

Grzegorz Zieliński¹, Aleksandra Byś¹, Michał Baszczowski¹,
Michał Ginszt¹, Marta Suwała¹, Jacek Szkutnik², Piotr Majcher¹

Received: 03.09.2018
Accepted: 05.10.2018
Published: 31.05.2019

Sleep bruxism risk factors in children: a literature review

Czynniki ryzyka bruksizmu w czasie snu u dzieci – przegląd literatury

¹ Department of Rehabilitation and Physiotherapy, Medical University of Lublin, Lublin, Poland

² Department of Functional Masticatory Disorders, Medical University of Lublin, Lublin, Poland

Correspondence: Marta Suwała, Magnoliowa 2, 20-143 Lublin, Poland, tel.: +48 501 656 011, e-mail: marta.suwala@umlub.pl

Abstract

Introduction: Bruxism is defined as a repetitive jaw and muscle activity involving teeth clenching and/or grinding which may occur during everyday activities or during sleep. The aetiology of bruxism includes three groups of causes: psychosocial, personal and pathophysiological factors. Currently, there is no effective method of treatment to completely eliminate the problem of bruxism. Teeth protection and pain reduction methods are used. Bruxism-associated pain is found in approximately 47.6% of children aged 3–6 years. The aim of the present study was to establish sleep bruxism risk factors in children based on a literature review. **Material and methods:** The material for review included articles from the PubMed, ResearchGate and Google Scholar databases. In order to identify suitable publications the search was conducted using combinations of the following keywords: “bruxism,” “child,” “teeth grinding” (according to Medical Subject Headings, MeSH). This review includes 12 publication regarding sleep bruxism risk factors in children. **Results:** The association between bruxism and respiratory disorders and that between bruxism and sleep problems were described by three studies each. Stress as a predisposing factor was noted in four articles and parental divorce in two papers. **Conclusions:** 1) Respiratory disorders during sleep, sleep disorders and stressful situations, particularly parents’ divorce, contribute to sleep bruxism in children. 2) The impact of the remaining factors discussed in this paper on the development of sleep bruxism requires further research.

Keywords: risk factors, bruxism, children, literature review

Streszczenie

Wstęp: Bruksizm jest definiowany jako powtarzalna czynność szczękowo-mięśniowa, przejawiająca się zaciskaniem i/lub zgrzytaniem zębów, która może wystąpić podczas codziennych aktywności lub w czasie snu. W etiologii bruksizmu można wyodrębnić trzy grupy jego przyczyn: czynniki psychospołeczne, czynniki osobowe i czynniki patofizjologiczne. Obecnie brak jest skutecznej metody leczenia, która zupełnie eliminowałaby problem bruksizmu. Stosuje się metody chroniące zęby oraz zmniejszające dolegliwości bólowe występujące w przebiegu tego zaburzenia, które jest stwierdzane u około 47,6% dzieci w wieku 3–6 lat. Celem badań autorów niniejszej pracy było ustalenie na podstawie przeglądu literatury czynników ryzyka bruksizmu występującego w czasie snu u dzieci. **Materiał i metody:** Materiał do przeglądu stanowiły artykuły z baz PubMed, ResearchGate i Google Scholar. W celu identyfikacji odpowiednich publikacji wyszukiwanie zostało przeprowadzone przy użyciu kombinacji słów kluczy: *bruxism*, *child*, *teeth grinding* (według Medical Subject Headings, MeSH). W niniejszym przeglądzie uwzględniono 12 publikacji dotyczących czynników ryzyka bruksizmu w czasie snu u dzieci. **Wyniki:** Związek między występowaniem bruksizmu a trudnościami z oddychaniem w trakcie snu, jak również problemami ze snem opisały po trzy prace. Stres jako czynnik predysponujący został dostrzeżony w czterech artykułach, a rozwód rodziców dziecka – w kolejnych dwóch. **Wnioski:** 1) Zaburzenia oddychania w trakcie snu, zaburzenia snu oraz sytuacje stresowe, w szczególności rozwód rodziców, przyczyniają się do występowania bruksizmu sennego u dzieci. 2) Wpływ pozostałych czynników omawianych w niniejszej pracy na rozwój bruksizmu w czasie snu wymaga dalszych badań.

