Review Article

Correlation Between Temporomandibular Joint Disorders and Bruxism: *A Systematic Review and Meta-analysis*

Tahsinul Haque

ABSTRACT

Background

The common conditions bruxism and temporomandibular joint disorders (TMD) have a major impact on dental health and quality of life. Even though both disorders have been thoroughly examined, there is still discussion and research surrounding their association.

Objective

The purpose of this study was to investigate the relationship, possible risk factors, and therapeutic consequences of the interaction between bruxism and TMD.

Methods

To summarize the available data on the relationship between bruxism and TMD, a thorough literature review was carried out. Furthermore, information was gathered to look at the connection between TMD symptoms and self-reported bruxism. We searched several databases for the relevant literature. These included; PubMed, Cochrane Google Scholar, etc. Following the inclusion and exclusion criteria a group of researchers collaborated to "include" and "exclude" the studies and a total of n=11 studies were considered for final review and analyses.

Results

The primary endpoint of the current analysis was to evaluate the correlation between temporomandibular joint disorders and bruxism. 10/11 (91%) of the studies advocated for a significant correlation; whereas, only 1/11 (9%) favored that there is a negative association between the two. The overall Odds ratio value was =5.66, CI=95% (4.63-6.91). The overall heterogeneity was found to be Tau^2=0.05; Chi^2=26.00; df=8; I2=69%. The overall effect size was found to be, Z=16.97 (p<0.00001) which was significant.

Conclusion

In conclusion, our research shows an important association between temporomandibular joint abnormalities and bruxism, emphasizing the significance of identifying and treating these diseases in clinical settings. When patients report similar symptoms, healthcare practitioners should think about screening for both bruxism and TMD. Multidisciplinary approaches may also be helpful for a thorough examination and course of therapy. To further inform preventive and treatment measures, more study is required to clarify the underlying processes and causal links between bruxism and TMD.

Keywords

Bruxism; temporomandibular joint disorders; meta-analysis.

INTRODUCTION

The temporomandibular joint (TMJ) is a central structure that facilitates vital movements of the jaw, including movements necessary for speech, chewing, and expressions on the face.[1] Temporomandibular joint disorders (TMDs) are abnormalities of the complex system that can cause a variety of symptoms, from mild discomfort to severe pain and decreased function.[2] Myofascial pain dysfunction syndrome, disc displacement disorders, and temporomandibular joint discomfort are only a few of the conditions that fall under the broad heading of "TMDs," and each presents its own set of difficulties for diagnosis and treatment.[3-4]

According to research, temporomandibular disorders (TMD) are the most prevalent cause of persistent pain in the orofacial region that is not of dental origin, affecting between 5 and 12% of the general population.[5-6]

The possible relationship between bruxism and the onset or aggravation of TMDs is an intriguing area of research amidst the complex etiology of these disorders.[7] Bruxism, which is defined as the compulsive clenching or grinding of teeth, is a common but sometimes undiagnosed condition. Its frequency is found in a wide range of demographics, including adults and children, and it manifests in different degrees of severity. Although bruxism has historically been thought of as a parafunctional activity that occurs at

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night, it can also occur during the day, which increases its potential to negatively affect TMJ and oral health.[8-9] In neurology, sleep medicine, and dentistry, there is a lot of interest in the connection between bruxism and TMDs with a patient's chance of experiencing TMD discomfort eight times higher.[10-11] Nevertheless, contradictory results abound in the literature, and the exact nature of this link is still unclear after decades of study. Certain studies propose a direct causative relationship between TMDs and bruxism,[12] citing microtrauma and mechanical stress on the TMJ and adjacent structures as triggers.[13] On the other hand, some suggest a more complex interaction, pointing to genetic predispositions, central nervous system regulation, and sociocultural variables as influencing the course of both disorders.[14] Determining the relationship between bruxism and TMDs becomes critical given the possible implications for clinical practice and patient care.[15] This research aims to contribute to a more nuanced understanding of this complicated relationship by critically reviewing methodological approaches, combining diverse findings, and thoroughly investigating the body of existing information. This study aims to shed light on the underlying mechanisms[16] that connect bruxism to TMDs through the thoughtful integration of empirical data and theoretical frameworks. This will help to guide future research directions, preventive measures, and targeted therapies. In light of this, the current study attempts to conduct a thorough literature review and analysis of a wide range of research regarding the relationship between bruxism and TMDs. By describing the most important findings, identifying knowledge gaps, and explaining the consequences for clinical practice, this study aims to provide doctors, researchers, and stakeholders with a thorough framework for tackling this urgent problem.

