

## IMPACT OF BRUXISM ON TEMPOROMANDIBULAR JOINT OVERLOAD

### IMPACTO DO BRUXISMO NA SOBRECARGA DA ARTICULAÇÃO TEMPOROMANDIBULAR

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## ABSTRACT

Bruxism is defined as a repetitive activity of the masticatory muscles characterized by teeth clenching or grinding, which may occur during sleep or wakefulness. This parafunctional activity is associated with increased muscular activity and may lead to structural and functional alterations in the stomatognathic system, particularly in the temporomandibular joint (TMJ). The present study aimed to analyze the scientific evidence regarding the impact of bruxism on temporomandibular joint overload. This study consists of an integrative literature review conducted using the PubMed and SciELO databases, including articles published between 2016 and 2026 in Portuguese and English. Controlled descriptors related to bruxism and temporomandibular disorders were used and combined through Boolean operators to refine the search strategy. After applying the inclusion and exclusion criteria, 16 scientific articles were selected for analysis. The findings indicated that bruxism is frequently associated with hyperactivity of the masticatory muscles, which may increase the mechanical forces exerted on joint structures such as the mandibular condyle and the articular disc. In addition, individuals with bruxism showed a higher prevalence of signs and symptoms related to temporomandibular disorders, including orofacial pain, muscle fatigue, limited mouth opening, and joint sounds. It is concluded that bruxism may significantly contribute to biomechanical overload of the temporomandibular joint, favoring the development or aggravation of temporomandibular disorders. Therefore, early identification and appropriate management of this condition are essential to prevent functional alterations and improve the quality of life of affected individuals.

**Keywords:** Bruxism. Temporomandibular Joint. Temporomandibular Disorders. Stomatognathic System. Joint Overload.

## RESUMO

O bruxismo é caracterizado como uma atividade repetitiva dos músculos mastigatórios, marcada pelo apertamento ou ranger dos dentes, podendo ocorrer durante o sono ou em vigília. Essa atividade parafuncional está associada à hiperatividade muscular e pode provocar alterações estruturais e funcionais no sistema estomatognático, especialmente na articulação temporomandibular (ATM). O presente estudo teve como objetivo analisar as evidências científicas acerca do impacto do bruxismo na sobrecarga da articulação temporomandibular. Trata-se de uma revisão integrativa da literatura realizada nas bases de dados PubMed e SciELO, considerando artigos publicados entre 2016 e 2026, nos idiomas português e inglês. Foram utilizados descritores relacionados ao bruxismo e às disfunções temporomandibulares, combinados por operadores booleanos. Após aplicação dos critérios

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de inclusão e exclusão, foram selecionados 16 estudos científicos para compor a análise. Os resultados evidenciaram que o bruxismo está frequentemente associado à hiperatividade dos músculos mastigatórios, o que pode aumentar as forças exercidas sobre as estruturas articulares, como o côndilo mandibular e o disco articular. Além disso, observou-se maior prevalência de sinais e sintomas relacionados às disfunções temporomandibulares em indivíduos com bruxismo, incluindo dor orofacial, fadiga muscular, limitação da abertura bucal e ruídos articulares. Conclui-se que o bruxismo pode contribuir significativamente para a sobrecarga biomecânica da articulação temporomandibular, favorecendo o desenvolvimento ou agravamento das disfunções temporomandibulares. Dessa forma, a identificação precoce e o manejo adequado dessa condição são fundamentais para prevenir alterações funcionais e melhorar a qualidade de vida dos indivíduos afetados.

**Palavras-chave:** Bruxismo. Articulação Temporomandibular. Disfunção Temporomandibular. Sistema Estomatognático. Sobrecarga Articular.