Słowa kluczowe: czynniki ryzyka, bruksizm, dzieci, przegląd literatury

INTRODUCTION

Bruxism is defined as a repetitive jaw and muscle activity involving teeth clenching and/or grinding. Based on the International Classification of Sleep Disorders, Third Revision (ICSD-3) and the American Academy of Sleep Medicine (AASM) criteria, sleep bruxism can be classified as a movement disorder present in parasomnias⁽¹⁾.

Bruxism may occur during everyday activities or during sleep. During the day, an affected person is usually half-aware of their bruxism, which involves teeth clenching. This is called awake bruxism (AB) or diurnal bruxism (DB). Sleep bruxism is an unconscious activity. It is a stereotypical movement disorder involving teeth grinding and/or clenching. The aetiology of bruxism includes three groups of causes: psychosocial, personal and pathophysiological factors⁽²⁾.

The main sign of sleep bruxism is headaches. Individuals suffering from bruxism are 3.25 times more at risk of headaches. In children without bruxism headaches subsided with sleep in 100% of subjects while the figure for children with bruxism was 89.6%. Other symptoms include chest pain, increased tension and fatigue of masticatory muscles and loud breathing during sleep⁽¹⁾. The consequences of sleep bruxism include, among others, temporomandibular dysfunction, pain and teeth and/or implant damage⁽³⁾. Bruxism occurs in approximately 1/10 of the adult population; however, not all individuals require treatment intervention⁽⁴⁾. In children aged 3–6 years bruxism is diagnosed in 47.6%. Depending on the diagnostic method used the rate of sleep bruxism in children and adolescents is considered to be 3.5–40.6% of the population⁽¹⁾.

The diagnosis of sleep bruxism may be based on using subjective questionnaires, clinical examinations and oral splints; however, the ultimate diagnosis can be determined with electrophysiological tools⁽³⁾. However, standardised and universal diagnostic methods for bruxism such as polysomnography, for example, were used in only few of the studies reported in the literature⁽⁵⁾.

Currently, there is no effective method of treatment to completely eliminate the problem of bruxism. Teeth protection and pain reduction methods are used such as splint therapy, botulin injections, physical therapy and manual therapy⁽³⁾. The aim of this study is to establish sleep bruxism risk factors in children based on the current literature.

MATERIAL AND METHODS

The material for this review included articles from the PubMed, ResearchGate and Google Scholar publication databases. In order to identify suitable publications the search was conducted using combinations of the following keywords: “bruxism,” “child,” “teeth grinding” (according to Medical Subject Headings, MeSH). Using these guidelines, 12 research studies from the last five years (2013–2018)

which contained these key words were included in this review (Tabs. 1, 2).

RESULTS

Based on the studies discussed above, predisposing factors for bruxism can be determined. Studies by Ferreira et al., Tachibana et al. and Drumond et al., despite different research material and methods, indicate respiratory disorders as a predisposing factor for sleep bruxism^(6,14,16). Studies by Rossi and Manfredini, Ribeiro et al. and Serra-Negra et al. show that sleep disorders such as problems with falling asleep, having nightmares and sleeping less than eight hours a day may contribute to bruxism^(7,11,12). The problem of bruxism as a reaction to stress is raised by Oliveira et al. and de Alencar et al.^(9,15). Among stressful situations predisposing to the development of bruxism in children, parental divorce is indicated by Bortoletto et al. and Rossi and Manfredini^(1,7). Vieira-Andrade et al. are the only authors to indicate the habit of biting on objects and prolonged breastfeeding and bottle feeding as factors associated with bruxism in preschool children⁽⁸⁾. Manfredini et al. find no significant associations between bruxism and living conditions⁽¹⁰⁾. Drumond et al. observed a higher rate of bruxism among children whose mothers have a higher level of education and stress⁽¹⁴⁾. A study by Alouda et al. found no statistically significant relationship between the mother’s work status and incidence of bruxism in the child⁽¹³⁾. The authors also noticed that bruxism risk factors in the child include aggressive behaviour, nail biting, headaches, drooling while asleep, snoring, muscle cramps and colic⁽¹³⁾. Based on the literature review above one may note that bruxism may be caused by respiratory disorders during sleep, sleep problems (difficulty falling asleep, waking up at night) and stressful situations for the child, particularly its parent’s divorce. Other factors such as the child’s quality of life and the mother’s educational and professional status require further research due to the low number of available publications on the subject.