Rationale:

The clinical relevance, high prevalence, difficulties in diagnosis, and therapeutic implications of temporomandibular joint diseases provide grounds for examining the association between them. This study intends to improve clinical management, expand our understanding of these complicated disorders, and direct future research endeavors focused on improving outcomes for people with TMDs and bruxism by clarifying the nature of this relationship.

Objectives: 1) Analyze existing research, meta-analyses, and systematic reviews in-depth to determine how bruxism and temporomandibular joint disorders (TMDs) are related. 2) Examine possible biological mechanisms that underlie the association between TMDs and bruxism. 3) Identify areas of current knowledge that need to be addressed and suggest directions for future study to improve our comprehension of the relationship between TMD and bruxism. 4)Examine the medical implications for dentists, oral surgeons, and primary care physicians of the connection between bruxism and TMJ disorders.

METHODS

Eligibility criteria

Eligibility criteria for the studies were set following the Population, Intervention, Comparison, Outcome, and Study Design (PICOS) scheme as recommended by the Preferred Reporting Items for Systematic Review and Meta-Analyses.[17] Inclusion and Exclusion criteria mentioned in the Table 1.

Inclusion criteria

The inclusion criteria were as follows: 1) Patients with a confirmed diagnosis of temporomandibular joint disorder (TMD) based on established diagnostic criteria, such as the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) or the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD). 2) People who have received a clinical diagnosis of bruxism based on accepted diagnostic standards, such as objective measurements (e.g., polysomnography), self-reported symptoms (e.g., grinding or clenching of teeth), or findings from dental examinations (e.g., wear patterns in teeth). 3) participants who are able and willing to take part in the research, give their informed consent, and adhere to all

Table 1: List of inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
1. Language	English	All other languages
2. Timeframe of publications	2005 onwards	Older
3. Type of Studies	Randomized control trials Cross-sectional studies Case-control studies	Perspective Case study Reviews Grey literature
4. Region	All	

Criteria	Inclusion	Exclusion
5. Target Population	individuals who present with either bruxism, temporomandibular joint disorders (TMDs), or both. This could encompass individuals of various demographics	Individuals with severe systemic diseases or conditions that could impact TMJ function or contribute to bruxism
6. Context	Evaluation of the relationship between TMJ disorders and bruxism	Other surgical or non-surgical interventions.

study protocols, which include gathering data, filling out questionnaires, and conducting follow-up exams.

4) people without a history of orthognathic or temporomandibular joint surgery, unless the study has been specifically intended to look at the results in this subgroup.

Exclusion Criteria

The exclusion criteria were as follows; 1) Patients who already have craniofacial defects or congenital abnormalities, or who suffer from any syndrome that may impair the structure or function of the temporomandibular joint. 2) People who have had orthognathic or temporomandibular joint surgery in the past 3) Individuals suffering from neuropathic pain syndromes or fibromyalgia, two chronic pain conditions linked to TMDs. 4) Individuals with serious systemic illnesses or disorders that may affect the function of the TMJ or cause bruxism.

Information sources:

We searched several databases for the relevant literature. These included; PubMed[18], Cochrane Google Scholar[19], etc. Several other independent journals were also considered, but no articles were retrieved from the journals due to a lack of full free-text availability.

Search strategy:

A total of 12 studies (N= 1039) were found that cover the search terms ("Bruxism" OR "Teeth grinding" OR "Tooth clenching" OR "Nocturnal bruxism" OR "Sleep bruxism") AND ("Temporomandibular disorders" OR "TMJ disorders" OR "TMJ dysfunction" OR "Temporomandibular joint dysfunction" OR "Temporomandibular pain") We also inspected the reference lists of the studies included for the systematic review and meta-analyses.

