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SYSTEMATIC REVIEW

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Sleep bruxism in children main methods of treatment: a systematic review with meta-analysis

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Abstract

Sleep bruxism is both masticatory muscle activities characterized by repeated or prolonged tooth contact as well as bracing or thrusting of the jaw. This meta-analysis evaluates the differences between sexes and which therapy is most effective in treating bruxism. A literature search was performed on PubMed, Lilacs, Web of Science and Scopus, and articles published from 2000 to 2022 were considered according to the keywords entered. The term "Bruxism" has been combined with "Children" using the boolean connector AND. At the end of the research, 1462 studies were identified from the search conducted on the three engines. Only four were chosen to draw up the present systematic study. The Forrest plot found that photo biomodulation therapy has a higher efficacy (Odds Ratio (OR) 0.10; 95% Confidence Interval (CI) from 0.03 to 0.43), followed by treatment with hydroxyzine (OR 0.19; 95% CI from 0.03 to 1.04). The average between girls and boys with bruxism is 18.5 for boys and 19.5 for girls. This meta-analysis showed that treatment by photobiomodulation has more significant effects on bruxism, followed by treatment with hydroxyisalazine. However, this meta-analysis has limitations due to the diversity of treatment evaluation methods.

Keywords

Bruxism; Children; Treatment; Temporomandibular disorder; Masticatory muscles; Masseters; TMD

1. Introduction

Sleep bruxism and conscious bruxism are masticatory muscle activities characterized by repeated or prolonged tooth contact and bracing or thrusting of the jaw [1, 2]. Although there is a lot of variation due to the various assessment techniques (self-report, clinical inspection, electromyography, or polysomnography), the literature reports that children and adolescents with sleep bruxism range from 3.5% to 49.6%, and those with fully conscious bruxism range from 4.1% to 7.1% [2]. There are no gender differences in Sleep Bruxism (SB) prevalence, according to the literature. Although bruxism was once viewed as a set of coordinated activities that did not contribute to a functional objective or a parafunctional activity, it now seems that the definition is more by a biological continuum that ranges from physiological to pathological function [3]. As a result, among healthy people, bruxism is no longer regarded as a disorder but rather as a practice that might have both dangerous and beneficial effects on dental health [4]. Given its involvement in the preservation of tissue homeostasis, stress management, and developing alveoli, it appears that bruxism is physiological, especially in children [5–10]. Therefore, extreme bruxism qualifies as abnormal. Therefore, controlling excessive and physiological bruxism is critical when weak structures are nearby. Additionally, it was said that in otherwise healthy people, bruxism shouldn't be viewed as a condition but rather as a behaviour that can increase (or decrease) the risk of certain health outcomes. It is stated that bruxism can be a risk factor with potentially adverse effects on oral health, including significant mechanical tooth wear, broken teeth, prosthodontic difficulties, and/or pain in the masticatory muscles or temporomandibular joint [11–14]. The main indicators and signs of bruxism are tooth erosion, sounds during the night, shattered teeth, tooth sensitivity, masseter muscle hypertrophy, tongue indentation, lip or cheek biting, and headaches [15–17]. Numerous risk variables are associated with the aetiology, including biological (such as genetics, sleep problems, and neurochemicals), psychologic (such as personality, anxiety, and stress, today also increased due to the 2019-nCoV acute respiratory disease (Covid-19)) [18–22], and exogenous factors (such as specific medications, alcohol, tobacco, caffeine, and illegal narcotics) [23–25]. Therefore, various specialists

and treatment methods treat both sleep and awake bruxism. Certain sleeping habits have been recognized as significant risk factors for bruxism. The risk factors for irregular tooth wear and the emergence of temporomandibular joint (TMJ) dysfunction are unknown to someone with SB. According to recent research findings, SB may also contribute to primary headaches, which are thought to be primarily controlled by the central nervous system and may be correlated with abnormalities in the brain's GABAergic and glutamatergic systems. In addition to bodily motions, respiratory issues, increased muscular activity, and heart rate irregularities, bruxism may also be accompanied by sleep disruptions [26, 27]. Occupation sleep apnoea, parasomnias, restless legs syndrome, mandibular myoclonus, and rapid eye movement disorders are among the sleep conditions that coexist with bruxism. The literature highlights sleep bruxism-related problems with falling asleep, interrupted sleep, and sleeping for fewer hours than is essential [28]. Sleep characteristics like nocturnal agitation, nightmares, night terrors, snoring, somniloquy, mouth breathing, and prone position are all linked to sleep bruxism. Sleep problems such as poor sleep quality and attention problems are also linked to conscious bruxism. The diagnosis of bruxism might be difficult [29]. Despite the illness being acknowledged, no universally acknowledged diagnostic criteria for AB were published in the literature. The American Academy of Sleep Medicine (AASM) proposed one of the most widely accepted criteria for the diagnosis of SB, which includes the presence of tooth grinding or clenching sounds during sleep and one or more of the following concurrent signs and symptoms: abnormal tooth wear, jaw muscle discomfort, fatigue, or pain and jaw lock on awakening, or masseter muscle hypertrophy on voluntary forceful clenching [30]. The therapeutic therapy of SB is a topic of debate among doctors. The medical professional, the child's parents, and the youngster must work together to treat bruxism successfully. SB is currently receiving physiotherapy treatment. Kinesiotherapy, massage, infrared therapy, and low-level laser therapy are typical treatment modalities for treating SB in pediatric patients (LLLT). Occlusal appliances are used as part of the dental bruxism treatment to guard the teeth against pathological abrasion while you sleep. Also, according to reports, youngsters with orthodontic procedures aimed at expanding their jaw are less likely to develop SB [31]. The primary purpose of this meta-analysis is to analyze which treatment methods are most effective in treating bruxism. A secondary purpose is to assess the average age of bruxism patients.

