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Associated factors and treatment options for sleep bruxism in children: an umbrella review

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Abstract: Data on clinical management options for sleep bruxism in the primary dentition are inconclusive. This umbrella review aimed to synthesize the available evidence from systematic reviews (SRs) on the associated factors and treatment approaches for clinical management of sleep bruxism in children. A search was conducted in the MEDLINE/PubMed, Web of Science, Embase, and OpenGrey databases up to March 2022. SRs published on sleep bruxism in children containing data on associated factors or treatment outcomes were included. The AMSTAR-2 tool was used to assess the methodological quality of SRs. The search identified 444 articles, of which six were included. Sleep conditions, respiratory changes, personality traits, and psychosocial factors were the associated factors commonly identified. Treatments included psychological and pharmacological therapies, occlusal devices, physical therapy, and surgical therapy. All SRs included presented a high risk of bias. Overlapping of the included studies was considered very high. The best evidence available to date for the management of sleep bruxism in children is based on associated factors, with sleep duration and conditions, respiratory changes, as well as personality traits and psychosocial factors being the most important factors commonly reported by studies. However, there is currently insufficient evidence to make recommendations for specific treatment options.

Keywords: Tooth, Deciduous; Pediatric Dentistry; Bruxism; Systematic Review; Sleep Bruxism.

Introduction

Sleep problems are increasingly common in childhood and can have a negative impact on children's health, learning, school performance, and quality of life.[1-4] Therefore, sleep bruxism, which mean prevalence in primary dentition is estimated to be 19.5%, ranging between 3.5 to 40.5% in different populations, is the focus of studies[5,6] seeking to understand the factors involved in its occurrence and determine a better therapeutic approach.[7-9]

Factors associated with sleep bruxism include breathing problems, anxiety, stress, snoring, and few hours of sleep.[7,8] These factors act as a stimulus to the central nervous system, modifying the release of

neurotransmitters such as dopamine, which results in repetitive activity of the jaw muscles characterized by clenching or grinding of the teeth and/or supporting or pushing the jaw during sleep.[10]

Consequently, this phenomenon has been associated with several disorders, such as dental problems and orofacial pain.[10,11] Besides, bruxism has been considered a risk factor for dental restoration failures in adults.[12] Thus, its management is a challenge for dentists.

Sleep bruxism in adults has been the focus of systematic reviews (SRs) that provided information on possible treatment strategies.[5] However, data on the clinical management options, associated factors, and treatment alternatives on the primary dentition are not clear. SRs on the topic have been conducted, but the management strategies evaluated differ between them, making the clinical approach in patients in this age group challenging.[7-9] The umbrella review, which summarizes the multiple approaches evaluated in SRs and provides a comprehensive overview of a specific research topic, is an accessible tool to guide decision-making by health providers and identify research gaps.[13,14]

This umbrella review aimed to synthesize the available evidence from SRs about the associated factors and treatment approaches for the clinical management of sleep bruxism in children with primary dentition.

Methodology

Study design

This umbrella review was registered on the PROSPERO (International Prospective Register of Systematic Reviews) platform (#CRD42019131446), conducted according to the Joanna Briggs Institute[15] guideline and reported based on the PRISMA Statement checklist.[16]

Two researchers performed the processes of article screening, data collection, and risk of bias analysis independently (SS e TKT). A researcher with experience in SRs solved cases of conflict or doubt (TG).

Study sources

The systematic search for available SRs was conducted in the MEDLINE/PubMed, Web of Science, and Embase electronic databases. The grey literature was searched through the OpenGrey platform. The reference list of potentially eligible studies was also screened to search for relevant articles that may have not been identified in the database search. There were no restrictions on the language of publication or publication date for study selection. The last search was carried out on March 11, 2022.

Search strategy

The search strategies were based on the PI(E)O question: "What are the associated factors and treatment options for the clinical management of sleep bruxism in children with primary dentition?" (Participants: children with sleep bruxism in primary dentition; Intervention/Exposure: treatments available and associated factors; Outcome: the success of clinical management), which was developed for MEDLINE/Pubmed database and adapted for the others. The search strategies are displayed in Table 1. The results from the different databases were cross-referenced using Microsoft Excel software for Mac (Microsoft Corporation, Washington, USA) to locate and eliminate duplicates.

Eligibility criteria

Initially, the titles and abstracts of potentially relevant studies identified in the databases were evaluated based on the following inclusion criteria:

a. Focused on sleep bruxism;
b. Evaluated children with an unremarkable health history;
c. Was an SR.

