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Review Article

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Exploring Effective Solutions: Evaluating Treatment Options for Sleep Bruxism and Their Impact

Sameer P P, Harish Babu P, Mohammed Basheer, Jamila Hameed *

Faculty, Department of Dentistry, Karuna Medical College, Vilayodi, Kerala, 678103, India.

*Corresponding Author: Jamila Hameed; *hameedjamila78@gmail.com*

Abstract

Background: Sleep bruxism involves involuntary grinding and clenching of teeth which is often under diagnosed. With appropriate diagnostic methods like polysomnography, clinical examinations and panoramic radiographs like cone beam computed tomography and MRIs coupled with effective treatment strategies, the condition can be well managed. ***Aim and objective:*** The primary question that we aimed to answer with this study was:" What are the various treatment approaches for sleep bruxism and which are the most suitable methods for effective management?". ***Methods:*** A total of 11 articles were selected finally from 17015 articles retrieved from PubMed and Google Scholar after title, abstract and full text screening for the review. ***Result:*** Occlusal splint displayed high effectiveness, followed by moderate, low and least effectiveness observed in biofeedback and behavioural therapy, botulinum toxin type A and pharmacological therapy, physiotherapy and psychotherapy including contingent electrical stimulation respectively. ***Conclusion:*** Treatments for sleep bruxism like occlusal splints, biofeedback, behavioural therapy, psychotherapy, physiotherapy and botulinum toxin injections showed effectiveness in different intensities. Treatment should be considered on the basis of the patient's needs and preferences for an improved life.

Keywords: ***Sleep bruxism, treatment, review, effectiveness, outcome.***

Introduction

Sleep bruxism(SB) is defined as the involuntary grinding and clenching of teeth during slumber. It is often underdiagnosed in children due to non-reporting and in adults due to non-awareness (Manfredini D *et al.*, 2022). SB results in complications like dental wear, pain in temporomandibular joints, and psychological, physical disorders and sleep disturbances. It has multifactorial aetiology including genetic predispositions, numerous lifestyle variables and psychological stress (Heyat MB *et al.*, 2021). The treatment is very challenging. Effective management is a mainstay in the treatment to avoid long-term complications. Relief from symptoms and dental wear prevention are the main treatment strategies. Occlusal splints or night guards are most common devices used for this purpose. Cognitive behavioural therapy and stress management methods also play an equally crucial role in management. Polysomnography is the gold standard in the diagnosis (Sinclair A *et al.*, 2022). Electromyogram(EMG) plays an important role as well (Sonmezocak T, Kurt S, 2021). Above all, a thorough clinical examination of temporomandibular joint in the patient with bruxism should be done. Palpation using fingers in TMJ area to notice swelling, tenderness and crepitus and checking for any clicking sound for assessing any dysfunction in TMJ are extremely important (Ohrbach R *et al.*, 2021). Panoramic radiographs, cone beam computed tomography(CBCT) or MRI will prove effective in evaluation. Pharmacological approaches with the use of botulinum toxin injections, muscle relaxants and anti-depressants serve as good treatment options. Our review aims at exploring bruxism and numerous treatment approached associated with it since it has got a multifactorial aetiology. A better understanding and need for future research will pave way for better outcome.

Methodology

This review and meta-analyses followed the Preferred Reporting Item for Systematic Review and Meta-Analyses (PRISMA) guidelines (Moher D *et al.*, 2009) (Figure 1).

Literature search

A comprehensive literature search was done to find out studies published between 2014 to 2023 on the treatment of sleep bruxism. Electronic database search was done in PubMed and Google Scholar using the keywords "Sleep Bruxism" and "treatment".

Inclusion and exclusion criteria

The inclusion criteria were: 1.) Cases available with complete data for treatment for sleep bruxism. 2.) Published in English.

The exclusion criteria were: - 1.) Case series, reports. 2.) Studies published in languages other than English and before 2014

Data extraction

The eligibility of the article based on criteria search was completed by 2 authors (SP and H.B). The full text of the studies was analysed by using Microsoft Excel 2016. The two authors assessed the methodology and the quality of the articles by using the New Castle Ottawa assessment scale (Wells GA *et al.*, 2000). Finally, a total of 11 studies met the quality of assessment. The data shows different

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studies from different parts of the world that is from countries namely China, Austria, UK, Brazil, Turkey and KSA. Data with first author with year of publishing, type of study, treatment method and outcome of treatment was tabulated (Table 1).