2. Materials and methods

2.1 Eligibility criteria

All documents were assessed for eligibility based on the following Population (including animal species), Exposure, Comparator, and Outcomes (PECO):

(P) Participants consisted of patients.

(E) Exposure consisted in being at a young age range (2–14 yrs).

(C) Comparison consisted of assessment with no bruxist patients and comparison of M/F sex.

(O) The prevalence of bruxism in children through different diagnostic methods according to outcome assessment of correlation with age and sex and more spread treatment options.

The following inclusion criteria were employed for this meta-analysis: (1) randomized clinical trial (RCT); (2) bruxism assessed through a questionnaire for parents or guardians or the American Academy of Sleep Medicine (AAMS) criteria; (3) all considered participants were bruxers, with tooth grinding and/or clenching; (4) all considered participants' age of 2 to 17 years; and (5) published in English.

Exclusion criteria were: (1) studies written in a language different from English; (2) full-text unavailability (*i.e.*, posters and conference abstracts); (3) studies involving animals; (4) review article; (5) case reports; (6) lack of practical statistical analysis; (7) lack of standardized measures for bruxism evaluation; (8) studies on patients with systemic diseases or syndromes or neurological or psychiatric disorders; (9) transition age to 14.

2.2 Search strategy

A literature search was performed on PubMed, Lilacs, Web of Science and Scopus, and articles published from 2000 to 2022 were considered according to the keywords entered. The term "Bruxism" has been combined with "Children" using the boolean connector AND. The web search was assisted using MESH (Medical Subjects Headings) (Table 1). The criteria for this review are described in the Preferred Reporting Items for Systematic Reviews (PRISMA) and by the following flowchart (Fig. 1). Furthermore, a manual search of the references of previous systematic reviews on a similar topic was conducted as well. In addition, a manual search was performed through the bibliography of studies and via google solar. However, they were not found. In addition, to further complete, non-English articles were also selected and viewed through the LILACS search engine. This systematic review was conducted according to (PRISMA) guidelines and the Cochrane Handbook for Systematic Reviews of Interventions. The systematic review protocol has been registered on the International Prospective Register of Systematic Reviews (PROSPERO) with CRD42022377415, recorded on 30 November 2022.

TABLE 1. Search strategy.

PubMed
("bruxism") AND ("children")
Web of Science
(ALL = (bruxism)) AND (ALL = (children))
Lilacs
bruxism (Palavras) AND children (Palavras)
Scopus
TITLE-ABSTRACT (ABS)-KEY (bruxism AND children)