After the first evaluation, the articles that met the inclusion criteria were reviewed in full text. Then, those that met at least one of the following exclusion criteria were considered ineligible:

a. No data on primary dentition;
b. Did not evaluate associated factors or treatment success.

Data extraction and synthesis

The same two reviewers entered the information required from the eligible studies independently

Table 1. Search strategies for all databases.

Database	Search terms
PubMed/MEDLINE	((bruxism OR ("sleep bruxism")) AND (children OR child OR infants) AND ("review" OR ("systematic review) OR ("Syst Rev") OR ("systematic" AND "reviews") OR ("systematic reviews") OR overview))
Web of Science	TS=((bruxism OR ("sleep bruxism")) AND (children OR child OR infants) AND ("review" OR ("systematic review") OR ("Syst Rev") OR ("systematic" AND "reviews") OR ("systematic reviews") OR overview))
Embase	('bruxism'/exp OR bruxism OR 'sleep bruxism'/exp OR 'sleep bruxism') AND ('children'/exp OR children OR 'child'/exp OR child OR 'infants'/exp OR infants) AND ('review'/exp OR 'review' OR 'systematic review'/exp OR 'systematic review' OR 'syst rev' OR ('systematic' AND 'reviews') OR 'systematic reviews'/exp OR 'systematic reviews' OR overview)

and in duplicate in structured tables. Doubts and discrepancies were discussed and, when a consensus was not possible, a third examiner was consulted. For each included study, the following data were systematically recorded: publication details (author and year), protocol registration (yes or no), number of articles included, databases used, date of search, number of reviewers, languages considered, design of eligible and included studies, bruxism assessment criteria considered by included primary articles, associated factors or treatments evaluated (as well as the measured outcome), methodological quality analysis or risk of bias assessment (yes or no and the tool used), and statistical synthesis of the data/meta-analysis (yes or no).

For data synthesis, the results (odds ratio and 95% confidence interval) of associated factors and treatment options were considered from the pooled data of at least two studies.

Methodological quality and risk of bias assessment

The methodological assessment of the included SRs was carried out using the AMSTAR-2 tool, which classifies the confidence of the studies as high, moderate, low, or critically low[17]. The risk of bias analysis was performed using the ROBIS tool. The final score of risk of bias was classified as low, high, or unclear.[18]

Overlap degree of studies included in systematic reviews

Citation matrices were generated to assess the overlap degree of studies included across the SRs. *Corrected Covered Areas (CCAs)* were calculated, with study overlaps being classified as slight (0–5), moderate (6-10), high (11–15), or very high (> 15).[13,19]

Results

Selection of studies

The search identified 444 potentially relevant studies: 115 from MEDLINE/PubMed, 69 from Web of Science, and 260 from Embase. No potentially eligible studies were found on the OpenGrey platform. One hundred and twenty-one were duplicated in more than one database. After screening the title and abstract, 301 studies were considered ineligible. The main reason for non-inclusion was that the studies were not in children with an unremarkable health history (38.9%). Twenty-two remaining studies were fully analyzed for the collection of more detailed information. Eleven studies were excluded because they did not present data about associated factors or treatment success for sleep bruxism in the primary dentition. Finally, six studies met the eligibility criteria and were included in the umbrella review — three focusing on associated factors and three on treatment options. The selection process of the SRs is shown in Figure.

Characteristics of systematic reviews

Table 2 presents the main characteristics collected from the SRs. Three SRs focused on associated factors for sleep bruxism evaluation. No study mentioned the registration of the protocol. The searches took place between 2014 and 2016. The number of studies included in the SRs ranged between 7 and 18. All studies performed the search in PubMed and at least two more databases. Besides, all studies had