Selection Process:

A literature search was conducted in peer-reviewed journals and publications, by the inclusion criteria. The peer-reviewed journals, with strong impact factors, were explored further to reduce the possibility of publication bias. All articles were uploaded on Rayyan.ai, for primary and secondary screening.[20] The first step was to detect any duplicate trials to prevent foreseeable outcomes. 66 articles were detected as duplicates and removed from the original literature search. n=437 articles were marked ineligible by the automation tools, A total of n=422 articles were deemed eligible for primary screening. Following the inclusion and exclusion criteria a group of researchers collaborated to "include" and "exclude" the studies and a total of n=12 studies were considered for final review and analyses. We excluded the studies due to a variety of reasons. 1) The study design was not ideal for analysis, 2) The study did not have the preferred outcome, and 3) The study showed a potential risk of bias. Sometimes it could be due to the combined effect of all of these reasons.

Data Items:

Following the completion of the secondary screening, the total n=32 articles from the selected literature were scrutinized. We used the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) standards to create a PRISMA FLOW DIAGRAM for the selected studies from journals and other independent resources (if the reports were available). The PRISMA flow diagram is given in Figure 1.[17]

After the study selection process was complete, the study interventions were tabulated against their study populations and their outcomes one by one. The synthesis table only mentions the relevant themes of the outcomes.

Bias in the analysis was minimized by 1) selecting high-end quality research through literature review. 2) requiring peer reviews to disclose conflicts of interest. 3) eliminating the biases around informed consent and peer review in clinical research and practice. 4) replacing ordinary review articles with meta-analyses. To maintain the standards of the study, Systematic reviews and narrative reviews were frequently excluded from the literature. These guidelines detect and