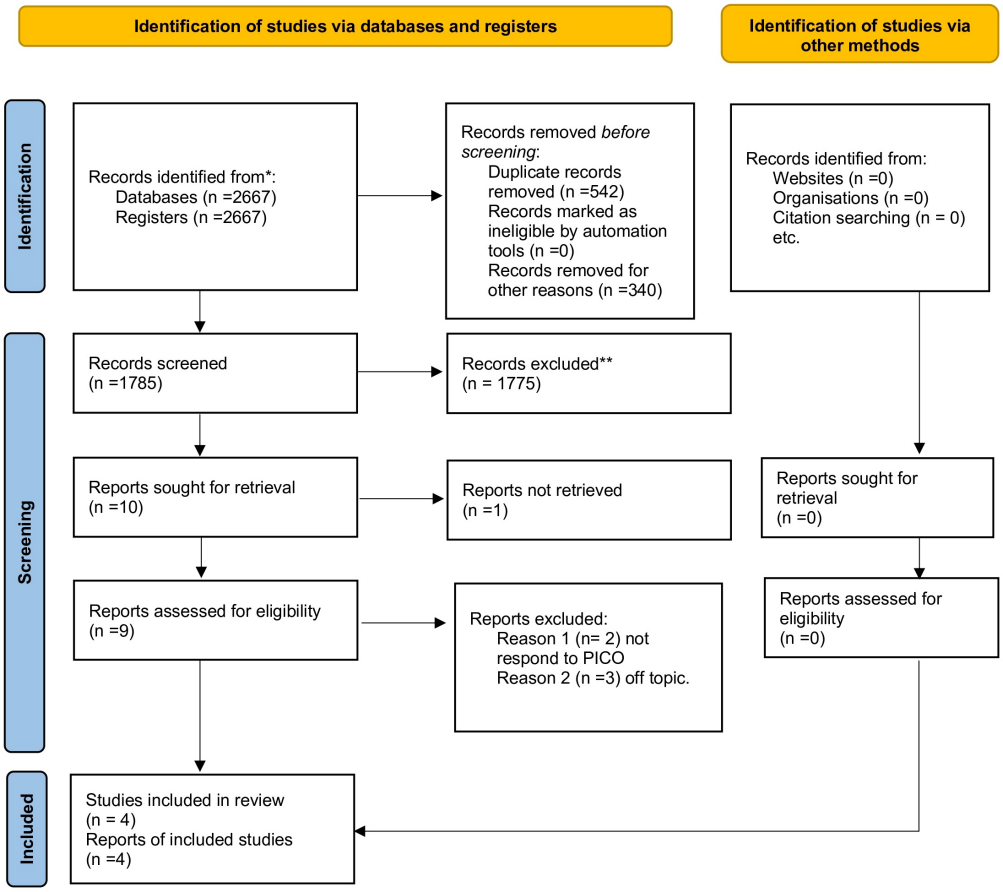

FIGURE 1. Prisma flowchart. PECO: Population (including animal species). *: Records evaluates from the database; **: Studies removed because they are systematic reviews of the literature.

2.3 Data extraction

Two reviewers (GM and RF) independently extracted data from the included studies using a customized data extraction on a Microsoft Excel sheet. In disagreement, a consensus was reached through a third reviewer (MC).

The following data were extracted: (1) First Author; (2) Year; (3) Sample; (4) Male/Female; (5) Diagnostic criteria of SB; (6) Subdivision in groups; (7) Results of therapy.

2.4 Quality assessment

The risk of bias in papers was assessed by two reviewers using Version 2 of the Cochrane risk-of-bias tool for randomized trials (RoB 2). Any disagreement was discussed until a consensus was reached with a third reviewer.

2.5 Statistical analysis

The average between the two sexes on the frequency of affected males and females was calculated. The pooled analyses were performed using Review Manager version 5.2.8 (Cochrane Collaboration, Copenhagen, Denmark; 2014). Innovative therapies not in everyday use (photobiomodulation, laser, homoeopathic drugs) were compared with commonly used treatments (occlusal splints, placebo). Inverse variance with random effects was used to compare different therapies. The Risk ratio between the two groups was measured. Heterogeneity among studies was evaluated using the Higgins Index (I^2) and the chi-square test and classified as follows: low heterogeneity (<30%), medium heterogeneity (30–60%), and high heterogeneity (>60%).

3. Results

3.1 Study characteristics

At the end of the research, 2667 studies were identified from the search conducted on the four engines. During the initial phase, 542 items were excluded because they were duplicates and 340 because are not in English. During the initial screening phase, 1775 articles were excluded from both search engines because they were systematic reviews of the literature and therefore did not meet the inclusion criteria; in addition, the filter was included in which only randomized clinical trials were considered. During the final screening phase, the abstracts of 10 articles were evaluated, and the full text could not be found for one article.

Only four were chosen to draw up the present systematic study, as illustrated by the PRISMA 2020 flowchart in Fig. 1; 5 articles were excluded: 2 did not meet PECO, 3 were off-topic (1 paper deals with the effect of passive smoking on bruxism and 2 reported alternative techniques to treat bruxism and didn't have a control group). According to the PECO model, the remaining articles were selected for the title and

abstract screening. Finally, four papers were present in the publication on the search engines used. The remaining pieces were selected and screened for the title and abstract screening according to the PECO model. Non-English articles and articles by the manual search were not found. The studies considered have a time frame from 2009 to 2020. The studies analysed were conducted in various parts of the world: Brazil, Iran, and Colombia. A total of 184 subjects were analysed. Of these patients, 19 were included in Salgueiro's study as a control group without bruxism. However, of all patients analysed, one therapy was considered in each study and compared with the control group or other therapy types, not the clinical trial's main object. However, of all patients analysed, one therapy was considered in each study and compared with the control group or other therapy types, not the clinical trial's main object. In Salgueiro's study, photobiomodulation was considered the primary therapy and compared with different therapies. In Tavares-Silva's study, phytotherapy was evaluated and compared with other therapies. In Ghanizadeh's study, hydroxyzine therapy was considered and compared with other therapies. In Quinteiro's study, the primary therapy was physiotherapy compared with a control group. Therefore, for the meta-analysis, the patient populations of these studies treated with the primary therapy and compared with other types of therapies and placebo were taken. Thus, the number of patients included in this meta-analysis was 94. Regarding the study design, there were only randomized clinical trials. Among these studies, two used as diagnostic methods the AAMS criteria, one used a questionnaire written by relatives and babysitters, and one used the ICSD (International Classification of Sleep Disorders). All studies have compared the effects of different therapies on the incidence of bruxism, either through questionnaires, electromyography or a gnathodynamometer. All studies have a placebo-treated control group; however, one study has a group of non-bruxism patients in addition to the placebo group. All studies assessed the incidence of bruxism among men and women. All studies considered used these inclusion criteria: first molars Angle Class I occlusion, no dental cavities, no physical motor impairment as reported by parents, and appropriate patient conduct throughout treatment and/or assessment made up the inclusion criteria. The limitations of the studies found are that one study evaluated a group of patients up to the age of 17 years. However, in the remaining studies, the maximum period is 12 years. According to the literature, the age of transition into adulthood and not pediatric competence in developing countries is 14 years.

