The Relationship Between Sleep Bruxism and Temporomandibular Disorders: A Systematic Review

Christian Lokita[1], Lia Kartika Wulansari[2], Ira Tanti[2]*

1. Prosthodontics Residency Program, Faculty of Dentistry, Universitas Indonesia, Indonesia.
2. Departement of Prosthodontics, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia.

Abstract

TMD is known to be one of the major health concerns in the stomatognathic system, and bruxism is one of the causes of TMD. This article reviews the literature on the relationship between sleep bruxism and TMD.

A systematic search by the PICO method was carried out on several databases. The inclusion criteria were subjects age ≥ 18 years old, either male or female. All literature was written in English within the past ten years. A questionnaire was used to examine sleep bruxism. A total of seven articles were used for this review.

Out of seven articles, five were descriptive cross-sectional study designs, one was a case-control study design, and one was a retrospective cohort study design.

Bruxism was found to have a relationship to TMD. The presence of bruxism significantly increases risks factors for TMD pain, which may develop further into other conditions. How bruxism is related to TMD and the possible influence of various conditions and demographics makes further studies required.

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Introduction

Temporomandibular Disorders (TMD) prevalence is around 10%, with an annual incidence of around 3%, making TMD a significant health condition that must be considered.[1] In adult populations, the incidence of TMD is around 10% - 15%, and only 5% of the population is seeking treatment. TMD is more common in women than in men, with varying symptoms ranging from mild discomfort to pain with limited movement and jaw function, headaches, TMJ clicks, masticatory muscle fatigue, deviation of mandibular trajectory, and tinnitus.[2,3] The etiology of TMD is multifactorial because one or more factors may contribute to its predisposition, initiation, and maintenance. Several possible etiological factors of TMD include trauma, emotional and psychological factors, degenerative processes, occlusal problems, and parafunctional activity.[3–5] Parafunctional activity is one etiological factor leading to TMD. There are two kinds of parafunctional activities: clenching and bruxism. Psychological and emotional factors are the predisposition factors that lead to clenching and bruxism.[1,2,6–8]

Bruxism is a parafunctional activity in the form of repetitive jaw muscle activity characterized by the grinding of teeth, bracing or thrusting of the mandible, and clenching. Many studies said that the prevalence of bruxism ranges from 8% - 31.4% and decreases with age. Bruxism can be divided into two conditions, daytime bruxism (diurnal bruxism) and sleep bruxism (nocturnal); more precisely, awake and sleep bruxism. [1,9–12] Both of this bruxism have different pathophysiological mechanisms; with sleep bruxism, almost 90% of episodes are grinding, whereas with awake bruxism, more episodes are clenching. Additionally, with awake bruxism, people are usually aware of this condition and try to avoid it, but with sleep bruxism, the symptoms are usually felt when the person wakes up in the morning. Therefore, sleep bruxism is hard to be noticed and control,

Corresponding author:
Ira Tanti
Department of Prosthodontics
Faculty of Dentistry, University of Indonesia
Jalan Salemba Raya No. 4, Jakarta Pusat 10430, Indonesia
E-mail: iratanti@ymail.com

and usually, the person gets the information from their partners.[11,13,14] The etiological factors that can trigger bruxism include high-stress levels, smoking, and the consumption of alcohol, caffeine, and drugs.[1,14,15]

Some studies have shown that diagnosing bruxism, especially sleep bruxism, can be challenging because many people are unaware that they have this condition. Multiple axes should be conducted to identify and diagnose bruxism, such as questionnaires, an oral history taken by asking the bed partners about grinding sounds while sleeping, extra- and intra-oral inspection, and an electromyographic (EMG) used to record the activity of the masticatory muscles or a polysomnographic (PSG) to record the sleeping patient. EMG and PSG have been considered the gold standard in diagnosing sleep bruxism, but it has high costs and is difficult to access for most; in addition, more time will be needed to examine a large sample. Therefore, the questionnaires would be more suitable and desired for a large sample population.[10,11,15,16]

There have been various studies on the relationship between sleep bruxism and TMD and multiple inspections and ways to identify them. This study aims to review the relationship between sleep bruxism with TMD or non-TMD, and the variation associated with these conditions.