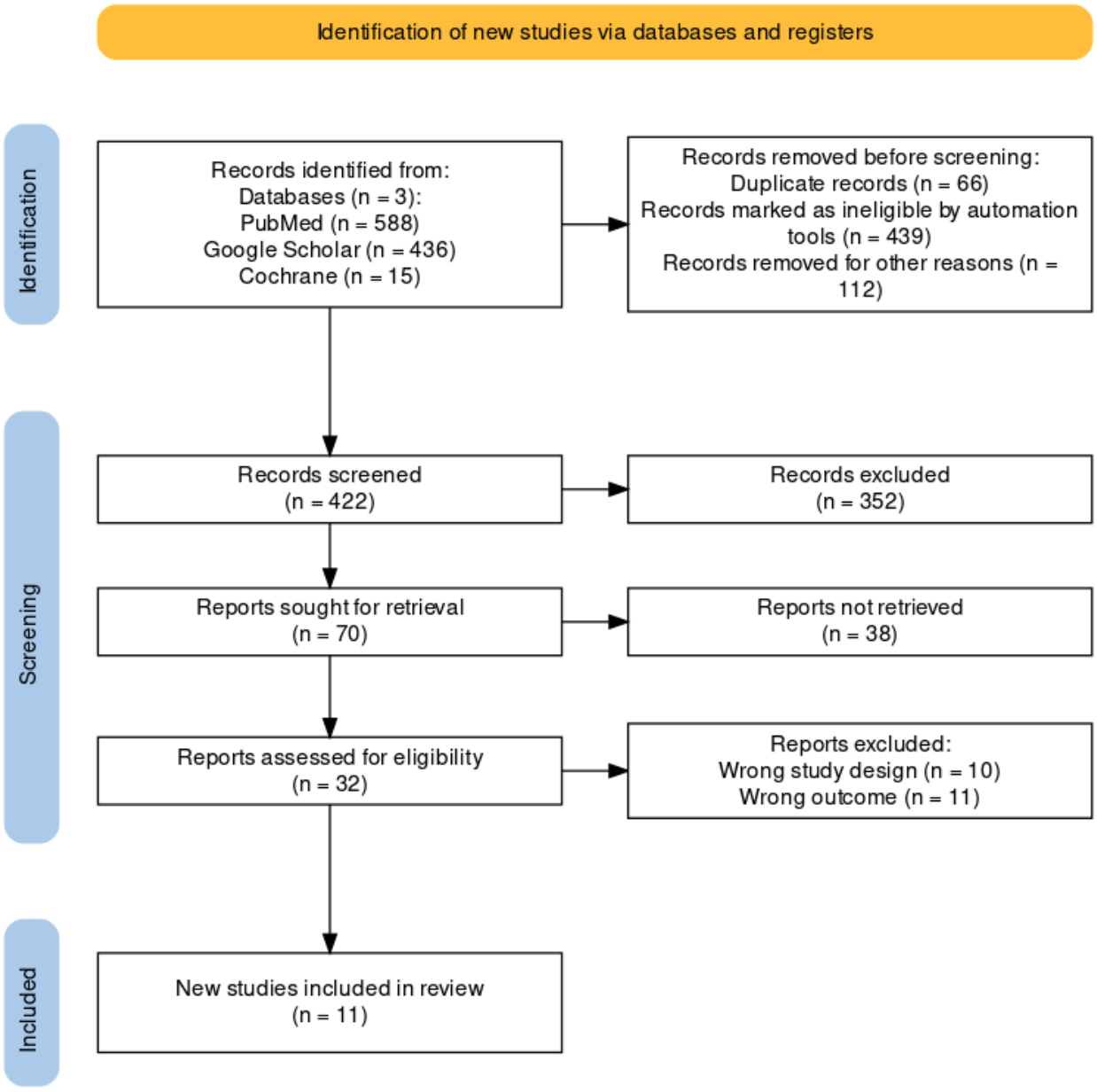

Figure 1: PRISMA flow chart for selected items.

eliminate the bias in the study protocol in compliance with *(DICKERSIN, 1997)* stages of removing the publication bias. Based on this data for randomization, a "traffic light" figure was plotted. A summary of the ROB was also mentioned for collaborator convenience.

RESULTS

Data Extraction:

A data collection form was created using Microsoft Excel and included all relevant factors and study results. Information regarding the clinical trial phase, study year, sample size, baseline characteristics, primary outcomes, and any documented adverse events were reported for each included article, which underwent independent evaluation.

Study Characteristics:

We selected 11 studies manually in the final sample. (see Table 2)

CASP Assessment:

As mentioned earlier, the CASP tool was used to assess the risk for all the primary studies selected for the systematic review. We used the Critical Appraisal Skills Programme (CASP) tool[32] to create a quality assessment table for all the studies included in the final sample. The assessment table for 8 primary studies is mentioned in Table 3.

Correlation between bruxism and TMJ disorders:

The primary endpoint of the current analysis was to evaluate the correlation between temporomandibular joint disorders and bruxism. 10/11 (91%) of the studies advocated for a significant correlation; whereas, only 1/11 (9%) favored that there is a negative association between the two. The overall Odds ratio value was =5.66, CI=95% (4.63-6.91). The overall heterogeneity was found to be Tau^2=0.05; Chi^2=26.00; df=8; I2=69%. The overall effect size was found to be, Z=16.97 ($p<0.00001$) which was significant. We concluded that a consistent association between bruxism and TMD, with numerous studies reporting a higher prevalence of TMD symptoms among individuals with bruxism compared to those without. The Odds values of Camparis et al, (2006), Fernandes et al (2012), Fernandes et al (2014), Huhtela et al (2016), Lekatas et al (2017), Manfredini et al (2013) were 7.30 [95% CI, 3.73-14.32], 6.90[95% CI, 3.59-13.26], 7.10 [95%CI, 1.40-36.01], 5.71[95% CI, 4.86-6.71], 4.96 [95% CI, 1.01-24.30] and 6.70 [5.90-7.61] respectively. The Odds values of the remaining studies, Muzalev et al (2019), ReiBmann et al, (2017), Sierwald et al, (2015), and Van Selms et al, (2017) were 7.02 [95% CI, 5.70-8.65], 5.10 [95% CI,3.30-7.88], 2.90 [95%CI, 2.10-4.00], and 1.15 [95%CI, 1.09-1.20] respectively. In the current analysis, a positive association was found between bruxism and Temporomandibular joint disorders. (Table 4)

DISCUSSION

The current systematic review and meta-analyses aimed at providing a comprehensive evaluation in identifying the correlation between temporomandibular joint disorders and bruxism.