3.2 Main findings

The study was out to determine the frequency of bite marks on children's buccal mucosa as a supplementary sign for diagnosing SB and to examine the efficacy of photobiomodulation as a potential alternative treatment for this illness. Sixty-six children between the ages of 6 and 12 were divided into four groups: G1 (with SB) and G4 (control group without SB), each of which received laser therapy over acupuncture points (786.94 nm, 20 seconds per point, fluency = 33.5 Jcm^2, energy = 1 J, number of points = 12). G2 also received occlusal splint (OS). Before and after therapy, clinical symptoms (such as bite marks on the buccal mucosa and headaches), biting force (BF), and salivary cortisol (a stress indicator) were assessed. The Kolmogorov-Smirnov, Shapiro-Wilk, and analysis of variance (ANOVA) tests were used in the statistical study. Buccal mucosal bite marks were substantially linked to SB (p = 0.001). There were no significant differences between the two groups. However, there was a statistically significant difference between the frequency of children with headaches before and after therapy in G1 (p = 0.0005) and G2 (p = 0.0001). Compared to the other groups, the kids in G1 showed decreased BF on both sides. Following therapy, all groups showed increased salivary cortisol levels in the intragroup analysis [32]. The study of Tavares-Silva evaluates the effectiveness of homoeopathic remedies *Melissa officinalis* (MO) and *Phytolacca decandra* (PD), and their combination in treating potential sleep bruxism (SB) in children was assessed in the current randomized controlled clinical experiment. Based on the parents' reports of SB, 52 patients (6.62 and 1.79 years old) were chosen for the study. The study's crossover design includes four 30-day treatment phases (Placebo, MO 12c, PD 12c, and MO 12c + PD 12c), each with a 15-day washout period in between. The Visual Analogic Scale (VAS) was employed as the primary end measure to assess the impact of therapies on the decline in SB at baseline and following each phase. A children's sleep diary with parent/guardian ratings of the quality of the child's sleep, the trait anxiety scale (TAS) to track changes in the child's anxiety profile, and side effect reports were utilized as additional end measures. Data were examined using ANOVA. In comparison to baseline (4.91 1.87), there was a significant decrease in SB with the usage of Placebo (−1.72 0.29), MO (−2.36 0.36), PD (−1.44 0.28), and MO + PD (−2.21 0.30). MO performed better than PD and the placebo (p = 0.018 and 0.050, respectively), but MO + PD performed similarly (p = 0.724). None of the therapies impacted the sleep diary or TAS outcomes. Following treatments, no adverse effects were noticed [33].

Thirty patients randomly assigned to one of the two groups in a 1:2 ratio comprised the study's participants. Both groups received placebos; one received hydroxyzine. The Clinical Global Severity scale and the Visual Analogue Scale test were used as the outcome measures. Assessments took place at the start of week four and the baseline. An evaluation of medication side effects was done utilizing a checklist. There were 21 and 9 kids in the hydroxyzine and placebo groups. In the hydroxyzine and placebo groups, the average age of the kids was 8/4 (standard deviation (s.d.) = 3/3) and 6/5 (s.d. = 1/5) years, respectively [34]. This study assessed how well physiotherapy worked for a group of bruxism kids to improve head posture and lessen bruxism symptoms. A randomized clinical trial with single blindness was conducted. According to the minimal ICSD criteria for bruxism, all the subjects were between the ages of three and six, had entire primary dentitions, dental and skeletal class I occlusions, and were all identified as bruxists. A clinical, photographic, and radiological evaluation of each child's head and neck posture was carried out using standardized methods. Both the experimental (n = 13) and control (n = 13) groups of kids were randomly assigned. Children in the experimental group

received a physiotherapeutic intervention once per week until ten sessions were finished. The cephalogram and a clinical and visual assessment of the head posture were measured once more. The *t*-test and Mann-Whitney test were used to analyse the data. The experimental group's participants demonstrated a statistically significant improvement in their default head posture [35] (Table 2).