## RESUMEN

El bruxismo se caracteriza por una actividad repetitiva de los músculos masticatorios, marcada por el apretamiento o rechinar de los dientes, que puede ocurrir durante el sueño o en estado de vigilia. Esta actividad parafuncional se asocia con hiperactividad muscular y puede causar cambios estructurales y funcionales en el sistema estomatognático, especialmente en la articulación temporomandibular (ATM). Este estudio tuvo como objetivo analizar la evidencia científica sobre el impacto del bruxismo en la sobrecarga de la articulación temporomandibular. Se trata de una revisión bibliográfica integradora realizada en las bases de datos PubMed y SciELO, considerando artículos publicados entre 2016 y 2026, en portugués e inglés. Se utilizaron descriptores relacionados con el bruxismo y los trastornos temporomandibulares, combinados con operadores booleanos. Tras aplicar los criterios de inclusión y exclusión, se seleccionaron 16 estudios científicos para el análisis. Los resultados mostraron que el bruxismo se asocia frecuentemente con hiperactividad de los músculos masticatorios, lo que puede aumentar las fuerzas ejercidas sobre las estructuras articulares, como el cóndilo mandibular y el disco articular. Además, se observó una mayor prevalencia de signos y síntomas relacionados con trastornos temporomandibulares en individuos con bruxismo, incluyendo dolor orofacial, fatiga muscular, limitación de la apertura bucal y ruidos articulares. Se concluye que el bruxismo puede contribuir significativamente a la sobrecarga biomecánica de la articulación temporomandibular, favoreciendo el desarrollo o el empeoramiento de los trastornos temporomandibulares. Por lo tanto, la identificación temprana y el manejo adecuado de esta afección son fundamentales para prevenir alteraciones funcionales y mejorar la calidad de vida de las personas afectadas.

**Palabras clave:** Bruxismo. Articulación Temporomandibular. Disfunción Temporomandibular. Sistema Estomatognático. Sobrecarga Articular.

## 1 INTRODUCTION

Bruxism is defined as a repetitive activity of the masticatory muscles characterized by clenching or grinding of the teeth, which can occur during sleep or wakefulness. This activity is related to involuntary or semi-voluntary mandibular movements that involve muscle hyperactivity of the stomatognathic system. Currently, bruxism is recognized as a parafunctional behavior capable of causing changes in different orofacial structures, including teeth, masticatory muscles, and the temporomandibular joint (TMJ). According to Lobbezoo et al. (2018), bruxism can be classified into sleep bruxism and awake bruxism, both of which are associated with functional changes in the masticatory system. In addition, studies show that repetitive muscle activity can generate relevant biomechanical impacts on joint structures (LAVIGNE et al., 2018).

The etiology of bruxism is considered multifactorial, involving the interaction between biological, psychological, and environmental factors. Several studies point out that aspects such as stress, anxiety, sleep disorders, genetic predisposition, and neurological factors can contribute to the development of this parafunctional activity. According to Manfredini and Lobbezoo (2016), psychosocial factors play an important role in modulating mandibular muscle activity, influencing the frequency and intensity of bruxism episodes. In addition, oral behaviors during wakefulness, such as prolonged tooth clenching, have also been associated with increased masticatory muscle activity and the appearance of painful symptoms in the orofacial region (EMODI-PERLMAN et al., 2025).

From a clinical point of view, bruxism can trigger several structural and functional changes in the stomatognathic system. Among the most frequently observed manifestations are tooth wear, hypertrophy of the masticatory muscles, tooth sensitivity, headaches, and myofascial pain. These alterations can directly influence the function of the temporomandibular joint, contributing to the development or worsening of temporomandibular disorders (TMD). Studies indicate that individuals with bruxism are more likely to develop TMD-related symptoms, especially orofacial pain and mandibular functional limitations (MORTAZAVI et al., 2023; OHLAND et al., 2020). In this context, integrative reviews also point out that the association between bruxism and TMD represents an important risk factor for joint alterations (PEREIRA et al., 2023).