Materials and methods

Search Strategy

The PICO structured summary method was chosen because it is a tool for structuring clinical research questions connected with evidence syntheses. It forces the questioner to focus on the patient's most important issue and outcome and direct the questioner to identify the problem, intervention, and outcome related to specific care provided to a patient.[17] In this article the PICO used as follow; P (population): people aged ≥ 18 years old with or without sleep bruxism and TMD, I (intervention): sleep bruxism or non-sleep bruxism, C (Comparison): TMD or non-TMD, O (Outcome): relation sleep bruxism or non-bruxism with TMD or non-TMD.

This systematic review was designed as the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocols/guidelines. A systematic search was conducted between 15 July 2020 – 23 July 2020 using EBSCOhost, ScienceDirect, PubMed.NCBI, Scopus, and ClinicalKey. The keywords were assigned as follow:

1. EBSCOhost database. Filters used were: publication dates: 2010 – 2020, Text Availability: Full Article, Language: English, keywords: ((sleep)) AND ((bruxism)) AND ((temporomandibular)) AND ((disorders))
2. ScienceDirect. Filters used were: publication dates: 2010 – 2020, Article Type: Review Article & Research Article, Publication: The Journal of Prosthetic Dentistry, Journal of Prosthodontic Research, Dental Clinic of North America, keywords: ((sleep bruxism)) AND ((temporomandibular disorder))
3. Pubmed.NCBI. Filters used were: publication dates: 2010 – 2020, Text Availability: Free Full Text, Publication Date 10 Years, Language: English. Keywords: ((sleep bruxism)) AND ((temporomandibular disorder))
4. Scopus. Filters used were: publication dates: 2010 – 2020, Document type: Article or Review, Access type: all, Language: English, Subject: Dentistry. Keywords: ((sleep) AND (bruxism)) AND ((Temporomandibular) (Disorders) OR (TMD))
5. ClinicalKey. Filters used were: publication date last five years, Text Availability: Full Text only, Language: English. Keywords: ((sleep bruxism)) AND ((temporomandibular disorder))

The inclusion criteria of this study are all journals/literature published between 2010 – 2020 (or for the past ten years), English language, subjects are at least 18 years old, with or without sleep bruxism, and TMD. The study's design is a descriptive cross-sectional study with a quantitative approach, descriptive statistics and frequency, case-control study, retrospective cohort study, and duplication literature can be used if the main topic of the research is related to the purpose of this review. Exclusion criteria include subjects under 18 years old, non-English language, and design study case reports.

All paper included must contain data that has been statistically validated. The articles selected in this systematic review discuss sleep bruxism, awake bruxism, and using questionnaires to examine sleep and awake bruxism. Non-questionnaire data gathering was excluded from the review process. For the Temporomandibular diagnosis, most of the literature's diagnosis uses RDC/TMD (Research

Diagnostic Criteria For TMD).

The SIGN checklist (Scottish Intercollegiate Guidelines Network) is used to assess the overall quality and the risk of bias for case-control and cohort, while the JBI checklist (Joanna Briggs Institute) is used to assess the cross-sectional journals.

The articles included in this review had to be officially published and used validated examinations and questionnaires. The subjects involved had been asked permission to participate in the research and agreed to sign informed consent. In addition, the study passed each local Research Ethics Committee. Table 1 was made to conclude the contents of each of the literature, categorized into literature, research design, subject, result, and conclusion.