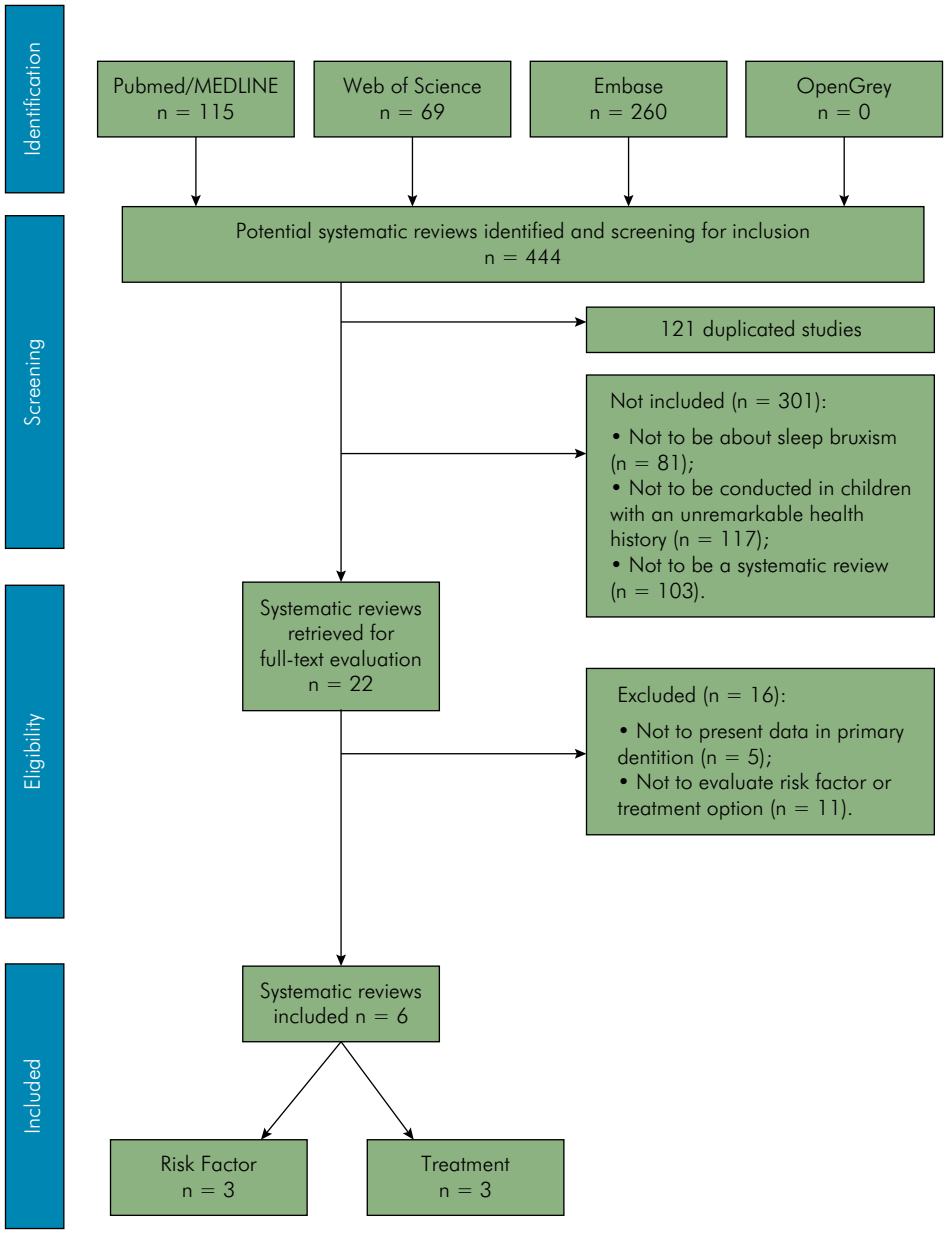

Figure. Flow diagram of identification, screening, and eligibility of studies.

two independent reviewers and had the help of a third researcher when there was no agreement, and also reported a methodological quality analysis or a risk of bias assessment. Only one study did not restrict the language in which the study was published.[20] However, the same study did not carry out a meta-analysis or statistical synthesis of the data.[20] Questionnaire for parents or guardians was the assessment method more commonly used in the included studies.[7,21]

The objective of one study was to evaluate several factors associated to sleep bruxism,[7] one study assessed the association of sleep bruxism with psychosocial factors,[20] and the other study evaluated the association between sleep behaviors and sleep bruxism.[21] Sleep condition was commonly associated with sleep bruxism in the included studies.[7,21] Personality traits and emotional problems were also associated.[7]

Three other studies focused on treatment options for sleep bruxism. No study mentioned

Table 2. Characteristics of systematic reviews included according to study focus.