Excessive muscle activity associated with bruxism can generate significant mechanical overload on the components of the temporomandibular joint, including the mandibular condyle, the articular disc, and the associated ligaments. This increase in load can alter the physiological distribution of joint forces, favoring the emergence of inflammatory or degenerative processes over time. Biomechanical studies have shown that repetitive

episodes of clenching and grinding of the teeth can modify the load dynamics in the temporomandibular joint. In this sense, Sagl et al. (2021) demonstrated that specific occlusal features and certain patterns of mandibular movement during bruxism can significantly increase mechanical stress on the TMJ. Similar results were observed in biomechanical analyses that investigated the influence of tooth morphology and direction of mandibular movement on joint load (SAGL et al., 2022).

The repercussions of bruxism on the temporomandibular joint can significantly compromise the quality of life of affected individuals, since they are often associated with orofacial pain, mandibular functional limitation, and changes in sleep pattern. In addition, the persistence of this parafunctional activity can contribute to the progressive worsening of muscle and joint changes over time. Clinical studies also point out that individuals with temporomandibular disorders often have poorer sleep quality and a greater presence of parafunctional habits (MOURATO et al., 2024). Thus, understanding the relationship between bruxism and temporomandibular joint overload becomes fundamental for the development of more effective diagnostic and therapeutic strategies. Thus, the present study aims to analyze, through an integrative literature review, the scientific evidence about the impact of bruxism on temporomandibular joint overload.

## 2 METHODOLOGY

The present study is characterized as an **integrative literature review**, a method that allows gathering, analyzing and synthesizing research results on a given topic, enabling a broader understanding of the investigated phenomenon and the identification of gaps in scientific knowledge. This type of review allows the inclusion of different methodological designs, allowing the integration of results from experimental and non-experimental studies, contributing to the construction of evidence relevant to clinical practice (WHITTEMORE; KNAFL, 2005).

The conduct of this integrative review followed previously established methodological steps, including: definition of the theme and the guiding question of the study, establishment of inclusion and exclusion criteria, search in the selected databases, screening and selection of studies, critical reading of the included articles, and synthesis of the evidence found in the literature.

The bibliographic search was carried out in the **PubMed and SciELO** databases, widely recognized for indexing relevant scientific publications in the health area. The search process took place between **January and March 2026**, using controlled descriptors from the **DeCS (Health Sciences Descriptors)** and **MeSH (Medical Subject Headings)**

vocabularies, in addition to free terms related to the research theme. The descriptors were combined using the Boolean operators **AND** and **OR**, with the objective of expanding and refining the results obtained.

The main descriptors used were: "**Bruxism**", "**Sleep Bruxism**", "**Awake Bruxism**", "**Temporomandibular Joint**", "**Temporomandibular Disorders**", "**Temporomandibular Dysfunction**" and "**Joint Loading**". Articles published between **2016 and 2026**, in **Portuguese and English**, available in full in the selected databases, were considered.

As inclusion criteria, scientific studies that addressed the relationship between **bruxism and functional, biomechanical, or clinical alterations of the temporomandibular joint** were considered, including **clinical studies, observational studies, literature reviews, systematic reviews, and comparative research**. Duplicate studies among the databases, publications that did not directly address the research topic, articles that were not available in full, isolated case reports, and studies published outside the previously established period were excluded.

The selection process took place in successive stages. Initially, the titles of the publications identified in the databases were read, excluding those that were not related to the research theme. Next, the abstracts were analyzed in order to verify the scientific relevance of the studies for the objectives of this review. Subsequently, potentially eligible articles were submitted to full reading, allowing them to confirm their adequacy to the established inclusion criteria.

After applying the eligibility criteria, **16 scientific studies were considered relevant to compose the analysis of this integrative review**.

The data extracted from the included studies were analyzed in a **qualitative and descriptive** way, considering aspects such as authors, year of publication, research objectives, methodological design and main results presented. The information obtained was organized and compared, enabling the synthesis of the available evidence on the impact of bruxism on temporomandibular joint overload.

### **3 RESULTS**

We included **16 scientific studies** that addressed the relationship between bruxism and functional, clinical or biomechanical changes in the temporomandibular joint. The studies analyzed have different methodological designs, including literature reviews, systematic reviews, observational studies, and biomechanical analyses.