DISCUSSION

Due to the complex aetiology of bruxism and the lack of standardised research tools for the diagnosis of the condition it is difficult to make any definitive determination of the predisposing factors. Many studies focus on the psychosocial aspect of the problem; however, the results of some studies are inconsistent making it impossible to determine the precise aetiology of sleep bruxism. Studies on the causes of bruxism often focus on anxiety disorders and stress^(9,14). It has also been proven that bruxism is influenced by traits such as the child’s aggressiveness and a higher level of anxiety^(13,15). A study by Rossi and Manfredini makes the opposite suggestion that living conditions are not important for the development of bruxism⁽⁷⁾. Taking into account the fact that worse socioeconomic conditions

Authors and year	Title, aim of the study, material and methods
Tachibana et al., 2016 ⁽⁶⁾	Title: <i>Associations of sleep bruxism with age, sleep apnea, and daytime problematic behaviors in children</i> Aim of the study: To investigate the prevalence of bruxism in children in Japan and its associations with sleep-related factors and problems during the day Material and methods: 6,023 children aged 2–12 years were examined using the Japanese Sleep Questionnaire
Rossi and Manfredini, 2013 ⁽⁷⁾	Title: <i>Family and school environmental predictors of sleep bruxism in children</i> Aim of the study: To identify potential predictors of child-reported sleep bruxism in the family and school environment Material and methods: 65 schoolchildren (mean age 9.3 ± 1.9). A 10-item questionnaire developed by the authors was used to investigate the prevalence of child-reported sleep bruxism
Vieira-Andrade et al., 2014 ⁽⁸⁾	Title: <i>Prevalence of sleep bruxism and associated factors in preschool children</i> Aim of the study: To evaluate the prevalence of sleep bruxism and the associated factors in children aged 3–5 years Material and methods: 749 preschool children. Data collection included an oral clinical test, anthropometric measurements and a questionnaire in the form of an interview
Bortoletto et al., 2017 ⁽¹⁾	Title: <i>The relationship between bruxism, sleep quality, and headaches in schoolchildren</i> Aim of the study: To assess the association between sleep bruxism and headache in schoolchildren Material and methods: 103 children aged 3–6 years. Sleep quality was assessed using a questionnaire describing the child's sleep characteristics
Oliveira et al., 2015 ⁽⁹⁾	Title: <i>Sleep bruxism and anxiety level in children</i> Aim of the study: To evaluate the level of anxiety in children with and without bruxism Material and methods: 84 children aged 6–8 years. Bruxism was verified using clinical examination and the parents completed a questionnaire regarding their children's behaviour and habits. In addition, the parents of selected patients completed the State-Trait Anxiety Inventory for Children (STAIC)
Manfredini et al., 2017 ⁽¹⁰⁾	Title: <i>Association between proxy-reported sleep bruxism and quality of life aspects in Colombian children of different social layers</i> Aim of the study: To investigate the association between bruxism and quality of life Material and methods: 1,556 of children aged 6–13 years were examined using the Pediatric Quality of Life Inventory, Version 4.0 (PedsQL4.0™). In addition, their sociodemographic and socioeconomic conditions were assessed
Ribeiro et al., 2018 ⁽¹¹⁾	Title: <i>Association of possible sleep bruxism in children with different chronotype profiles and sleep characteristics</i> Aim of the study: To evaluate the possibility of sleep bruxism in children with different chronotypes and sleep characteristics Material and methods: 207 children aged 3–12 years. A questionnaire regarding the sociodemographic profile of parents and children and children's sleep characteristics was applied; in addition, the Circadian Energy Scale (CIRENS) was used to determine the child's chronotype
Serra-Negra et al., 2014 ⁽¹²⁾	Title: <i>Environmental factors, sleep duration, and sleep bruxism in Brazilian schoolchildren: a case-control study</i> Aim of the study: To assess the association between environmental factors, duration of sleep and sleep bruxism in schoolchildren Material and methods: 120 children with bruxism and 240 children without bruxism (mean age 8 years). A questionnaire based on AASM criteria was administered
Alouda et al., 2017 ⁽¹³⁾	Title: <i>Mother's work status on children's bruxism in a subset of Saudi population</i> Aim of the study: To determine whether there is a link between the mother's professional status and the incidence of bruxism and habits associated with bruxism in her children Material and methods: 561 women completed a questionnaire developed by the authors regarding the mother's professional status and the habits and behaviour of the child
Drumond et al., 2017 ⁽¹⁴⁾	Title: <i>Respiratory disorders and the prevalence of sleep bruxism among schoolchildren aged 8 to 11 years</i> Aim of the study: To assess the relationship between respiratory disorders and sleep bruxism as well as investigating demographic/socioeconomic factors and the child's stress as confounding factors Material and methods: 448 randomly selected children aged 8–11 years. The study involved the completion of a bruxism questionnaire; socioeconomic and demographic factors and respiratory disorders such as rhinitis, sinusitis and bronchitis were analysed; the Children's Stress Scale was used
de Alencar et al., 2017 ⁽¹⁵⁾	Title: <i>Sleep bruxism and anxiety impacts in quality of life related to oral health of Brazilian children and their families</i> Aim of the study: To evaluate the influence of parent-reported sleep disorders in children and anxiety traits and sociodemographic/socioeconomic characteristics of children on Oral Health Related Quality of Life (OHRQoL) of children and their families Material and methods: 66 children aged 3–7 years. The children's parents were interviewed using the Brazilian version of the Early Childhood Oral Health Impact Scale (B-ECOHIS) and the Trait-Anxiety Scale (TAS) in order to measure the level of anxiety disorders
Ferreira et al., 2015 ⁽¹⁶⁾	Title: <i>Sleep bruxism associated with obstructive sleep apnea syndrome in children</i> Aim of the study: To evaluate bruxism and obstructive sleep apnoea and the associations between them Material and methods: 496 children aged 5.5 years ± 1. Clinical examinations were performed and the parents completed the modified Mallampati questionnaire

