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Review

Sleep bruxism and related risk factors in adults: A systematic literature review

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ABSTRACT

Objective: The aim of this article was to systematically review the literature to assess the relationship between risk factors and sleep bruxism (SB) in adults (age ≥18 years).
Design: A systematic search of the following databases was carried out: PubMed, Embase, Scopus, Cochrane Oral Health Group's Trial Register and Cochrane Register of Controlled Trials, Web of Science, LILACs and SciELO. Nine out of the 4583 initially identified articles were selected. This review was conducted according to the guidelines from the Cochrane Handbook for Systematic Reviews of Interventions, with reporting in agreement to the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines.
Results: Among the nine analyzed articles, associations between SB and gastro-esophageal reflux disease (GERD) (OR = 6.6, CI = 1.4–30.9) was found in one randomized clinical trial (RCT). Four cross-sectional studies suggested history of SB during childhood (OR = 8.1 CI = 5.4–12–2), age (OR = 3.1, CI = 2.3–4.1) and chronic migraine (OR = 3.8, C.I = 1.8–7.8) as determinant factors for the development of SB. In one case-control study, patients with genetic polymorphisms were more likely to present SB (OR = 4.3, CI = 1.6–11.3). Smoking (OR = 2.8, CI = 2.2–3.5) and alcohol intake (OR = 1.9, CI = 1.2–2.8) showed moderate association in two case-control studies.
Conclusions: History of SB during childhood, gastro-esophageal reflux disease and genetic polymorphisms seem to be important risk factors associated to SB in adults. Dry mouth on awakening seems to be a protective factor. Association does not infer with causality. Even if the evidence emerged from the considered studies was clinically relevant, further studies are requested to better understand the biological mechanisms behind the described associations.

1. Introduction

Sleep bruxism (SB) is a stereotypical rhythmic activation of masticatory muscles, characterized by grinding and/or clenching of the teeth and/or by bracing or thrusting of the mandible during sleep (Lobbezoo et al., 2013) In detail, SB is classified as a centrally mediated movement disorder related to sleep (Lobbezoo et al., 2013). The pathophysiology of SB is still unknown. It is considered multifactorial with potential influences of the central nervous system (CNS) (Manfredini & Lobbezoo, 2009). Considering that bruxism can seriously affect life quality through dental and orofacial problems such as tooth wear, masticatory muscle tenderness and pain, headache and temporomandibular disorders (TMDs) (Carlsson, Egermark, & Magnusson 2002; De Meyer & de Boever, 1997; Manfredini, Winocur, Guarda-Nardini, Paesani, & Lobbezoo, 2013), it is important to provide to clinicians the best evidence-based information to support their clinical practice and to researchers a starting point for future developments.

SB presents no gender differences in all age stages. Its prevalence tends to decrease with aging (Machado, Dal-Fabbro, Cunali, & Kaizer, 2014; De Meyer & de Boever, 1997; Manfredini et al., 2013): in young adults aged between 18 and 29 years old, it is of 13%, reducing to 3% in individuals over 60 years of age. In relation to etiology, multiple risk factors have been associated to SB (Feu, Catharino, Quintão, & Almeida, 2013; Giraki et al., 2010). Most of the studies were conducted on

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bruxers subjects without any reference to SB or awake bruxism (AB) and accordingly to what has been defined in a recent consensus, most of the studies were based on a probable diagnosis of SB (Lobbezoo et al., 2013). The authors of this consensus (Lobbezoo et al., 2013) proposed a classification of SB diagnosis on the basis of the available instruments: 'possible' SB should be based on self-report, by means of questionnaires and/or the anamnestic part of a clinical examination, 'probable' SB should be based on self-report plus the inspection part of a clinical examination, 'definite' SB should be based on self-report, clinical examination, and polysomnographic recording, preferably along with audio/video recordings.

On the basis of the statements above mentioned, the aim of the present systematic review was to provide a comprehensive and exhaustive summary of the existing literature relevant to the following clinical research questions:

- Which are the identified risk factors for SB in adults?
- Which is the weight of each risk factor?

2. Materials and methods

The protocol for this systematic review (CRD42016037199) was registered in the International Prospective Register of Systematic Review (http://www.crd.york.ac.uk/PROSPERO/).

On 3 March 2017, a systematic search in the medical literature was performed in order to identify all peer-reviewed papers investigating risk factors related to SB in adults aged from 18 years. Thus papers in which a clear distinction between SB and AB was not performed were not considered for the selection. The selection procedure was thoroughly described through a detailed flow chart, according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines (PRISMA) statement and according to guidelines from the Cochrane Handbook for Systematic Reviews of Interventions (Higgins & Green, 2010; Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009) (Fig. 1).