**Table 1** presents the characterization of the studies included in this integrative review, containing information on authors, year of publication, type of study, and main findings related to the impact of bruxism on the temporomandibular joint.

**Table 1**

*Characterization of the studies included in the integrative review*

Author	Year	Type of study	Key findings
Kato et al.	2017	Narrative review	Sleep bruxism involves repetitive orofacial movements associated with masticatory muscle activity during sleep. Bruxism related to muscle hyperactivity
Lavigne et al.	2018	Narrative review	and functional alterations of the stomatognathic system.
Lobbezoo et al.	2018	International consensus	It defines and classifies bruxism into sleep bruxism and wakefulness bruxism.
Manfredini; Lobbezoo	2016	Narrative review	Psychosocial factors such as stress and anxiety participate in the etiology of bruxism.
Mortazavi et al.	2023	Systematic review with meta-analysis	Significant association between bruxism and temporomandibular disorders.
Ohland et al.	2020	Clinical observational study	Correlation between sleep bruxism and clinical signs of temporomandibular disorder.
Pereira et al.	2023	Integrative review	Bruxism associated with symptoms and functional changes of the TMJ.
Figueiredo et al.	2024	Narrative review	Bruxism can generate tooth wear and overload of the masticatory system.
Sagl et al.	2021	Biomechanical study (finite element)	Dental contact patterns influence the load exerted on the TMJ during bruxism.
Sagl et al.	2022	Biomechanical study	Dental morphology and direction of mandibular movement alter the distribution of joint forces.

Mourato et al.	2024	Cross-sectional observational study	Association between TMD, sleep quality and parafunctional habits.
Emodi-Perlman et al.	2025	Observational clinical study	Awake bruxism associated with a higher prevalence of orofacial pain.
Silva et al.	2023	Narrative review	Discussion on the diagnosis and treatment of bruxism.
Costa et al.	2023	Narrative review	Etiological and therapeutic aspects of sleep bruxism.
Cunha; Sousa	2022	Narrative review	Pharmacological approaches in the management of bruxism.
Garcia et al.	2025	Narrative review	Use of botulinum toxin as a therapeutic alternative for bruxism.

Source: Authors.

## 4 DISCUSSION

### 4.1 CONCEPT AND PATHOPHYSIOLOGY OF BRUXISM

Bruxism is currently understood as a repetitive activity of the masticatory muscles characterized by clenching or grinding of the teeth, which can occur during sleep or wakefulness. According to Lobbezoo et al. (2018), this parafunctional activity involves rhythmic or sustained mandibular movements associated with masticatory muscle hyperactivity. In a complementary way, Lavigne et al. (2018) highlight that bruxism has a multifactorial origin and may involve neuromuscular and behavioral mechanisms related to the motor control of mastication. In this context, repetitive muscle activity can have significant impacts on the structures of the stomatognathic system, especially when it occurs persistently or in association with predisposing factors.

In addition, the literature indicates that bruxism can play an important role in modifying the biomechanical forces exerted on the temporomandibular joint. The constant repetition of episodes of tooth clenching can alter the functional balance between muscles, teeth and joint structures, contributing to the increase in the loads exerted on the TMJ. Thus, understanding the pathophysiology of bruxism becomes essential to explain its possible effects on the joint and muscle structures of the masticatory system.

### 4.2 ETIOLOGICAL FACTORS ASSOCIATED WITH BRUXISM

The etiology of bruxism is considered complex and multifactorial, involving the interaction between biological, psychological, and behavioral factors. Studies indicate that

psychosocial factors, such as stress and anxiety, can directly influence masticatory muscle activity. Manfredini and Lobbezoo (2016) point out that emotional and behavioral aspects can act as important modulators of mandibular parafunctional activity, contributing to the increase in the frequency and intensity of bruxism episodes.