Author, year	Protocol registration	Number of articles included	Databases / Date of search	Number of reviewers	Languages	Studies design eligible	Studies design included	Bruxism assessment criteria	Methodological Quality analysis or Risk of bias assessment	Statistical synthesis of data (meta-analysis)	Associated Factors / Treatment options evaluated	Main results*§
Risk factors												
De Luca Canto et al., 2015[20]	No	7	Pubmed, Embase Cochrane, Medline, Virtual Health Library, Google Scholar. June 16, 2014	2	Without restrictions	Case-control, Cohort	Case-control, Cohort	Proposed by American Academy of Sleep Medicine	QUIPS	No	Psychosocial factors: conformity, masculinity/femininity, maturity, aggression, inhibition, activity levels, sleep disturbance, somatization, daytime cognitive behavioral, stress, anxiety level, personality traits, stress, anxiety level, depressive symptom levels, and psychiatric disorders.	There is no evidence in children under 5 years.
Guo et al., 2017[21]	No	14	Pudmed, Embase, Cochrane Library, Web of Science, CBM, CNKI, WF. September 12, 2016	2	Chinese and English	RCT, Cross-sectional, Case-control, Cohort.	Case-control, Cross-secional.	Questionnaire for parents or guardians, Clinical examanination and parasitologic analysis	NOS and Criteria of the cross-sectional/ prevalence study quality	Yes	Sleep behaviors: snoring, mouth breathing, restless sleep, awakening at night, crying at night, position during sleep, sleep talking, drooling, night mares, sleep hours, obstructive sleep apnea, light on, noise in room, sleeping with hand on face, frequency of sleep starts, nap habit.	Mouth breathing 1.51 (1.04–2.18) Position during sleep – on side vs on back (ref) 1.48 (1.07–2.06) Position during sleep – Stomach position vs on back (ref) 1.70 (1.20–2.39) Drooling 1.79 (1.07–2.97) Sleep talking 1.80 (1.02–3.18) Snoring 3.56 (2.88–4.38) Restless sleep 2.31 (1.89–2.83) **Lack of sleep.
Guo et al., 2018[7]	No	18	Pudmed, Embase, Cochrane Library, Web of Science, CBM, CNKI, WF. October 1, 2016	2	Chinese and English	RCT, Case-control, Cohort.	Case-control, Cohort.	Questionnaire for parents or guardians	NOS and RoB	Yes	Gender, age, gene, sleep position, secondhand smoke, personality traits, psychological reactions, responsibility, obstructive sleep apnea, restless sleep, sialorrhea, sleep hours, lights on, noise in room, headache, nail biting, objects biting, lip biting, cheek tonus, perioral musculature participation , driving problems, conduct problems, posterior crossbite, peer problems, emotional problems, birth weight, occupation of the family head, maternal marital status, family income, hyperactivity, primary canine wear, clenching teeth when awake.	Male 1.13 (1.02-1.26) Headache 1.39 (1.07–1.8) Nail biting 1.52 (1.05–2.21) Peer problems 1.74 (1.39–2.18) Restless sleep 2.31 (1.62–3.29) Emotional symptoms 1.91 (1.32–2.75) Objects biting 1.99 (1.32–2.98) Mental Health problems 2.08 (1.67–2.58) **Gene, psychological reactions, responsibility, secondhand smoke, snore loudly, sleep with light on, noise in room, duration of sleep and conduct problem.

Continue

Continuation

Treatments											
Restrepo et al., 2019[9]	No	2	Medline/ PubMed, Ovid, Biomed Central, EBSCO, ISI, Cochrane Library, Embase, LILACS, Scielo, Scirus, Metacrawler, Academic Google, dogpile, Looksmart, and Journal Sede. From March 1985 to the end of September 2007.	2	Spanish and English	Experiemntal studies	Before and After.	Questionnaires, an oral history taking (including a parent or guardian's report of grinding sounds), and extraoral and intraoral inspections for clinical signs.	Chalmers instrument	No	(1) Psychological therapy (2) Adenotonsillectomy (patients with respiratory difficulties)	Absence of evidence for the treatment of bruxism.
Chisini et al., 2020[23]	No	17	PubMed/ Medline, SciVerse Scopus, ISI Web of Science, Cochrane Library, BVS Bireme, annals of the International Association for Dental Research, pediatric conferences, and conventions, and in ResearchGate. May 2019	2	Without restrictions	Case-control, Case series, Case reports, RCT, NRCT	Clinical trial crossover, Clinical trial, Clinical case, RCT, Before and After.	Self-reported, signs (headache, morning face/ jaw pain	RoB, NOS, tool developed by Murad et al.	No	Pharmacological interventiona: (1) Flurazepam (2) Hydroxyzine (3) Imipramine (4) Tradozone (5) Diazepam (6) Psychological intervention (7) Physiotherapy intervention	Reduction in self-reported bruxism and headaches with medications (hydroxyzine/ trazodone/flurazepam), occlusal splints, orthodontic interventions, and psychological and physical therapy interventions. Melissa officinalis showed inconclusive results.
Ierardo et al., 2021[22]	No	10	Medline/ PubMed,Web of Science, Scopus, Cochrane Library. From 1950 to November 30, 2017	2	English, French, German, Spanish, Polish, and Portuguese.	RCT, Sequential unblended phases studies, Cohort, Cross-sectional, Case-control.	RCT, Sequential unblended phases.	Tooth grinding and/or clenching – Parent-reported and investigation protocol.	NOS and Jaded scale	Yes	1) Melissa officinalis (2) Hydroxyzine (3) Flurazepam vs. Placebo	(1) Melissa officinalis OR=0.50 (0.10-2.60) (2) Hydroxyzine OR=10.63 (1.48-76.1) (3) Flurozepam OR=0.75 (0.17-3.33) Weak evidence of a possible efficacy of the Hydroxyzine