3.3 Metanalysis

The meta-analysis was conducted by random model effect because of the medium heterogeneity ($I^2 = 53\%$) between the four included studies. The overall effect, reported in the forest plot (Fig. 2), the Forrest plot found that photo biomodulation therapy has a higher efficacy (OR 0.10; 95% CI from 0.02 to 0.43), followed by treatment with hydroxyzine (OR 0.19; 95% CI from 0.03 to 1.04). The average between girls and boys with bruxism is 18.5 for boys and 19. 5 for girls (Fig. 2) with a p-value < 0.05.

3.4 Quality assessment and risk of bias

Using RoB 2, the risk of bias was estimated and reported in Fig. 3. Regarding the randomization process, 100% of the studies ensured a low risk of bias. However, 50% of the studies excluded a performance bias, but 100% reported all outcome data, and 100% of the included studies adequately excluded bias in the selection of reported outcomes, while 75% excluded bias in self-reported outcomes. Overall, only 3 of the four studies were shown to have a low risk of experiencing bias.

4. Discussion

This meta-analysis aimed to put the different studies on treating bruxism in children. All the analysed studies evaluated new therapies' effects on treating bruxism and compared them with either occlusal splint or placebo. The most effective treatment in this study is photobiomodulation, followed by hydroxyzine. There is proof that photobiomodulation (PBM) prevents delicate nerves from moving along their axons, which lowers the potential of their mitochondria and, in turn, reduces the amount of adenosine triphosphate (ATP) available for nerve activity. The principal purpose of using photobiomodulation on the head and neck muscles is to relieve pain brought on by temporomandibular disorders. The first generation of potent H1 receptor antagonists includes hydroxyzine. It contains anti-dopaminergic and anti-histaminergic properties. The pharmaco-pathological link between hydroxyzine's anti-dopaminergic action and the problem in the dopaminergic area of the brain can be used to explain how the drug may help treat bruxism. The emotional condition is most frequently mentioned, with stress and worry being risk factors for temporomandibular disorders (TMD). Oliveira *et al*. [36] demonstrated that patients with bruxism are more likely to experience anxiety and distress. Neuroticism-prone personality traits have

TABLE 2. Main characteristics of studies included in the present systematic review.

Author	Year	Sample	Male/Female	Criteria	Subdivision	Results of therapy
Salgueiro *et al*. [32]	2020	76 Children 6–12 yr	25 male/32 female	AAMS	Four groups G1: n19 with photobiomodulation G2: n19 with occlusal splint G3: n19 with placebo G4: n19 no bruxist	A gnatodynanometer was used to evaluate change. Photobiomodulation showed an important effect on muscle.
Tavares-Silva *et al*. [33]	2018	52 children 6 yr	27 male/25 female	Self-reported	Four groups G1: n13 with placebo G2: n13 with MO G3: n13 with PD G4: n13 with MO and PD	Evaluation of VAS and sleep diary. Reduction of sleep bruxism.
Ghanizadeh *et al*. [34]	2013	30 children 4–17 yr	14 male/15 female	AAMS	Two groups G1: n21 with hydroxyzine G2: n9 with placebo	VAS after therapy with hydroxyzine, at the end of therapy, a decrease in pain and sleep bruxism.
Quintero *et al*. [35]	2009	26 children 3–6 yr	Seven male/Six female	ICSD	2 group G1: n13 with physiotherapy G2: n13 control group	Evaluation of cephalometry pre and after physiotherapy. Decrease of reported bruxism.

VAS: Visual Analogic Scale; MO: Melissa officinalis; ICSD: International Classification of Sleep Disorders; AAMS: American Academy of Sleep Medicine; PD: Phytolacca decandra.

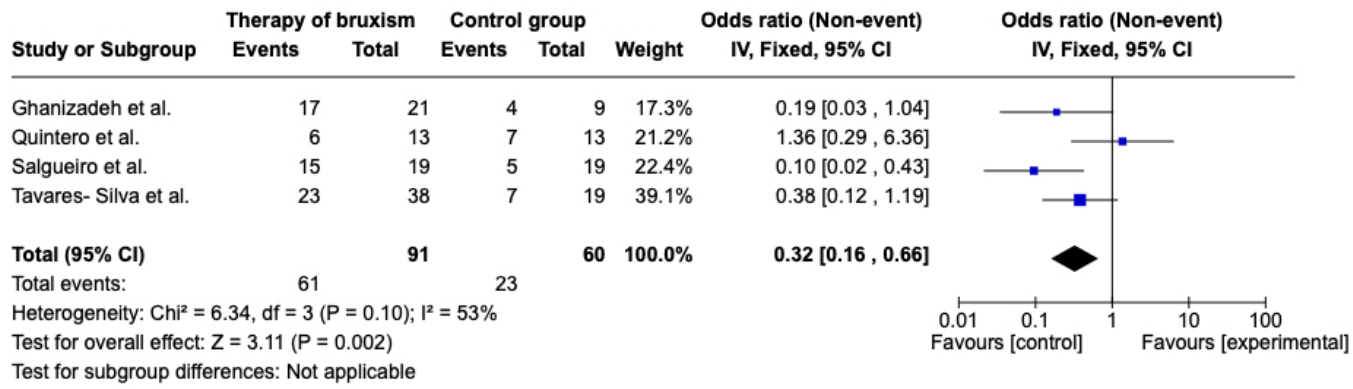

FIGURE 2. Forest plot of the meta-analysis. CI: confidence interval.