Results

A flow diagram of the search and selection process of articles based on PRISMA guidelines is presented in Figure 1. According to the SIGN checklist, it found that for cohort study is acceptable and for the case control study is high quality, and according to the JBI checklist, all selected papers are acceptable. From all of the databases chosen, all seven of the studies pass the age category ≥ 18 years old, five out of seven studies have descriptive cross-sectional study design, one literature has case-control study research design, and one literature has retrospective cohort study design. In six of the studies, RDC/TMD was used to examine and diagnose TMD, while—one literature used RDC/TMD and Fonseca Index, and one literature used FAI index (Fonseca Anamnesis Index).

Discussion

Finding from articles shows that the types of bruxism that are often examined are sleep bruxism and awake bruxism. In the literature reviewed, the age of the subjects examined is at least 18 years old, in which the adult age category (18-60 years) was said to have a sleep bruxism prevalence of 56.8%, and the incidence of sleep bruxism in women was greater than in men.[11] The examination and assessment of the presence or absence of sleep bruxism can be conducted in several ways, including questionnaires, PSG, and EMG. In the literature reviewed, most researchers used questionnaires that were suitable for a large number of samples and can quickly collect data from many subjects in a short period of time, and 1 study used EMG.[10,11,18,19] For sleep bruxism questionnaires, most of the literature uses RDC/TMD, and there is also literature using questionnaires from the American Academy of Sleep Medicine[1,3,4,11,18-21]. According to Manfredini et al., the use of questionnaires as a diagnostic tool depends on the patient's ability to distinguish between sleep and awake bruxism. However, the use of PSG and EMG is limited because the costs are too high, and it is challenging to examine large numbers of subjects. Therefore, the ability of the operator or clinician to perform anamnesis and examine data from patients using a questionnaire is crucial in screening.[13]

To carry out examinations and diagnose TMD, subjects were mostly subjected to RDC / TMD questionnaires. RDC / TMD is a diagnostic index created to provide consistent results for studies in different populations.[1,3,4,11,12,21,22] RDC / TMD consists of a dual-axis system in which Axis I is a classification of physical examination (masticatory muscle disorder, disc displacement, inflammatory or degenerative disease of the TMJ) and Axis II evaluates behavioral, physical, and psychosocial status. RDC / TMD Axis I was divided into three groups: group I (painful TMD) - myofascial pain TMD or myofascial pain TMD with limited opening), group II - disc displacement with or without the reduction or absence of TMD and group III - arthralgia and or osteoarthritis (non-painful).[19] One study uses the FAI (Fonseca Anamnestic Index), which was developed in Brazil and contained ten questions with three answer options (“yes”, “sometimes”, and “no”), which is a questionnaire to determine the severity of TMD.[23]

From the literature reviewed, bruxism itself at the time of examination will be divided into awake bruxism, sleep bruxism, and non-bruxism categories. The three categories can provide diverse results and conclusions of the study. For TMD, the diagnosis and screening methods carried out in the literature produce a variety of diagnostic variations.

Literature showed that sleep bruxism could increase TMD risk and develop other conditions such as TMD pain, chronic migraine, cervical muscle pain, and headache.[1.11,20,21,23] All studies meet the criteria in the risk of bias checklist so that it can be concluded that all

literature used is of good quality.

From this systematic review, sleep bruxism or bruxism could be found either in TMD or non-TMD. A more detailed examination and history-taking would help diagnose and classify the disorder. This study's limitations include that each paper had different conditions when examining the subject, and some papers had other sleep bruxism questionnaires.

For sleep bruxism studies, some papers showed that PSG could not be used in a study with a very large sample, needed high cost for the examinations, and involved sophisticated devices. It also needed specialized professionals in sleep laboratories, and still, it cannot yield a reliable diagnosis by itself, so self-reported data and clinical examinations would again be used.[1,2,23]

In this systematic review, we observed studies using a questionnaire to identify bruxism and its relationship to TMD; combined with clinical examination, these methods were considered desirable to gather large subject samples, the most practicable method, especially in daily clinical practice.

Conclusions

These systematic reviews showed the relationship between sleep bruxism and TMD; furthermore, this relationship can develop into other conditions. The prevalence of this parafunction activity is more common in adult patients and much greater in women than men. Each paper reviewed has a large number of samples in common, used a diagnostic tool for examining the condition of TMD, and points out that the questionnaire is a suitable screening for sleep bruxism.