Tab. 1. Set of publications included in the review (title, aim of the study, material and methods)

can have a negative impact on family relations in that, for example, they cause anxiety and stress in children, one can expect that they will also affect the rate of sleep bruxism, which may suggest the need for more research in this respect⁽¹⁷⁾. The results of a study by Drumond et al. indicating that children whose mothers have a higher educational status are more at risk of sleep bruxism may be surprising⁽¹⁴⁾. However, this may be explained by a higher

level of stress in these mothers which may increase the level of stress in their children. The conclusions from two studies investigating the influence of parental divorce on bruxism in the child confirm the correlation of this factor with sleep bruxism^(1,7). Undoubtedly, the parents' divorce is a very stressful experience for their children; therefore, one can expect that the stress caused by the poor family situation will predispose the child to bruxism. Stress may

Author	Results
Tachibana et al., 2016 ⁽⁶⁾	Bruxism was found in 21.0% of Japanese children and showed independent associations with age, movements during sleep and snoring. The coexistence of respiratory disorders during sleep may be associated with problems in children with bruxism
Rossi and Manfredini, 2013 ⁽⁷⁾	Parental divorce and problems falling asleep were indicated as the sole two factors predisposing one to bruxism
Vieira-Andrade et al. ⁽⁸⁾	The habit of biting on objects and prolonged breastfeeding and bottle feeding were found to be associated with bruxism in preschool children
Bortoletto et al. ⁽¹⁾	Children with bruxism were characterised by a higher risk of primary headache; parental divorce was a predisposing factor for headaches
Oliveira et al. ⁽⁹⁾	A direct association between the presence of anxiety disorders and bruxism in children was found
Manfredini et al., 2017 ⁽¹⁰⁾	No significant associations were found between bruxism and living conditions
Ribeiro et al., 2018 ⁽¹¹⁾	Waking up at night and having nightmares were associated with a risk of bruxism. In addition, small children with an evening chronotype were more prone to bruxism
Serra-Negra et al., 2014 ⁽¹²⁾	Bruxism was found to be more common in children sleeping less than 8 hours a day. Light and noise in the room where the children slept were two predisposing factors for bruxism
Alouda et al., 2017 ⁽¹³⁾	It was concluded that the mother's professional status was not statistically significant with respect to an increased incidence of bruxism in the child. The study also defined the characteristics which increase the risk of nocturnal bruxism in a child twice: its aggressive behaviour, nail biting; headaches; drooling while asleep; snoring, muscle cramps and colic
Drumond et al., 2017 ⁽¹⁴⁾	A relationship between rhinitis and sinusitis and sleep bruxism was demonstrated. Moreover, bruxism was more common among children whose mothers had a higher educational status and higher stress levels
de Alencar et al., 2017 ⁽¹⁵⁾	The results indicated anxiety as the main factor causing bruxism
Ferreira et al., 2015 ⁽¹⁶⁾	A statistical relationship between bruxism and obstructive sleep apnoea was found