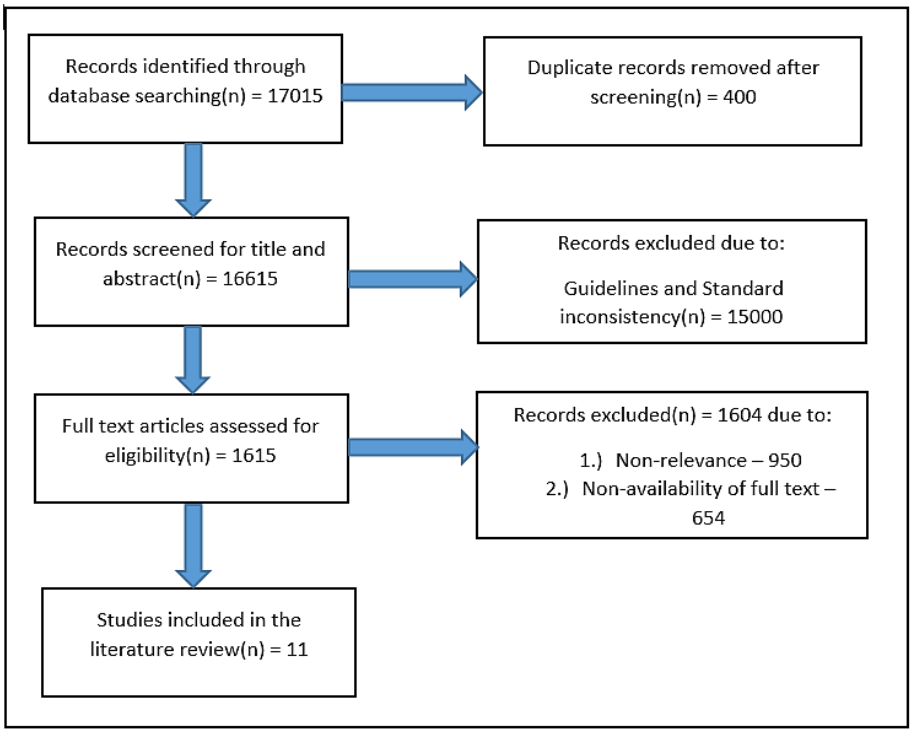

Figure 1: Flowchart for review on treatment of sleep bruxism

Results

Screening flow

According to the search strategy set in advance, a total of 17015 articles were retrieved in the target database (Figure 1). Then 400 duplicate articles were removed. The remaining 15000 articles were excluded from 16615 articles on title and abstract screening. Finally, a total of 11 articles were taken for review after removing 1604 articles due to certain reasons from 1615 articles during full screen assessment.

High effectiveness: Occlusal Splints- 72% (Figure 2)

Moderate Effectiveness: Biofeedback and behavioural therapy- 36% each

Limited Effectiveness: Botulinum Toxin Type A, Pharmacological Therapy

Least Effectiveness: Physiotherapy and psychotherapy including contingent electrical stimulation: - 9% each

Table 1: Treatment and outcome reported by various studies author wise

S No	Author Name (Year)	Country	Type of Study	Treatments for Sleep Bruxism	Outcomes of Treatments
1	Lu-Fei Wang *et al.* (2014)	China	Systematic Review	Biofeedback (auditory, electrical, visual)	Specific medications were not mentioned
2	Marc Guaita and Birgit Hogl (2016)	Austria	Review	Various (behavioral techniques, intraoral devices, medications, CES); Clonazepam	Clonazepam helped in psychiatric patients with bruxism
3	Philip Riley *et al.* (2020)	UK	Systematic Review	Oral splints: Amitriptyline, Bromocriptine, Clonidine, Propranolol, Levodopa	Oral splints and medications (Amitriptyline, bromocriptine, clonidine, propranolol, levodopa) didn't show particular pain reduction
4	Sandra Kalil Bussadori *et al.* (2020)	Brazil	Systematic Review	Botulinum Toxin Type A, occlusal splints, biofeedback	Botulinum toxin Type A (BTX-A) reported pain and bruxism frequency reduction in comparison to behavioral therapy and splints
5	R S Hardy and SJ Bonsor (2021)	UK	Systematic Review	Occlusal splint, behavioral therapy, amitriptyline	Amitriptyline did not report any particular pain reduction, occlusal splints also lacked effectiveness
6	Sylwia Bulanda *et al.* (2021)	Poland	Review	physiotherapy, psychotherapy, occlusal devices	Lack of particular pharmacological approaches, stress on behavioral therapy and education for parents

7	Guieseppe Minervini *et al.* (2022)	Italy	Systematic Review	Occlusal splint, behavioral therapy	Not much stress laid upon medications, behavioral therapy and occlusal splints emphasized
8	Samanta Scarpini *et al.* (2023)	Brazil	Umbrella review	Occlusal splint, pharmacological therapy, behavioral therapy	Psychological and behavioral therapies highlighted
9	Kevser Kolcakoglu *et al.* (2021)	Turkey	Systematic Review	Occlusal splint, pharmacological therapy	No particular pharmacological approach found effective
10	Sultan Ainoosah *et al.* (2021)	Saudi Arabia	Systematic Review	Occlusal splint, behavioral therapy	No particular pharmacological approach found effective
11	Larissa Soares Silva *et al.*	Brazil	Systematic Review	Occlusal splint, biofeedback	Biofeedback mechanism showed impressive results