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Declaration of Interest

The authors report no conflict of interest.

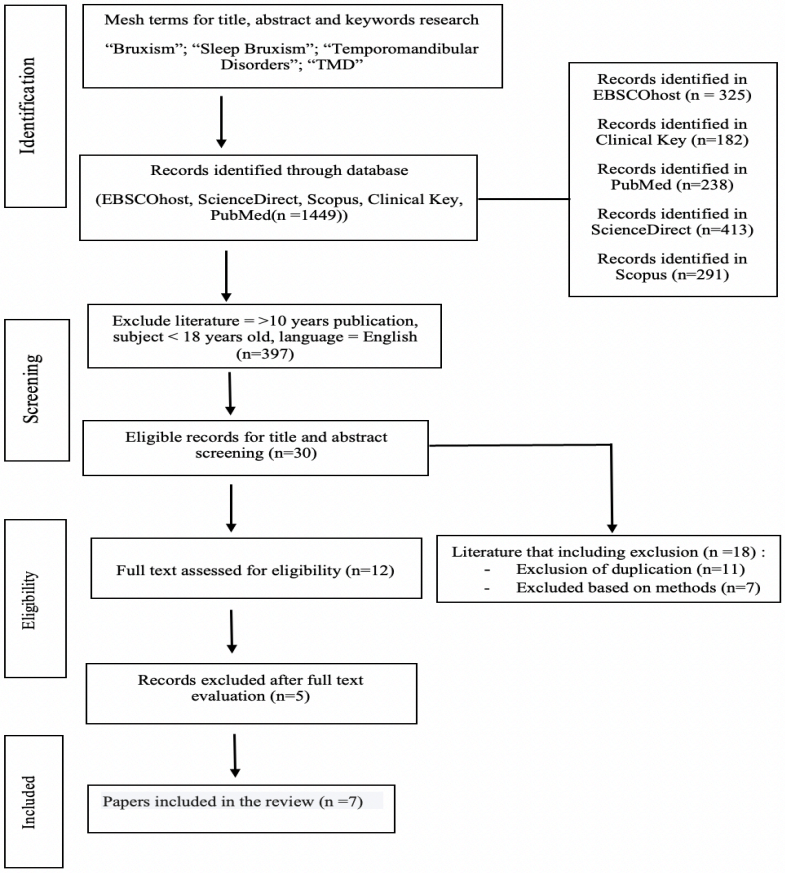

Figure 1. Data Collection Workflow.

Literature	Research Design	Research Purpose	Subject	Result	Conclusions
Coutinho et al. (2018)[3]	Descriptive-cross sectional study with a quantitative approach	Evaluate the association between self-reported sleep bruxism and TMD in undergraduate students from Brazil	600 students (217 male, 383 female) Aged between 18 – 45 years old TMD using RDC/TDM and Anamnestic Index of Fonseca Sleep bruxism using a questionnaire in RDC/TMD)	Women had a higher presence of TMD, prevalence 67.9% (383) Students under 23 years old show statistically significant association with TMD ($p < 0.001$) 66.8% (243) 233 students reported sleep bruxism; 82% (191) had TMD Statistically significant association ($p < 0.0001$) Students who reported sleep bruxism had 5.28 times (95% CI: 3.50-7.95; $p < 0.0001$) greater chance of TMD	Self-reported sleep bruxism and TMD had a high prevalence among undergraduate students Not every patient who has sleep bruxism will develop TMD, but can develop other muscle pains involving the joints and pterygoid muscle
Aguilera et al (2014)[11]	Analytical Observational cross-sectional	Evaluates the association between self-reported sleep bruxism and the age, gender, clinical subtypes of TMD, pain intensity, and grade of chronic pain in patients previously diagnosed with TMD	1220 patients (1020 (84.4%) woman, 190 (15.6%) men. Age: ≥ 18 years old RDC/TMD to diagnose TMJ Graded chronic pain scale (GCPS) for finding the pain intensity Sleep bruxism using questionnaire in RDC/TMD	Presence of bruxism → 665 (54.5%) Presence history locked joint → 531 (43.5%) Muscle, joint, and disc disease → 377 (30.9%) Muscle and joint disease → 350 (28.7%) Diagnose with chronic pain → group II (52.3%) OR bruxism 1.95 times higher in women than in men (95% CI, 1.42 - 2.67) Muscle + discopathy + arthropathy and Muscle +arthropathy	A strong association between reports of sleep bruxism and the presence of painful symptoms of TMD The prevalence of parafunctional activity is higher in women and patients under the age of 60 Highlights the importance of differentiating between sleep bruxism and awake bruxism in future studies