CBM: Chinese biomedical literature database; CNKI: Chinese national knowledge infrastructure; NOS: Newcastle Ottawa scale; NRCT: Non-Randomized clinical trial; RCT: Randomized clinical trial; RoB: Risk of bias tool for randomized clinical trials; QUIPS: quality in prognosis studies tool; WF: Wanfang data. *Risk factors for sleep bruxism identified after pooled data from at least two studies; **Risk factors associated for sleep bruxism but without pooled data; §Outcome considered in treatment studies: Reduction of signs and symptoms of bruxism

the registration of the protocol. The searches took place between 2007 and 2019. The number of articles included in the SRs ranged between two[9] and seventeen.[23] One SR included ten primary studies, but only three presented data for meta-analysis and were analyzed qualitatively and quantitatively.[22] All studies searched the PubMed database and at least two more databases. All studies had two independent reviewers and a third researcher was consulted when there was no agreement, and all conducted some type of methodological quality analysis or risk of bias assessment of the studies. However, there were language restrictions in two included studies.[9,22] Only one study collected enough data to perform a meta-analysis.[22] All studies reported a lack of evidence[9] or low level of evidence[22] for recommending any of the treatments evaluated, or yet the information from studies had high or unclear risk of bias.[23]

Methodological quality and risk of bias assessment

Table 3 shows the results of the methodological quality analysis.

All SRs did not meet the proposed criteria in at least one domain. However, one study met the criteria for all critical domains, and was ranked as moderate confidence in the results.[23] On the other hand, two studies did not fulfill the criteria for a critical domain and were classified as having low confidence in the results.[7,22] The other SRs did not meet the criteria proposed in more domains and were rated as critically low confidence in the results.[9,20,21]

Table 4 shows the result of the risk of bias assessment for the included SRs. SRs showed a high risk of bias. In general, studies presented at least one parameter with a low risk of bias. Study eligibility received a high risk in all SRs, mainly due to the absence of a previous protocol (registered or published). Besides, the lack of search in the grey literature or in the references of eligible studies and restriction of the publication date or language resulted in a high risk of bias for all studies except one in the parameter identification and selection of studies.[23] On the other hand, in the parameters of data collection and study appraisal as well as data synthesis and findings, all SRs presented a low risk of bias. However, three did not conduct data synthesis/meta-analysis and were not scored for this parameter. [9,20,23]

Overlap degree of studies included in systematic reviews

Table 5 shows the overlap of studies included in the SRs on associated factors. Most studies were included in only one SR (62.1%). It was also observed that the newer the SRs, the greater the number of studies included. The overlap of studies was considered very high (38%; CCA = 0.38).

Table 6 shows the overlap of studies included in the SR on treatment options. Only one study was included in the three SRs (5.3%). The overlap of the studies was considered very high (21%; CCA = 0.21).

Discussion

The control of sleep bruxism is a challenge for pediatric dentists, not only due to the difficult assessment but mainly due to the lack of evidence to support the available management strategies for the condition. This study aimed to summarize the data on associated factors and treatment approaches available for clinical management to sleep bruxism in children with primary dentition.

The best evidence reported by SRs to date is for factors associated with this condition. For this reason, the focus should be the management of these factors. In general, the sleep conditions of affected children are associated with bruxism, being the duration and quality of sleep frequently associated.[7,21] The primary studies included in the SRs indicate that factors such as snoring, restless sleep, insomnia, sleeping position, noise in bedroom, and sleeping with the light on directly interfere with sleep bruxism.[7,21] Some justifications have been pointed out: a) the change in sleeping position may be associated with airway obstruction, and as a consequence, bruxism[7]; b) restless sleep, in addition to frequent changes in position during the night, may also indicate discomfort, suggesting anxiety or stress;[7] c) stimuli such as the light on and noise can negatively impact the child's

Table 3. Methodological quality of included systematic reviews.