Table 2: Important findings, merits and gaps reported by various studies of the review

S No	Author Name (Year)	Important Findings	Strengths	Gaps
1	Lu-Fei Wang *et al.* (2014)	No significant association was found in EMG measured sleep bruxism in case of biofeedback methods (auditory, electrical, visual). There was much emphasis on further research to overcome small no of studies and high risk bias	Comprehensive systematic review of biofeedback treatment for bruxism	Limited no of studies and potential bias
2	Marc Guaita and Birgit Hogl (2016)	Botulinum toxin type A(BTX-A) indicated reduction in pain but lack of double blind randomized controlled trials was reported by authors	Numerous treatment modalities were thoroughly analysed including medications and behavioural techniques	Lack of double-blind randomized controlled trials(RCTs) for various treatments
3	Philip Riley *et al.* (2020)	No evidence was provided in support of oral splints in pain reduction or tooth wear in association with bruxism. High bias and low evidence was reported by authors suggesting further research	Deep insights were provided into effectiveness of oral splints	High bias and low evidence
4	Sandra Kalil Bussadori *et al.*(2020)	Botulinum toxin type A(BTX-A) proved effective in overcoming pain. Mixed results for occlusal splints was depicted stressing on need for future research in treatment modalities	Botulinum toxin type A(BTX-A) effectiveness in bruxism frequency and pain reduction	High bias and lack of long-term follow up
5	R S Hardy and SJ Bonsor (2021)	Inadequate data to support effectiveness of behavioural therapy and occlusal splint in bruxism and temporomandibular disorders(TMD) management. To get clearer results, the need for high quality studies and stress on prosthodontic treatment was suggested by author	Much stress was laid upon bruxism management and prosthodontic treatment	Lack of high quality studies
6	Sylwia Bulanda *et al.* (2021)	Bruxism frequency was affected by psychosocial factors and sleep conditions. Need for more targeted research was suggested by the author. The author also highlighted inadequate data for specific treatment approaches and wide variations in therapy.	Numerous non-pharmacological treatment approaches were highlighted in the comprehensive literature review	Lack of adequate treatment evidence and focus on pharmacological approaches
7	Guieseppe Minervini *et al.* (2022)	Lack of evidence for management of bruxism with occlusal splint in pain management and TMD. High quality studies were suggested by author to better understand occlusal devices and behavioural therapy in bruxism treatment	The role of occlusal splints and behavioural therapies for bruxism management was highlighted	Less evidence of occlusal splint effectiveness
8	Samanta Scarpini *et al.* (2023)	Need for more comprehensive studies suggested to assess behavioural therapy and pharmacological efficacy	Various treatment modalities with emphasis on pharmacological options were reported	High bias risk and small no of studies for comparison
9	Kevser Kolcakoglu *et al.* (2021)	Mixed results reported for pharmacological approach and occlusal splints in effective pain management. High variation in results and limited sample size complicated analyses of findings	There was much focus on pharmacological interventions providing deep insights	Low sample size affecting generalizability
10	Sultan Ainoosah *et al.* (2021)	Behavioural therapy displayed promising results in bruxism frequency reduction. Long term follow up was lacking along with presence	Crucial role of behavioural therapy in reduction of bruxism frequency was reported	Lack of long-term follow up and less sample size

		of small sample size that limited generalizability of findings		
11	Larissa Soares Silva *et al.*(2021)	Biofeedback gave positive results in bruxism episodes' reduction. However, small no of studies on long-term effectiveness and high bias risk were highlighted by the author	Potential of biofeedback in bruxism management was emphasized	High bias and limited studies