				attain significance ➔ least perceived bruxism (OR 2.04 (95% CI 1.36-3.06) and 1.64 (95% CI, 1.09-2.46) Intensity of acute pain greater in group with perceived bruxism (x=56.85; s.d = 25.77) than in group without perceived bruxism (x= 49.60; s.d.= 28.12), with *t*-test = 4.68, df = 1218 and p< 0.0001	
Fernandes et al. (2013)[19]	Descriptive cross-sectional study	Investigates the association among TMD, sleep bruxism, and primary headaches, assessing the risk of occurrence of primary headaches in patients with or without painful TMD and sleep-bruxism	286 individuals (241 women and 45 men) Age 18 – 76 years old RDC/TMD for diagnosing TMD Sleep bruxism using questionnaire from AASM	Painful TMD was associated with the presence of migraines and episodic tension-type headaches (*p < 0.01)* 98.6% present with chronic migraines and TMD, 1.4 % with no painful TMD. (*p < 0.0001)* 83.6% episodic migraines and painful TMD; 16.4% with no painful TMD (*p < 0.0001)* 73.2% episodic tension-type headaches and painful TMD; 26.8% with no painful TMD (*p* = 0.0036) In patients with SB, the association among painful TMD and headache diagnosis was significant (p<0.001)	Sleep bruxism and painful TMD increase the risk of episodic migraines and episodic tension type-headaches, especially chronic migraines Strongly recommended that dentists and neurologists make a close interaction when evaluating and managing patients suffering from facial pain and primary headaches

				The association between painful TMD and sleep bruxism significantly increased the risk for chronic migraines	
Ohlmann et al (2020)[20]	Descriptive cross-sectional study	Examines the correlation between sleep bruxism and temporomandibular disorder	110 participants (>18 years old, 45 males SD: 11.9, 65 females SD: 12.8) TMD diagnosed using RDC/TMD Sleep Bruxism using a questionnaire from AASM and portable EMG/ECG	Table 1 RDC/TMD Axis I with sleep bruxism → significant differences found between bruxers and non-bruxers regarding group-I diagnosis myofascial pain (p=0.011) Joint related RDC/TMD group-II, 8 subjects in bruxers, 6 in non-bruxers groups, no significant difference between bruxers and non-bruxers (p = 0.930) Group-III 4 subjects in bruxer and 3 in the non-bruxer group also include two subjects diagnosed with osteoarthrosis in both TMJ. No significant difference between bruxers and non-bruxers (p= 0.789) Table 2 – the examination using a graded chronic pain scale reveals a correlation between somatization and sleep bruxism (p= 0.0083) Table 3 – jaw disability and sleep bruxism,	Non-specific physical symptoms seem to be the predictor for the diagnosis of myofascial pain Longitudinal studies are needed to investigate the relationship between sleep bruxism and myofascial pain, ideally using verified diagnoses of bruxism and TMD