Criteria	Associated factors			Treatment		
	Canto et al. (2015)[20]	Guo et al. (2017)[21]	Guo et al. (2018)[7]	Restrepo et al. (2019)[9]	Chisini et al. (2020)[23]	Ierardo et al. (2021)[22]
1. Did the research questions and inclusion criteria for the review include the components of PICO?	Y	Y	Y	Y	Y	Y
2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?	PY	PY	PY	PY	PY	PY
3. Did the review authors explain their selection of the study designs for inclusion in the review?	Y	Y	Y	Y	Y	Y
4. Did the review authors use a comprehensive literature search strategy?	PY	PY	PY	PY	Y	PY
5. Did the review authors perform study selection in duplicate?	Y	Y	Y	Y	Y	Y
6. Did the review authors perform data extraction in duplicate?	Y	Y	Y	Y	Y	Y
7. Did the review authors provide a list of excluded studies and justify the exclusions?	N	N	PY	N	Y	N
8. Did the review authors describe the included studies in adequate detail?	PY	PY	PY	N	Y	N
9. Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	Y	Y	Y	PN	Y	Y
10. Did the review authors report on the sources of funding for the studies included in the review?	N	N	N	N	N	N
11. If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	Not applied	Y	Y	Not applied	Not applied	Y
12. If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	Not applied	N	N	Not applied	Not applied	N
13. Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?	N	N	N	N	Y	PY
14. Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	Y	N	N	N	N	N
15. If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	Not applied	Not applied	Not applied	Not applied	Not applied	Not applied
16. Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	Y	Y	Y	N	Y	Y
Rating overall confidence in the results of review	Critically low	Critically low	Low	Critically low	Moderate	Low

Y: yes; PY: partial yes; N: No; PN: partial no.

biological clock and sleep pathophysiology, since the sleep cycle is influenced by stimuli of the environment,[24] which are related to restless sleep and, consequently, bruxism. These findings are supported by two SRs, which included 21 primary studies with very high overlap between them, even though the most recent SR has included a larger number of studies. These two SRs present, however, a high risk of bias and critically low methodological quality.

Table 4. Risk of bias of included systematic reviews.

Variable	Systematic review	1. Study eligibility criteria	2. Identification and selection of studies	3. Data collection and study appraisal	4. Synthesis and findings	5. Risk of bias in the review
Associated factors	Canto et al., 2015[20]	High risk	High risk	Low risk	Not applied	High risk
	Guo et al., 2017[21]	High risk	High risk	Low risk	Low risk	High risk
	Guo et al., 2018[7]	High risk	High risk	Low risk	Low risk	High risk
Treatment	Restrepo et al., 2019[9]	High risk	High risk	Low risk	Not applied	High risk
	Chisini et al., 2020[23]	High risk	Low risk	Low risk	Not applied	High risk
	Ierardo et al., 2021[22]	High risk	High risk	Low risk	Low risk	High risk

Table 5. Overlap of studies included in systematic reviews on associated factors.

Author, year	Canto et al., 2015[20]	Guo et al., 2017[21]	Guo et al., 2018[7]
Kuch et al.,1979	X[a]		
Vanderas et al.,1999	X[a]		
Zhang et al., 2000		X[b]	X[b]
Chen et al., 2004			X[a]
Herrera et al., 2006	X[a]		
Katayoun et al., 2008	X[a]		
Restrepo et al., 2008	X[b]		X[b]
Suw et al., 2009		X[a]	
Zhu et al., 2009		X[b]	X[b]
Jiang et al., 2010		X[a]	
Simoes-Zenari et al., 2010		X[b]	X[b]
Miamoto et al., 2011		X[b]	X[b]
Motta et al., 2011			X[a]
Wang et al., 2011		X[b]	X[b]
Ferreira-Bacci et al., 2012	X[a]		
Montaldo et al., 2012			X[a]
Serra-Negra, Paiva, Auad et al., 2012		X[b]	X[b]
Serra-Negra, Paiva, Flores-Mendonza et al., 2012			X[a]
Renner et al., 2012			X[a]
Junqueira et al., 2013		X[b]	X[b]
Turhoglu et al., 2013	X[a]		
Nachas-Scocate et al., 2014		X[b]	X[b]
Serra-Negra et al., 2014		X[b]	X[b]
Oliveira et al., 2015			X[a]
Alencar et al., 2016		X[a]	
Soares et al., 2016		X[a]	
Tachibana et al., 2016		X[b]	X[b]
Diaz-Serrano*			X[a]
Tehrani**			X[a]

[a]no overlap; [b]study included in two systematic reviews; *Reference was not informed by the authors of the systematic review.