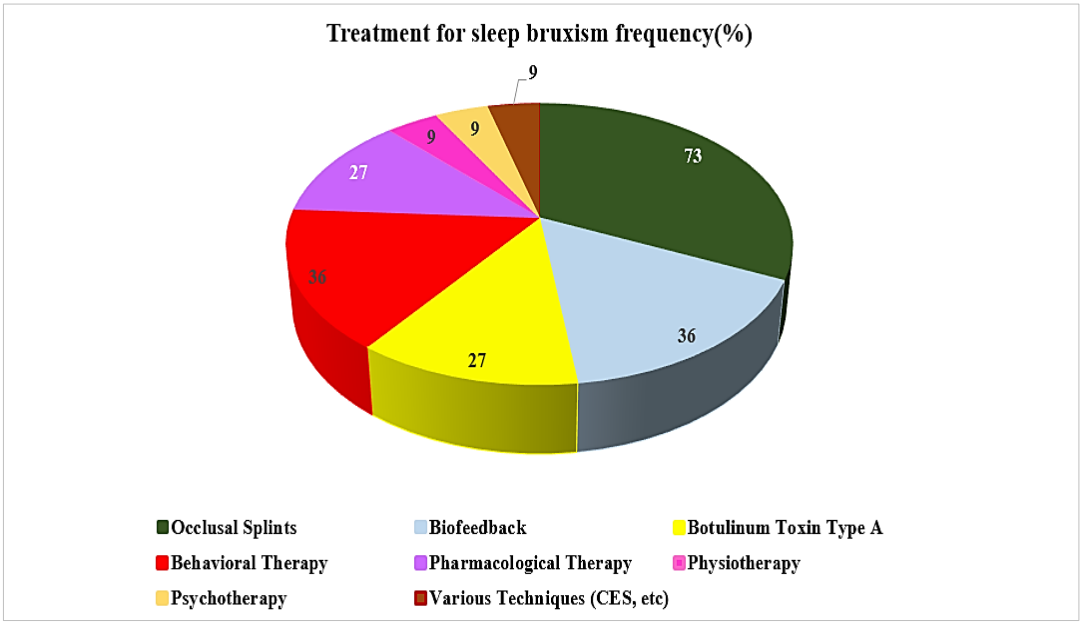

Figure 2: Treatment for sleep bruxism frequency (%)

Discussion

Eight studies reported overall positive outcome of 72% for occlusal splints (Wang LF *et al.*, 2014; Guaita M, Hogl B, 2016; Riley P *et al.*, 2020; Bussadori SK *et al.*, 2020; Hardy RS, Bonsor SJ, 2021; Bulanda S *et al.*, 2021; Minervini G *et al.*, 2022; Scarpini S *et al.*, 2023). This was supported similarly by another study (Ali SM *et al.*, 2021). Four studies depicted overall 36% for positive outcome in biofeedback treatment of SB (Wang LF *et al.*, 2014; Bussadori SK *et al.*, 2020; Bulanda S *et al.*, 2021; Minervini G *et al.*, 2022). This was reported by another author (Viera MD *et al.*, 2023). Botulinum Toxin Type A (BTX-A) had promising overall outcome with 27% supported by three of our studies (Guaita M, Hogl B, 2016; Bussadori SK *et al.*, 2020; Minervini G *et al.*, 2022). This was corroborated on by another author.21Four of our studies reported fair outcomes for behavioural therapy to treat SB with an overall of 36 (Wang LF *et al.*, 2014; Guaita M, Hogl B, 2016; Bussadori SK *et al.*, 2020; Minervini G *et al.*, 2022). This was elucidated upon by another study (Minakuchi H *et al.*, 2022). Pharmacological therapy showed positive results for three of our studies with an overall of 27% (Guaita M, Hogl B, 2016; Bussadori SK *et al.*, 2020; Minervini G *et al.*, 2022). This was supported by another study (Montastruc JL, 2023). One study came out with positive outcome of 9% for physiotherapy treatment in SB patients(Sandra). Another author showed similar findings (Miotto CS *et al.*, 2021). Similarly, one study reported 9% of overall outcome for psychotherapy treatment (Bussadori SK *et al.*, 2020). This was showed by another author (Ierardo G *et al.*, 2021). Numerous other methods like contingent electrical stimulation(CES) showed 9% of positive result on the whole in one study (Bussadori SK *et al.*, 2020). This was suggested by another study (Kawahara S *et al.*, 2024). The important findings as well as the merits and gaps of all studies considered for review were tabulated (Table 2).

Strengths and limitations

The comprehensive review was based on a vivid comparison between various methods for the treatment of SB contributing to the strength of our study. The sample was limited with most of the studies reporting high bias. Most of the studies included in our review were reviews of literature lacking longitudinal data and long term follow up.

Conclusion

To conclude, the various treatments for SB like occlusal splints, biofeedback, behavioural therapy, psychotherapy, physiotherapy and botulinum toxin injections show effectiveness in different intensities. Finally, treatment should be tailored according to patient's particular needs and preferences in order to improve the quality of life. The aim of the study is a stepping stone for future research and throws light on the multifactorial aetiology to deal with SB more effectively based on various interventions.

Declaration

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Conflicts of interests

The authors report no conflict of interest.

Ethical approval

Not Required as the study conducted was a systematic review.

Consent to publication

Not applicable

Availability of supporting data

Not applicable as the study is a systematic review and meta-analyses.

Author contributions

Conceptualization and methodology, S.P, H.B, M.B; Formal analysis, S.P, H.B, M.B; Visualization and writing – original draft S.P, H.B and M.B; Writing – review and editing, S.P, H.B, M.B and J.H. All authors have read and agreed to the final version of the manuscript.

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