In addition to psychosocial factors, changes in sleep patterns and oral behaviors during wakefulness have also been associated with the occurrence of this condition. Emodi-Perlman et al. (2025) observed that individuals who have parafunctional habits, such as prolonged tooth clenching, tend to have a higher prevalence of painful symptoms in the orofacial region. These findings suggest that the interaction between psychological, behavioral, and physiological factors may contribute to the maintenance of excessive muscle activity, favoring functional changes in the stomatognathic system.

#### 4.3 BRUXISM AND TEMPOROMANDIBULAR DISORDERS

Several studies indicate an association between bruxism and the development of temporomandibular disorders (TMD). These dysfunctions involve muscle and joint changes that can compromise the proper functioning of the temporomandibular joint and masticatory muscles. Mortazavi et al. (2023), in a systematic review with meta-analysis, observed that individuals with bruxism are more likely to develop TMD-related symptoms, including orofacial pain and mandibular functional limitation.

Similarly, Ohland et al. (2020) identified a correlation between sleep bruxism and the presence of clinical signs of temporomandibular disorder, such as joint pain and joint noises during mandibular movements. However, some authors point out that this relationship may not be exclusively causal, since behavioral and psychosocial factors can also contribute to the development of these dysfunctions (MANFREDINI; LOBBEZOO, 2016). Thus, although bruxism is often considered a factor associated with temporomandibular disorders, its influence should be analyzed within a multifactorial context.

#### 4.4 BIOMECHANICAL OVERLOAD OF THE TEMPOROMANDIBULAR JOINT

Muscle hyperactivity associated with bruxism can result in increased forces exerted on the structures of the temporomandibular joint, favoring the occurrence of biomechanical overload. Repetitive episodes of tooth clenching can generate increased pressure on the mandibular condyle and the articular disc, altering the physiological distribution of joint loads.

Biomechanical studies indicate that certain occlusal features and mandibular movement patterns may intensify mechanical stress on temporomandibular joint structures. Sagl et al. (2021) demonstrated that the pattern of dental contact during bruxism episodes

can directly influence the magnitude of the forces transmitted to the joint. In a later study, Sagl et al. (2022) observed that the morphology of the dental cusps and the direction of mandibular movement can also modify the distribution of joint loads. These findings reinforce the hypothesis that bruxism may contribute to biomechanical alterations in the temporomandibular joint, especially when associated with unfavorable occlusal factors.

#### 4.5 CLINICAL IMPLICATIONS AND FUNCTIONAL IMPACT

The repercussions of bruxism on the stomatognathic system can significantly compromise the quality of life of affected individuals. Among the most frequently reported clinical manifestations are orofacial pain, muscle fatigue, limitation of mouth opening, and the presence of joint noises. Mourato et al. (2024) highlight that individuals with temporomandibular disorders often have poorer sleep quality and a greater presence of parafunctional habits, which can contribute to the maintenance of excessive muscle activity.

In addition, the persistence of bruxism over time can favor the progression of muscle and joint changes, increasing the risk of developing chronic temporomandibular disorders. In this context, the early identification of bruxism and the adoption of appropriate therapeutic approaches become essential to reduce the functional overload of the temporomandibular joint and minimize the impacts of this parafunctional activity on the masticatory system.

### 5 CONCLUSION

It is concluded that bruxism has a significant relationship with functional and biomechanical alterations of the temporomandibular joint (TMJ), and may contribute to the increase of masticatory muscle activity and to the overload of joint structures. The studies analyzed in this integrative review indicate that muscle hyperactivity associated with clenching or grinding of the teeth can intensify the forces exerted on joint components, such as the mandibular condyle and the articular disc, favoring the emergence or worsening of joint dysfunctions.

In addition, the literature shows that individuals with bruxism have a higher prevalence of symptoms associated with temporomandibular disorders, including orofacial pain, muscle fatigue, and mandibular functional limitations. In this context, understanding the relationship between bruxism and joint overload becomes fundamental for the development of more effective diagnostic and therapeutic strategies. Thus, the importance of early diagnosis and a multidisciplinary approach in the management of bruxism is emphasized, as well as the need for further studies that deepen the understanding of the biomechanical mechanisms involved in this condition.

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