Table 6. Overlap of studies included in systematic reviews on treatment options.

Author, year	Restrepo et al., 2019[9]	Chisini et al., 2020[23]	Ierardo et al., 2021[22]
Reimão; Lefévre,1982		**Xa**	**Xa**
Ingerslev,1983			**X**
Jones, 1993		**X**[b]	[b]
Egermark; Rönnerman, 1995		**X**[b]	[b]
Restrepo et al., 2001	**X**[c]	**X**[c]	**X**[c]
DiFrancesco et al., 2004	**X**[b]		
Shakibaei et al., 2008		**X**[b]	[b]
Hirsch, 2009			**X**
Quintero et al., 2009			**X**
Restrepo et al., 2011		**X**[b]	
Carra et al., 2013		**X**[b]	[b]
Ghanizadeh; Zare, 2013		**Xa**	**Xa**
Giannasi, 2013		**Xa**	**Xa**
Oliveira et al., 2013		**X**[b]	[b]
Giannasi et al., 2015		**Xa**	**Xa**
Bellerive et al., 2015		**Xa**	**Xa**
Bortoletto et al., 2016		**Xa**	**Xa**
Silva et al., 2017		**X**[b]	[b]
Mostafavi et al., 2019		**X**[b]	[b]

[a]no overlap; [b]study included in two systematic reviews; [c]study included in three systematic reviews.

However, it cannot be claimed that there is any causal association between restless sleep and inadequate sleep habits with sleep bruxism. Individuals with sleep bruxism do not necessarily report signs of poor sleep quality.[25] Besides, the adoption of sleep hygiene habits does not play a decisive role in eliminating parafunction, reinforcing the hypothesis of a non-causal association.[26]

Sleep bruxism has been shown to be associated with personality traits and psychosocial factors, such as stress and anxiety. Personality traits refer to how the individual reacts to different situations, and anxious, tense, or stressed children can discharge this energy during sleep, resulting in sleep bruxism.[27] On the other hand, in one SR, these associations were identified only in children older than 6 years,[20] which was not the focus of this SR. The authors explain that the social development expected from the school stage gradually makes the child less self-centered, with more experiences in social environments, which often takes the form of anxiety and stress[20]. On the other hand, they mention that bruxism seems to be a relatively common habit in children between 5 and 6 years old, with no significant psychological correlates[20]. Two SRs support these associations,[7,20] although all of them are at high risk of bias and lack critical methodological criteria, and 25 primary studies have been included, with only one mentioned in more than one SR. These SRs also reported a high risk of bias in primary studies, especially due to the lack of standard criteria for the assessment of psychosocial factors and sleep bruxism, which the most significant limitation is the subjectivity of the assessment and self-report of parents.

Although the association between sleep bruxism and psychosocial factors is widely reported in the literature, there is no biological plausibility for the mandibular movement to be associated with anxiety. Teeth grinding, which characterized sleep bruxism, is determined by aphasic muscle activity

involving movement. However, neurophysiology studies indicate that muscle activity related to tension and concentration states is tonic, *i.e.*, the muscles exhibit sustained contraction.[28,29] Thus, it is more likely that the anxious profile results from respiratory obstruction, a recognized risk factor for sleep bruxism.[30]

One SR also includes exposure to secondhand smoke as a factor associated with sleep bruxism.[7] The role of nicotine or smoke exposure in the pathogenesis of bruxism is based on the trigeminal's activation of baseline afferents, leading to the trigeminal-cardiac reflex.[7] The clinical presentation of this reflex is bradycardia, hypotension, apnea, and gastric hypermotility, but it can also lead to sleep bruxism.[7] The SR that identified this association presents a high risk of bias and the absence of methodological criteria, either because it was not conducted or it was not reported. However, most primary studies included were evaluated as having good quality and/or low risk of bias.