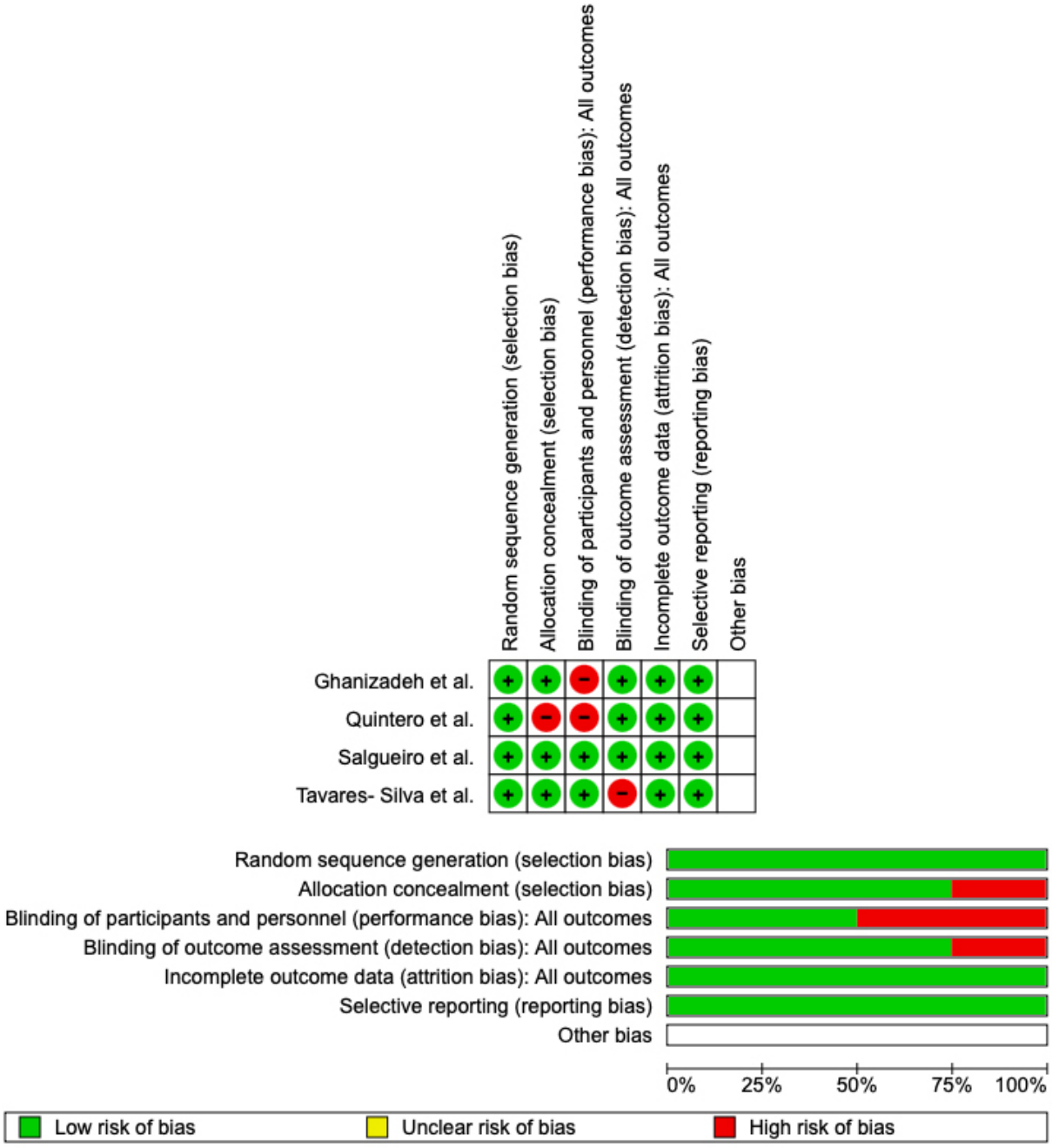

FIGURE 3. Risk of bias domains of the included studies.

also been linked to an increased risk of SB in young people. Therefore, the clinician needs a multidisciplinary approach in treating bruxism in children since, in addition to drug or laser therapy, it also needs behavioural therapy since stress is one of the leading etiological causes [36]. Although dealing with children, this meta-analysis considered only one study by Ghanizadeh *et al*. [34], whose study population is between the ages of 4 and 17. The remaining studies have as their maximum age range 12 years. However, the final results were not biased since they are still a residual number compared to the total population in this meta-analysis. In this study, according to the literature that defines 14 years as the age of transition, we used this criterion, which is respected by almost all studies except Ghanizadeh *et al*. [34, 36].