				non-bruxer group = 98% no limitations, in bruxer group, =69% on moderate bruxer group, and 60% on severe bruxers had limitations Table 4-6 = significant correlation between somatization and myofascial pain (p= 0.049) and between female gender and disc displacement (p= 0.030)	
Sierwald et al (2015)[1]	Case-control study	To investigate whether the risk of TMD pain is increased in the presence of awake or sleep bruxism Whether awake or sleep bruxism pose different risk levels for TMD pain Whether awake and sleep bruxism are unrelated to each other as risk factors	1573 patients 733 patients for the case TMD (case) and 890 Non-TMD (control) Screening TMD using RDC/TMD Graded Chronic Pain Scale (GCPS) Jaw Disability List (JDL) For awake and sleep bruxism diagnosis using a questionnaire from the RDC/TMD	Most TMD patients (77%) had a diagnosis of muscle pain (myofascial pain with or without limited mouth opening) 57.6% had a diagnosis of TMJ-related pain arthralgia or osteoarthritis In control ➔ 13.9% diagnosis with disc displacement with reduction Sleep and awake bruxism had significantly higher patients than the controls. Awake bruxism ➔ 33.9% vs 11.2% (*p<0.001)* Sleep bruxism ➔ 49.4% vs 23.5% (*p<0.001)* Correlation coefficient 0.67 was obtained, indicating a close mutual association between self-reported data on	Awake and sleep bruxism significantly increase the risk of TMD pain TMD pain in Awake and sleep bruxism show only a slight difference in value

				awake and sleep bruxism	
Manfredini et al (2011)[21]	Retrospective cohort study	Reports the frequency of TMD diagnoses and prevalence of self-reported awake and sleep bruxism in patient populations recruited at two highly specialized clinics	219 subjects, 74% women at the University of Padova, Italy 397 subjects; 79% women at the University of Tel Aviv, Israel. Examined using RDC/TMD RDC/TMD was used to record data on self-reported awake and sleep bruxism	Significant differences were shown between the two clinic samples for the frequencies of TMD diagnoses. Myofascial pain constituted the most diagnoses in the Tel Aviv sample (36.8%) and myofascial pain combined with an inflammatory-degenerative disorder in Padova (27.4%) (p<0.001) Tel Aviv ➔ 38.3 % (women) myofascial pain, 35.8% (men) disc displacement -Padova ➔ 58.9% (men) and 82.45 (women) both multiple diagnosis Padova ➔ prevalence of self-reported bruxism was similar among the different TMD diagnostic groups Tel Aviv ➔ patients with myofascial pain tended to report bruxism more frequently than other diagnoses	The more widespread TMJ imaging can cause higher multiple diagnoses. Patients' capability to discriminate between sleep or awake bruxism is important for the result Different interpretations of the same diagnostic guidelines may have a strong influence on epidemiological reports on bruxism and TMD prevalence and their association
Yeler et al. (2016)[22]	Cross-sectional survey	To evaluate whether there is a relationship between possible sleep bruxism, temporomandibular disorders, unilateral chewing, and occlusal factors in university students To test the hypothesis that occlusal factors are	519 subject (223 males mean age 21.57 ± 2.3 years, 296 females, mean age 21.02 ± two years) TMD diagnoses using FAI index	Possible sleep bruxism in 147 students (28.3%) No significant association was found between bruxism and the direction of malocclusion (p > 0.05) TMD was not significantly	Within the limitation, unilateral chewing habits are common factors in sleep bruxism and TMD Occlusal factors do not seem to be involved in the development of sleep bruxism and TMD

	not correlated with bruxism in fully growing young individuals	Questionnaire chewing habits Questionnaire about sleep bruxism Grouped to any malocclusion	associated with the direction of malocclusion (p > 0.05) Bruxism was found in 42% of students with TMD, and the relationship was significant (p <0.05) TMD was found in 96.6% of bruxers Possible sleep bruxism 61.5% with severe TMD (p < 0.05) Bruxism is statistically significantly associated with unilateral chewing (p < 0.05) TMD levels were significantly associated with UC (p < 0.05)

Table 1. Demographic Data of The Included Studies.

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