Tab. 2. Set of publications included in the review (results)

also be associated with a habit of biting on objects, which is mentioned by Alouda et al.⁽¹³⁾.

Another risk factor for bruxism is sleep disorders, which compromise sleep quality. The following disorders were found in children suffering from bruxism: difficulty falling asleep, snoring, movements during sleep, waking up at night and having nightmares^(6,7,11). In addition, Serra-Negra et al. found that children with sleep bruxism slept less than eight hours, fell asleep with the light on and slept in noise⁽¹²⁾. Alvaro et al. and Drake et al. suggest that there is a link between anxiety disorders and increased exposure to stress and sleep disorders^(18,19). Considering the fact that children with bruxism have been found to have higher levels of anxiety and stress, one may argue that these psychological factors may contribute to the sleep disorders mentioned above, and, as a result, lead to bruxism during sleep^(9,15).

The results of a study by Bortoletto et al. demonstrate a higher prevalence of primary headaches in children with sleep bruxism⁽¹⁾. This may be explained by a higher tension in masticatory muscles caused by psychological factors such as stress or anxiety disorders, which may lead to tension-type headaches⁽²⁰⁾. A literature review regarding the presence of sleep disorders and headaches does not provide any definitive indication whether headaches are a cause or an effect of sleep disorders; different studies, however, are consistent in terms of the correlation between these symptoms^(21,22).

The results obtained by Ferreira et al. indicate the presence of an association between obstructive sleep apnoea (OSA) in children and sleep bruxism⁽¹⁶⁾. Drumond et al. demonstrate that both sinusitis and rhinitis correlate with bruxism⁽¹⁴⁾. Considering the fact that rhinitis is associated with OSA, it is perhaps not surprising that sleep bruxism is more common in children in whom OSA has been diagnosed as well^(14,23).

Individuals with OSA are often also more prone to depression, which is demonstrated by a study by Hobzova et al.⁽²⁴⁾. The factors leading the development of depression include the presence of anxiety and stress, which makes it reasonable to suspect that anxiety and stress contribute to OSA, as they do to sleep bruxism^(14,25,26).

Due to the use of various research tools and methodological differences between the studies it is difficult to determine precisely which factors may be directly responsible for the development of bruxism. Therefore, more research is necessary on the topic involving larger groups of subjects.

CONCLUSIONS

1. The causes of sleep bruxism in children may be respiratory disorders during sleep, sleep disorders and stressful situations, particularly parental divorce.
2. The impact of the remaining factors discussed in this paper on the development of sleep bruxism is subject to debate and requires further research.

Conflict of interest

The authors do not report any financial or personal affiliations to persons or organisations that could adversely affect the content of or claim to have rights to this publication.