In order to retrieve lists of potential papers to be included in the review, the search strategy illustrated in Chart 1 was used in the following databases: PubMed, Embase, Scopus, Cochrane Oral Health Group's Trial Register and Cochrane Register of Controlled Trials, Web of Science, LILACs and SciELO. Title and abstract (TIAB) screening was performed to select articles for full text retrieval. The inclusion and exclusion criteria for admittance in the systematic review were based on the type of study, were dependent on the clinical research questions, and are reported in Chart 2. Duplicate papers were removed and the studies were selected for inclusion independently by two of the authors (A.B. and G.R.). Disagreements were solved by consensus. The Population Intervention Comparator Outcomes (PICO) approach was used to extract data from the included papers independently and in duplicate by two review authors (T.C. and G.R.) (Lichtenstein, Yetley, & Lau, 2009). The primary outcome was represented by risk factors for SB in adults. According to the PRISMA statements and to the CRD (Centre for Reviews and Dissemination, University of York) the evaluation of methodological quality gives an indication of the strength of evidence provided by the study because flaws in the design or in the conduction of a study can result in biases (Centre for Reviews and Dissemination, University of York, 2008; Moher et al., 2009). However, no single approach for assessing methodological soundness is appropriate to all systematic reviews (Higgins & Green, 2010). The GRADE criteria (Grading of Recommendations Assessment, Development and Evaluation), are widely adopted by several authors and organizations throughout the world to assess the overall quality and the risk of bias level in a systematic review (Meader et al., 2014). In order to rate the extent of agreement among data collectors, Kappa statistics were performed (Mary & McHugh, 2012). Detailed quality assessment and reliability coefficient are illustrated in Table 1.

2.1. Statistical analysis

Statistical analysis was performed using the R statistical package (version 3.0.1, R Core Team, Foundation for Statistical Computing, Vienna, Austria). To improve the power of risk factors estimates associated with SB, papers in which a multiple regression analysis was performed (adjusted for variables statistically associated with SB) were selected for the review process. Several data extracted from the selected studies were processed in order to obtain either suitable data for the analysis or for presentation in an evidence table; only statistically significant risk factors were included (p value < 0.05).

The primary outcomes were risk factors associated to SB in adults, calculated as the standardized Odds Ratio (OR) effect size (Walter, 2000). This effect size was the result of the OR differences between SB patients and controls.

Non-overlapping 95% CI was considered statistically significant. Based on recommendations of the Cochrane Collaboration (Moher et al., 2009), one author (G.C.) converted the standardized relative risk (RR) into a natural log OR. In order to be considered eligible for the final review process, papers had to include OR analysis for investigated risk factors.

Empirical evidence suggests that relative effect measures are, on average, more consistent than absolute measures (Deeks, 2002; Littell, Corcoran, & Pillay 2008). OR is the main way to quantify how strongly the presence or absence of a risk factor is associated with the presence or absence of a disease in a given population.

3. Results

The search strategy returned 9 relevant publications (Abe et al., 2012; Aguilera et al., 2014; Fernandes et al., 2013, 2014; Kato, Velly, Nakane, Masuda, & Maki, 2012; Mengatto, Dalberto, Scheeren, & Barros, 2013; Ohayon, Li, & Guilleminault, 2001; Rintakoski & Kaprio, 2013; Rintakoski et al., 2010). Mean age in the evaluated samples ranged from 18 to 89 years. Sample size in individual studies ranged from 45 to 12.454 subjects, with a total of 25.107 subjects. The article selection process is illustrated in the PRISMA flow diagram (Fig. 1). Table 2 summarizes the characteristics of each of the nine included studies.

3.1. Quality analysis

According to the GRADE guidelines (Meader et al., 2014), among the selected sample, the methodological quality was perfect for all studies. The inter-rater reliability or the percentage of agreement among the selected papers reviewers accordingly to the simplified GRADE checklist, was 100% (Table 1). The most important sources of bias were the absence of allocation concealment and the lack of adequate blinded procedures for all included studies.

All the selected studies were referred to a SB diagnosis based on questionnnaires and/or clinical investigations. Considering the diagnostic classification proposed by Lobbezoo et al. (2013) all the studies were therefore based on a possible or probable diagnosis of SB.

3.2. Study results

Table 3 summarizes the results of each article reviewed, by the type of study and risk factor analyzed. The nine articles included in the review examined effects of various risk factors on SB: genetic (Abe et al., 2012), depressive and stressed status (Mengatto et al., 2013), sleep disordered breathing (Ohayon et al., 2001), gastroesophageal reflux disease (GERD) (Mengatto et al., 2013), morphological parameters (Mengatto et al., 2013), behavioral factors and personality traits (Abe et al., 2012), symptoms of TMDs and parafunctions (Kato et al., 2012), gender and age (Aguilera et al., 2014), chronic migraine (Fernandes et al., 2013), tinnitus (Fernandes et al., 2014) and legal psychoactive