The role of decreased oxygenation in sleep bruxism is biologically supported, so a causal association between the two variables is very likely. Most individuals with sleep apnea initiate mandibular movement shortly after the episode.[31] The activation of the suprahyoid muscle and the consequent mandibular protrusion favor airway patency, returning the breathing pattern before the apneic moment.[32,33] Consequently, the protrusion of the mandible has a protective role for the organism that is physiologically based. The causality between upper airway obstruction and bruxism is supported by experimental research showing that the suppression of the causative agent decreases sleep bruxism.[34,35] However, the fact that there are individuals who experience sleep bruxism before apnea raises the hypothesis that there is a specific phenotype where the causal association between the situations fits.[31]

Conversely, when treatment of sleep bruxism was the focus of SRs, there is no evidence to support any strategy. Restrepo et al.[9] used a quality criterion for the inclusion of articles in the SR. Although they point to other treatment options such as drugs, occlusal devices, and physical therapies, only two studies met the criteria proposed by them, which evaluated adenotonsillectomy and psychological therapy as approaches to sleep bruxism. However, there is still insufficient evidence to confirm that the surgery reduces bruxism, especially considering that the authors did not report assessment criteria for reducing bruxism. Likewise, the study that evaluated the effect of psychological therapy on signs and symptoms of sleep bruxism had several methodological flaws, which makes the findings unfeasible for the construction of evidence.

Another SR by Ierardo et al.[22] has focused on pharmacological options for treating sleep bruxism in children. The authors noted that pharmacotherapy with hydroxyzine had possible effectiveness in reducing signs and symptoms of sleep bruxism, but the evidence level is low. The finding was based on a single primary study of very low methodological quality.[22] The administration of benzodiazepines and *melissa officinalis* was not associated with bruxism improvement and should not be recommended. Since these findings are based on low-quality studies,[22] well-designed randomized clinical trials with low risk of bias and a representative sample size are required to confirm or refute these results.

In the same line, Chisini et al.[23] also investigated the effect of pharmacological approaches for the clinical control of sleep bruxism. The authors affirmed that a reduction in self-reported bruxism and headaches associated with bruxism were observed in studies using medication (hydroxyzine/ trazodone/ flurazepam). However, alternative treatments, such as *Melissa officinalis L*, show inconclusive results. These findings corroborate the SR by Ierardo et al.[22] since the authors from both studies affirm that these results were from studies with a high risk of bias and low-methodological quality, hindering the recommendation of such treatments for sleep bruxism based on them.

Complementing these findings, several interventions were identified with reports of bruxism reduction. Occlusal splints, orthodontic interventions, and psychological and physical therapy are the approaches identified by this SR. Nevertheless, even though this SR presents moderate methodological quality, a high risk of bias has been found. Also,

these reported results are from primary studies with a high risk of bias.[23]

It is worth mentioning that umbrella reviews aim to summarize the findings of the SRs without assessing the primary studies individually.[13] Thus, some information that could impact the synthesis of results could be missed in umbrella reviews, such as sample size and study design of the primary studies included in SRs. The quality of evidence generated from the SRs is affected by these factors. In the present umbrella review, the SRs included different studies design, of which the most common were cross-sectional and case-control for studies on associated factors, and RCT and before-and-after study for studies on treatment assessment. RCTs are the most appropriate study design to compare treatment strategies and provide the best evidence for clinical practice, whereas cohort studies are best suited to identify risk factors rather than associated factors.

It is assumed that the included studies followed previously defined search strategies and eligibility criteria, although none of the included SR had registered the protocol before implementation. Registering research protocols ensures transparency in the conduct and reporting of studies and should be considered in future SRs. On the other hand, methodological quality analysis or risk of bias assessment of primary studies were conducted for all SRs included and considered in our reports.

Another critical aspect that should be considered is the lack of standardization for the assessment of bruxism, which could reflect the large range of bruxism prevalence (3.5%–40.6%) in different populations, resulting in a clinical heterogeneity that compromises the summarizing of data.

Thus, the best evidence available to date for the management of sleep bruxism in children is the control of associated factors, with sleep duration and conditions, respiratory changes, personality traits, and psychosocial factors being the most commonly reported in the studies. On the other hand, there is currently insufficient evidence with a high risk of bias and critically low confidence in the results to make recommendations for specific treatment options. Further well-designed studies that consider strategies for clinical control of bruxism should be performed.

Conclusion

There is currently no evidence-based recommendation for a treatment strategy for sleep bruxism in children so far. On the other hand, management of associated factors seems to be the best strategy for clinical control of sleep bruxism in children. The studies focusing on strategies for the management of associated factors could provide more clinically relevant and applicable information for children with primary dentition.

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