Various studies on bruxism and TMJD were found during the literature review. We extracted the desirable outcomes from these studies for; the correlation between bruxism and TMJD. Because of their widespread occurrence, variety of clinical presentations, and possible negative effects on quality of life, bruxism and temporomandibular joint disorders (TMD) provide serious challenges to the fields of dentistry and orofacial medicine. In literature, there has been much discussion and interest in the relationship between these conditions. In this study we will go over the consequences of our research on the relationship between TMD and bruxism, as well as possible underlying processes, clinical considerations, and directions for further study.

In the study conducted by Sierwald et al. (2015), a case-control study conducted in Germany, the case group for the present study included 733 patients. The control group comprised 890 of 896 individuals after excluding 6 cases with diagnosed TMD pain. A thorough evaluation was conducted to find an association between sleep, awake bruxism, and temporomandibular joint disorders. Assessment of bruxism (Awake and sleep bruxism) were identified by self-reports on a standardized medical history form which is part of the RDC/ TMD. The percentage of TMD patients who reported clenching or grinding while awake was significantly greater (33.9%; $p<0.001$) compared to the 11.2% of controls. 49.4% of TMD patients and 23.5% of controls reported having nocturnal clenching or grinding ($p<0.001$). The overall odds ratio for this study was found to be 2.90[2.10-4.00].

Another study mentioned in our synthesis table, Reißmann et al. (2017) was also a case-control study, conducted in Germany to evaluate the association between both. There were 705 participants recruited as a part of a Multicentre trial. To determine if self-reported bruxism (as in sleep or awake) and the existence of painful TMD are related, logistic regression analyses were used. The results included the computation of odds ratios (ORs) with 95% confidence intervals (CIs). The results of this study have shown that both sleep and awake bruxism are linked to a higher prevalence of painful TMD and that these links are not exclusive but rather result from additive interactions between the two forms of bruxism. The main effects for both awake (OR = 6.7; 95% CI: 3.4 to 12.9) and sleep (OR = 5.1; 95% CI: 3.1 to 8.3) bruxism were significant, according to logistic regression models that controlled for age and gender. The Odds ratio value for this study was 5.10[3.10-7.88]. A cross-sectional study

conducted in Finland, with data gathered from 4,403 Finnish students included in the Finnish Student Health Survey 2012 also demonstrated the same results, with a significant association between bruxism and TMJD. TMD symptoms and bruxism are common among university students in Finland. Self-reported bruxism is linked to symptoms of TMD, which validates previous research. The results of the logistic regression analysis, which took age and gender into account, indicated a correlation between TMD discomfort and the report of sleep or awake bruxism (Odds Ratio [OR] = 5.71; 95% confidence interval [CI] = 4.86-6.70).

Our research supports the body of data that bruxism and TMD are related. When patients appear with orofacial discomfort, dysfunction, or associated symptoms, it is clinically relevant to examine both diseases. The documented correlation between self-reported bruxism and TMD symptoms demonstrates this. Those with bruxism appear to have a higher prevalence of TMD symptoms than those without, suggesting a possible role for bruxism in the onset or aggravation of TMD. Neurophysiologically, the pathophysiology of TMD and bruxism may be related to changes in the central nervous system's control of masticatory muscle activity, neurotransmitter imbalances, and aberrant sensorimotor processing.[33] The symptoms of bruxism and TMD may be made worse by psychosocial variables such as stress, anxiety, and unhealthy coping techniques. This emphasizes the significance of a biopsychosocial approach to diagnosis and treatment.[34,35] Understanding the link between TMD and bruxism has significant clinical ramifications for patient care, diagnosis, and therapy planning. When treating patients who come with similar symptoms, healthcare professionals should take a thorough approach to evaluating and treating both illnesses. To determine the existence and severity of bruxism and TMD, a comprehensive history-taking, physical examination, and, where necessary, diagnostic imaging should be included in the clinical evaluation process. A variety of conservative measures, including patient education, behavioral interventions, occlusal splint therapy, medication, and, in cases where treatment is not responding, surgical interventions or interdisciplinary approaches involving dentists, oral and maxillofacial surgeons, orthodontists, and specialists in orofacial pain management, may be included in management strategies.[36-39]

To sum up, our research adds to the increasing amount of data indicating a link between temporomandibular joint problems and bruxism. The identification of this correlation has significant implications for clinical practice, patient management, and future research endeavors aimed at improving the diagnosis and treatment of these prevalent and frequently co-occurring conditions in dental and orofacial medicine, even though the precise mechanisms and causal relationships are still not fully understood.