The prevalence of sleep bruxism reported in this systematic review is consistent with the previous two systematic reviews that estimated this subject and discovered around 30% prevalence of SB in youngsters. This finding demonstrates that most of the research included in both systematic reviews, which were chosen based on parental complaints of SB, used a similar technique for diagnosis [37]. Additionally, the authors' classification in their works was used to determine the diagnosis of SB in the included research. However, given the cultural variations, varying socioeconomic levels, and unique aspects of the study's methodology, the variation in incidence by continent can be considered understandable. The most common clinical symptom in children with SB was dental wear, which was to be expected. Typically, the dentist will ask parents whether their kids are clenching or grinding their teeth before the parents pay attention and report the problem [38]. Therefore, paying attention to canine primary wear is crucial and frequently linked to functional wear. As a result, it is advised that the diagnosis of the likely SB be assessed in a way that considers both pathological and physiological wear, considering each age group. It is crucial to agree on categorising the primary differences and dental wear in youngsters because this may have affected the study's findings. Care must be given when determining the source of a child's dental wear, which can also result from other factors, including erosion. Half of the children with SB reported headaches, the most common symptom. Only one study looked at headache frequency; the others only reported whether this symptom was present [39]. No study determined if this condition was a headache in the morning or occurred throughout the day. A kind of orofacial pain, this illness typically affects adults and children [40]. It is explained by the fact that sleep bruxism is thought to be a central nervous system behaviour and may be an etiological mechanism and a means of activating the muscles. The muscle alterations generated by SB also caused the trigeminal nociceptive neuron's central sensitization. Additionally, this habit may impair sleep quality by prompting nocturnal awakenings. These sleep disorders are linked to SB and are especially prevalent in youngsters. Five studies showed a positive relationship between headaches and SB in the analysis. Although the prevalence could be estimated, there wasn't enough research with the same design to analyse the relationship between sleep bruxism and most clinical signs and symptoms of the masticatory system examined. Following the most common clinical symptoms and indicators of headache, around 30% of the study participants experienced frontal muscular, TMJ, face, and masseter muscle pain. The least frequent symptom in kids was discomfort when moving their jaw. The children whose pain-related symptoms were evaluated ranged in age from 3 to 8 years. In a sample of 1263 kids, Tachibana *et al*. [41] discovered a prevalence rate of 21.0%, with a higher rate in the five to seven-year-old age range (27.4%). The high prevalence highlights the significance of an early, accurate diagnosis. Although polysomnography is the preferred method for diagnosing SB in adults, there is no standard procedure for doing this additional test on children. Therefore, a thorough clinical examination is crucial for correctly diagnosing childhood SB. A strong correlation between SB and bite marks on the buccal mucosa was discovered in the current investigation. Children with headaches were more common before and after therapy in G1 (photobiomodulation). One of the most typical symptoms is a headache, including tension and migraine headaches. Particularly tension headaches, brought on by hunched-over posture or stress, have been linked in the literature to SB. Muscle spasms brought on by ongoing stress are the source of tension headaches and SB. Most headache cases recorded did not go away with sleep, leading to restless nights. According to Herrera *et al*. [42], children with SB have more microarousals, which appear to be linked to increased behaviour and attention deficits. Following laser treatments, maximum muscular contraction increased in clinical investigations utilizing photobiomodulation. In a different study, individuals with mandibular fractures were treated with photobiomodulation, and that study likewise discovered a rise in BF. Lower BF in patients with SB appears to imply muscle relaxation, which could prevent tissue injury from severe muscle contraction, even though the study's findings differ from those published in the literature. The literature lists several SB side effects, including connections with TMDs, headache, tooth deterioration, restricted mouth opening, and muscle exhaustion [32]. The World Health Organization advises using homoeopathic medicines due to their accessibility, low cost, lack of side effects, and ability to be used internally. Even though, regardless of the disease, healthcare practitioners do not typically recommend homoeopathy as a first line of treatment, its prescription has been rising due to its low toxicity. In the current trial, *M. Officinalis* was effective in treating potential SB in children, whether used in conjunction with *P. decandra* or not. Both medications are all-natural, and parents or guardians have not experienced any physical side effects [43]. Homoeopathic material medica recommends *P. decandra* to prevent teeth grinding and clenching, while *M. Officinalis* is recommended for anxiety. Since bruxism has been linked to anxiety and teeth grinding (Oliveira *et al*. [36], 2015), the current clinical investigation sought to determine how these drugs might affect potential sleep bruxism when taken singly and combined [44]. According to recent research, the regulation of SB is central rather than peripheral (Saletu *et al*. [45], 2005). To treat sleep bruxism, numerous Central nervous system acting medications have been administered to reduce the activity of the orofacial muscles while the patient is asleep (Macedo *et al*. [46], 2014). Only the CNS alpha agonist Clonidine, the dopamine precursor L-dopa, and the benzodiazepine Clonazepam has effectively

