employed, and considering the results observed, a limitation of this study was that its findings cannot be generalized. It is suggested that future investigations on masticatory function and orofacial myofunctional disorders should strive for better diagnostic and therapeutic methods, as well as employ interdisciplinary teams in a biopsychosocial context.

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