Limitations

Differences in diagnostic standards throughout research projects may compromise the coherence and comparability of results.

Conclusion

First, bruxism and TMD were revealed to be statistically significantly associated in our study. It has been discovered that the likelihood of TMD symptoms in those with bruxism is higher than in people without the condition. There may be a strong correlation between the two conditions because this association is held for both genders and age groups. Furthermore, stress, anxiety, malocclusion, and sleep disruptions were among the potential risk factors and comorbidities linked to TMJ and bruxism that our study revealed. These elements may interact with TMD and bruxism to affect the severity and course of both disorders. Finally, our results highlight how critical it is for clinicians to understand the relationship between temporomandibular joint diseases and bruxism. When patients appear with similar symptoms, healthcare practitioners should think about screening for both illnesses. For a thorough examination and course of therapy, interdisciplinary approaches involving dentists, orthodontists, and specialists in orofacial pain management may be helpful.

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Conflict of Interest: None

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Table 2: Selected study characteristics.

Sr.	Study Id.	Location	Participants	Study Design	Intervention	Key findings	Results
1	Sierwald et al. (2015)[21]	Germany	The case group for the present study included 733 patients. The control group comprising 890 of 896 individuals after excluding 6 cases with diagnosed TMD pain i	Case-control study	Assessment of bruxism Awake and sleep bruxism were identified by self-reports on a standardized medical history form which is part of the RDC/ TMD	When occurring separately, awake and sleep bruxism are significant risk factors for TMD pain. In case of simultaneous presence, the risk for TMD pain is even higher.	While 11.2% of the controls reported clenching or grinding while awake, this proportion was significantly higher in TMD patients (33.9%; p<0.001). Nocturnal clenching or grinding was reported by 23.5% of the controls and 49.4% of the TMD patients (p<0.001).
2	Reißmann et al. (2017)[22]	Germany	there were 705 participants recruited as a part of a Multicentre trial	case-control study	Logistic regression analyses were applied to test for the association between self-reported bruxism (sleep and/or awake) and the presence of painful TMD, and odds ratios (ORs) with 95% confidence intervals (95% CIs) were computed.	This study has demonstrated that awake and sleep bruxism are associated with an increased presence of painful TMD, and that both types of bruxism are not independently associated, but interact additively.	Based on logistic regression analyses adjusted for age and gender, the main effects for both awake (OR = 6.7; 95% CI: 3.4 to 12.9) and sleep (OR = 5.1; 95% CI: 3.1 to 8.3) bruxism were significant.
3	Leketas et al. (2017)[23]	Italy	260 controls and 260 subjects with TMD	case-control study	The subjects were asked to fill in the OBC control list, which is a self-report scale for identifying and quantifying the frequency of jaw overuse behaviors. The instrument was translated into Lithuanian following the International RDC-TMD Consortium guidelines.	etermine the link between OBs and TMD. We selected TMD patients with no face or head traumas, no previous orthodontic treatment, occlusion or dental row defects, who indicated at least one parafunction in the questionnaire. Thus, other well-known and most common causes of TMD were eliminated.	very frequent expression of "holding, tightening, or tense muscles" is associated with 10.83 times (P < 0.05) higher risks of TMD, "grinding teeth together during waking hours" with 4.94 times (P < 0.05), and "sustained talking with" 2.64 times (P < 0.05) higher risks of TMD.
4	Muzalev et al. (2019)[24]	Netherlands	Nine male participants with clinical signs of SB underwent two subsequent baseline ambulatory polysomnographic (PSG) recordings before undergoing an experimental pain provocation protocol.	Experimental study	We hypothesized that experimentally induced jaw muscle pain would lead to decreasing jaw muscle activity during sleep. To that end, we provoked TMD-pain using a previously published protocol in pain-free bruxers and recorded the SB activity in the absence (before provocation) and presence (after provocation) of pain	Our results confirmed our research hypothesis, because a decline in SB activity was found for all nine participants who experienced jaw muscle pain after the pain provocation tests.	Experimentally induced TMD pain causes a reduction in SB activity in healthy individuals