lowered SB. SB should be diagnosed along several axes; both non-instrumental and instrumental diagnostic techniques are acceptable. Polysomnography is the standard gold method for identifying symptoms while you sleep (Bortoletto *et al*. [47], 2016). Iwasaki *et al*. [48] (2010) recommended against using this diagnosis approach on children since results could be affected by taking them out of their normal environments and placing them in a sleep lab. Clinical inspection is one of the non-instrumental procedures. In addition to self-reports, some questionnaires ask about sleep history. This experiment's primary objective was to examine hydroxyzine's efficacy in treating bruxism in children [48]. It's likely that managing comorbid conditions also manages bruxism. Additionally, the efficacy and safety of hydroxyzine over the long term cannot be predicted by existing results. Children took part in this study as participants. The medical professional administering the drugs to the parents was aware of the allocation groups. It is unclear if hydroxyzine also reduces bruxism in older people. This study also used a scale and a symptom questionnaire before and after using the drug to treat bruxism [49]. A physiotherapeutic method to enhance head posture was evaluated for effectiveness. Although numerous therapies for child bruxism have been the subject of studies, there is still a shortage of data to back up these treatments. It was previously shown that the anterior head position is prevalent in children who grind their teeth and impacts the central nervous system's oxygenation. Compared to the control group, whose position was poorer in the second measurement, the experimental group's kids corrected their head postures more. This may imply that bruxism causes an anterior head tilt that may worsen over time. To be confirmed, additional research is required. Dopamine levels raised in low-oxygen environments are also linked to bruxism in youngsters. To increase the free airway and thereby lessen the incidence of bruxism, physiotherapeutic methods to alter head posture have not yet been documented. Higher anxiety levels have been observed when the airway pressure is decreased, linked to bruxism symptoms. Another advantage of altering the forward head posture in bruxism-prone youngsters is that higher airway pressure can lessen anxiety [50]. The studies in this meta-analysis evaluate photobiomodulation as an effective treatment method for bruxism followed by hydroxylysine. All this shows a psychological and emotional component in the aetiology of bruxism [51]. All of this might suggest clinicians' direct treatment of the masticatory muscles by stimulating relaxation, or in more severe cases; action could be taken on the central nervous system. The limitation of this meta-analysis firstly, the inconsistency of the sample and, secondly, the lack of common methods for diagnosing bruxism. In addition, another important limitation is the lack of a common method to assess the improvement of bruxism. Some studies evaluate pre- and post-treatment by questionnaires given to parents or sitters, while others evaluate the effectiveness of therapy by electromyography or gnathodynamometer.

5. Conclusions

Therefore, given the different methods of treatment and evaluation of bruxism and therapy, further clinical trials and meta-analyses on a larger cohort of patients are needed to evaluate the effectiveness of other ways of bruxism treatment. The use of photobiomodulation and hydroxyzine therapy is a valuable means of being able to treat bruxism in children. Bite therapy needs compliance and, on the part of the child, is quite tricky and, therefore, not very predictable in outcome. Therefore either with photobiomodulation or hydroxyzine, there will be better results in decreasing bruxism since there is no need for patient compliance. Photobiomodulation obviously and still requires the patient to go to the office while as. At the same time, draisie therapy has o or at least very mild side effects, including fatigue. Therefore, this drug therapy should be limited in severe cases. However, further studies and an adequate sample are needed to evaluate the efficacy. Although this meta-analysis was conducted on studies that were very uneven in terms of therapy, we can say, albeit with the limitation of data and studies,that hydroxyzine and photobiomodulation are important aids in the treatment of growing bruxism patients. In fact, photobiomodulation has been used for a long time in the treatment of muscle disorders and therefore the meta-analysis performed confirms this effect. The pharmacological effects of hydroxyzine are central and therefore act on muscle contractility. Therefore the therapy of first choice, as studies in the literature using it in the treatment of orofacial pain, is photobiomodulation.

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

AUTHOR CONTRIBUTIONS

GM, RF, MMM, SC, LF, GC and MC—designed the research study. GM and RF—performed the research. MC, LF, SC, AB and GC—analyzed the data. GM, MMM and MC—wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

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CONFLICT OF INTEREST

The authors declare no conflict of interest. Giuseppe Minervini is serving as one of the Editorial Board members of this journal. We declare that Giuseppe Minervini had no involvement in the peer review of this article and has no access to information

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