References

1. Bortoletto CC, Salgueiro M da CC, Valio R et al.: The relationship between bruxism, sleep quality, and headaches in schoolchildren. *J Phys Ther Sci* 2017; 29: 1889–1892.
2. Shetty S, Pitti V, Satish Babu CL et al.: Bruxism: a literature review. *J Indian Prosthodont Soc* 2010; 10: 141–148.
3. Yap AU, Chua AP: Sleep bruxism: current knowledge and contemporary management. *J Conserv Dent* 2016; 19: 383–389.
4. Castrillon EE, Ou KL, Wang K et al.: Sleep bruxism: an updated review of an old problem. *Acta Odontol Scand* 2016; 74: 328–334.
5. Machado E, Dal-Fabbro C, Cunali PA et al.: Prevalence of sleep bruxism in children: a systematic review. *Dental Press J Orthod* 2014; 19: 54–61.
6. Tachibana M, Kato T, Kato Nishimura K et al.: Associations of sleep bruxism with age, sleep apnea, and daytime problematic behaviors in children. *Oral Diseases* 2016; 22: 557–565.
7. Rossi D, Manfredini D: Family and school environmental predictors of sleep bruxism in children. *J Orofac Pain* 2013; 27: 135–141.
8. Vieira-Andrade RG, Drumond CL, Martins-Júnior PA et al.: Prevalence of sleep bruxism and associated factors in preschool children. *Pediatr Dent* 2014; 36: 46–50.
9. Oliveira MT, Bittencourt ST, Marcon K et al.: Sleep bruxism and anxiety level in children. *Braz Oral Res* 2015; 29: 1–5.
10. Manfredini D, Lobbezoo F, Giancristofaro RA et al.: Association between proxy-reported sleep bruxism and quality of life aspects in Colombian children of different social layers. *Clin Oral Investig* 2017; 21: 1351–1358.
11. Ribeiro MB, Manfredini D, Tavares-Silva C et al.: Association of possible sleep bruxism in children with different chronotype profiles and sleep characteristics. *Chronobiol Int* 2018; 35: 633–642.
12. Serra-Negra JM, Paiva SM, Fulgêncio LB et al.: Environmental factors, sleep duration, and sleep bruxism in Brazilian schoolchildren: a case-control study. *Sleep Med* 2014; 15: 236–239.
13. Alouda R, Alshehri M, Alnaghmoosh S et al.: Mother's work status on children's bruxism in a subset of Saudi population. *J Int Soc Prev Community Dent* 2017; 7 (Suppl 3): S170–S178.
14. Drumond CL, Souza DS, Serra-Negra JM et al.: Respiratory disorders and the prevalence of sleep bruxism among schoolchildren aged 8 to 11 years. *Sleep Breath* 2017; 21: 203–208.
15. De Alencar NA, Leão CS, Leão ATT et al.: Sleep bruxism and anxiety impacts in quality of life related to oral health of Brazilian children and their families. *J Clin Pediatr Dent* 2017; 41: 179–185.
16. Ferreira NMR, Dos Santos JFF, Dos Santos MBF et al.: Sleep bruxism associated with obstructive sleep apnea syndrome in children. *Cranio* 2015; 33: 251–255.
17. Warren EJ, Font SA: Housing insecurity, maternal stress, and child maltreatment: an application of the family stress model. *Soc Serv Rev* 2015; 89: 9–39.
18. Alvaro PK, Roberts RM, Harris JK: A systematic review assessing bidirectionality between sleep disturbances, anxiety, and depression. *Sleep* 2013; 36: 1059–1068.
19. Drake CL, Pillai V, Roth T: Stress and sleep reactivity: a prospective investigation of the stress-diathesis model of insomnia. *Sleep* 2014; 37: 1295–1304.
20. Song TJ, Cho SJ, Kim WJ et al.: Anxiety and depression in tension-type headache: a population-based study. *PLoS One* 2016; 11: e0165316.
21. Quartana PJ, Wickwire EM, Klick B et al.: Naturalistic changes in insomnia symptoms and pain in temporomandibular joint disorder: a cross-lagged panel analysis. *Pain* 2010; 149: 325–331.
22. Yatani H, Studts J, Cordova M et al.: Comparison of sleep quality and clinical and psychologic characteristics in patients with temporomandibular disorders. *J Orofac Pain* 2002; 16: 221–228.
23. Chirakalwasan N, Ruxrungtham K: The linkage of allergic rhinitis and obstructive sleep apnea. *Asian Pac J Allergy Immunol* 2014; 32: 276–286.
24. Hobzova M, Prasko J, Vanek J et al.: Depression and obstructive sleep apnea. *Neuro Endocrinol Lett* 2017; 38: 343–352.
25. Tiller JW: Depression and anxiety. *Med J Aust* 2013; 199 (Suppl 6): S28–S31.
26. Yang L, Zhao Y, Wang Y et al.: The effects of psychological stress on depression. *Curr Neuropharmacol* 2015; 13: 494–504.