Sr.	Study Id.	Location	Participants	Study Design	Intervention	Key findings	Results
5	Sinclair et al. (2021)[25]	Brazil	The study sample consisted of 40 individuals	case-control study	A one-night video polysomnographic examination with video recording was performed for each included patients in Clinica Artmedica.	The present work with a small study sample of 40 individuals did not reject the null hypothesis, indicating that there is no association between SB as currently defned and TMD	The results showed that the frequency of TMD in individuals diagnosed to have SB was 46.4%.
6	Fernandes et al. (2012)[26]	Brazil	The sample consisted of 272 individuals.	Cross-sectional study	In the present study, the two axes of the RDC □ TMD were used. Axis I was used to confirm and classify the TMD diagnosis, and Axis II to record the psychological status (depression and non-specific physical symptoms).	Those patients who had the presence of odontalgia, neuropathy, TMD pain for <3 months, intra-oral lesions, any chronic pain syndrome, including fibromyalgia or arthritis, had cognition or language impairments, and those under the age of 18 years were excluded from the total sample.	Patients with SB had an increased risk for the occurrence of myofascial pain (OR = 5Æ93, 95% CI: 3Æ19–11Æ02) and arthralgia (2Æ34, 1Æ58–3Æ46).
7	Camparis et al. (2006)[27]	Brazil	group A: bruxism with TMD (n = 20) and II. group B: bruxism without TMD (n = 20).	case-control study	A standardised diagnostic protocol was applied to all patients equally by the same trained dentist.	The exclusion criteria were: use of drugs (psychotropic, antidepressant, antianxiety, anticonvulsive and analgesic), lack of posterior occlusal support, the use of an occlusal splint or to be undergoing orthodontic treatment, and fibromyalgia.	There were no statistically significant differences for bruxism and sleep variables of the two groups: number of bursts and bruxism episodes per hour, amplitude and duration of bruxism episodes
8	Huhtela et al. (2016)[28]	Finland	The data were gathered from 4,403 Finnish students included in the Finnish Student Health Survey 2012.	Cross-sectional study	Bivariate associations between self-reported bruxism and TMD symptoms were evaluated using chi-square tests, and logistic regression model was used with age and gender as factors.	Bruxism and TMD symptoms are frequent in Finnish university students. Self-reported bruxism is associated with TMD symptoms, confirming earlier findings.	The logistic regression analysis (including age and gender) showed that report of sleep bruxism and/or awake bruxism was associated with TMD pain (Odds Ratio [OR] = 5.71; 95% confidence interval [CI] = 4.86-6.70)

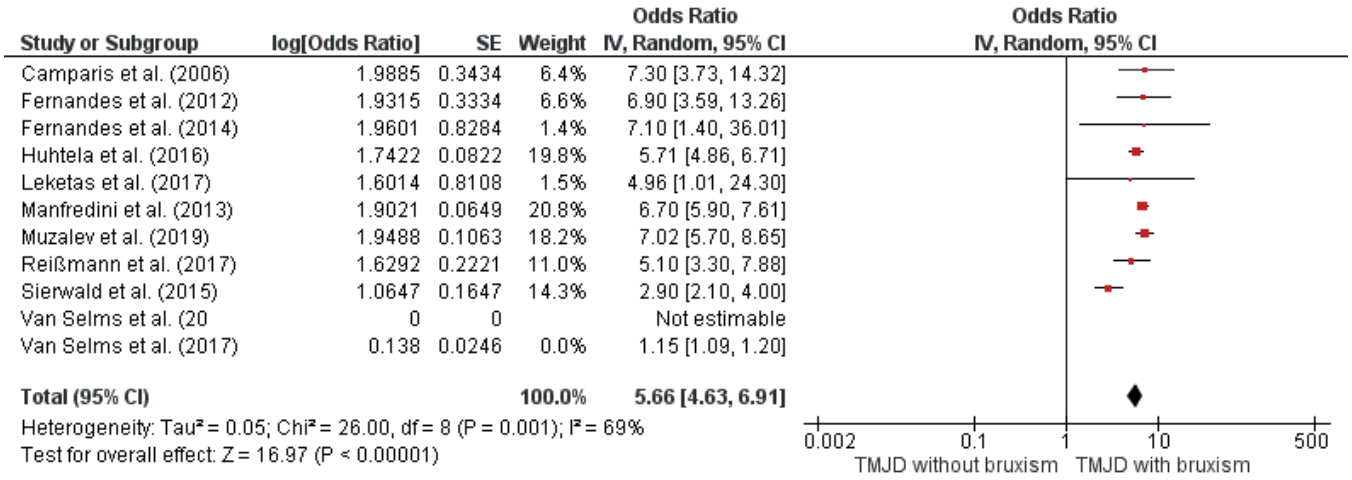
Sr.	Study Id.	Location	Participants	Study Design	Intervention	Key findings	Results
9	Manfredini et al. (2013)[29]	Brazil	The sample consisted of 301 individuals	Cross-sectional study	Sleep bruxism was diagnosed by clinical criteria proposed by the American Academy of Sleep Medicine, and primary headaches were diagnosed according to the International Classification of Headache Disorders-II.	The association of sleep bruxism and painful TMD greatly increased the risk for episodic migraine, episodic tension-type headache, and especially for chronic migraine.	The association between painful TMD and sleep bruxism significantly increased the risk for chronic migraine (87.1; 10.79-702.18)
10	Fernandes et al. (2014)[30]	Brazil	The sample consisted of 261 women	Cross-sectional study	The Research Diagnostic Criteria for Temporomandibular Disorders were used to classify TMD and self-reported tinnitus.	he exclusion criteria were: odontalgia (toothache), neuropathy, intraoral lesions, any chronic pain syndrome (including fibromyalgia or arthritis), cognition or language impairments and individuals under the 18 years of age.	With regard to SB, the association was of lower magnitude (OR = 1.9; 95%CI = 1.16-3.26; p < 0.0163).
11	Van Selms et al. (2017)[31]	Amsterdam	The patient sample was then split into a case group consisting of 268 patients diagnosed with TMD pain	Cross-sectional study	After verifying that the pain complaint as reported in the digital questionnaire was located in the orofacial area, dentists carried out a clinical examination that included palpation of the masticatory muscles and the TMJs.	In these cases, the orofacial pain may have had its origin in neurologic or vascular causes, but it is equally likely the pain was dental in origin.	Patients with TMD pain reported significantly more bruxism than patients without any report of orofacial pain.

Table 3: Assessment table for primary studies.

Column1	Column2	Sierwald et al. (2015)	Reißmann et al. (2017)	Leketas et al. (2017)	Muzalev et al. (2019)	Sinclair et al. (2021)	Fernandes et al. (2012)	Camparis et al. (2006)	Huhtela et al. (2016)	Manfredini et al. (2013)	Fernandes et al. (2014)	Van Selms et al. (2017)
1	Did the study address a clearly focused issue?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2	Did the authors use an appropriate method to answer their question?	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
3	Were the cases recruited in an acceptable way?	Y	Y	?	Y	?	?	Y	Y	Y	Y	?

Column1	Column2	Sierwald et al. (2015)	Reißmann et al. (2017)	Leketas et al. (2017)	Muzalev et al. (2019)	Sinclair et al. (2021)	Fernandes et al. (2012)	Camparis et al. (2006)	Huhtela et al. (2016)	Manfredini et al. (2013)	Fernandes et al. (2014)	Van Selms et al. (2017)
4	Were the controls selected in an acceptable way?	Y	Y	Y	Y	N	Y	Y	?	Y	Y	Y
5	Was the exposure accurately measured to minimize bias?	Y	Y	N	N	Y	Y	N	N	Y	Y	Y
6	Aside from the experimental intervention, were the groups treated equally?	Y	N	Y	Y	Y	?	?	?	?	Y	Y
7	Have the authors taken account of the potential confounding factors?	?	Y	N	Y	Y	Y	N	N	Y	?	N
8	Is the model validated?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	?
9	Do you believe the results?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
10	Can the results be applied to the local population?	N	Y	Y	N	N	N	?	Y	N	Y	Y
11	Do the results of this study fit with other available evidence?	Y	?	N	Y	Y	N	Y	N	Y	Y	Y
	SCORE OUT OF 11	9	8	7	9	8	7	7	7	9	10	8

Table 4: Association between bruxism and Temporomandibular joint disorders.



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