WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 6.805
Volume 5, Issue 6, 88-96. Research Article ISSN 2277– 7105

# PREVALENCE OF BRUXISM IN CHILDREN WITH ATTENTION DEFICIT/HYPERACTIVITY DISORDER: A CASE-CONTROL STUDY

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Article Received on
27 March 2016,

Revised on 18 April 2016,
Accepted on 09 May 2016

DOI: 10.20959/wjpr20166-6301

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## ABSTRACT

**Background:** Bruxism is an involuntary movement of the lower jaw, occurring during the day or night. This condition causes many side effects (e.g. dental problems, craniofacial muscle pain, etc.) which could have different effects on a person's quality of life. The prevalence of bruxism is higher during childhood and is observed in almost 40% of the child population. There are many risk factors associated with this disorder, and recently attention deficit/hyperactivity disorder (ADHD) is also believed to be involved in determining the risk of bruxism. The aim of this study is to evaluate the prevalence of symptoms and risk factors associated with bruxism in ADHD patients compared to healthy individuals. **Materials and methods:** This case-control study was conducted on 200 children (100 children with ADHD and 100 healthy controls), who were referred to the psychiatric ward of Ahvaz Golestan hospital, Iran. Children were initially examined by a psychiatrist regarding to ADHD development. Finally, the prevalence of symptoms and risk factors associated with bruxism were investigated from the parents using the International Classification of Sleep Disorders (ICSD) questionnaire. **Results:** The prevalence of bruxism in patients with ADHD and the control group were 35% and 25%, but this difference was not statistically significant (p=0.16). In addition, the prevalence of symptoms and risk factors associated with bruxism did not show significant differences between ADHD patients and healthy subjects. However, the symptoms of nocturnal bruxism such as chewing muscle pain during sleep were significantly higher in ADHD patients taking methylphenidate. **Discussion:** Based on these findings, it appears that ADHD itself has no role in developing the bruxism symptoms, but medication given to such patients (methylphenidate) increased the problems related to this condition.

**KEYWORDS:** Methylphenidate, attention deficit/hyperactivity disorder, bruxism.

## INTRODUCTION

Bruxism is a movement disorder, characterized in the form of teeth grinding and jaw clenching.[1] This disorder is classified according to various criteria, in particular, based on the incidence time as bruxism during wakefulness (awake bruxism), bruxism during sleep (sleep bruxism) or a combination of both conditions. In addition, it is also divided into the primary, essential or idiopathic (without an apparent reason) or secondary (due to another disease, taking a medication, etc.) group according to its etiology.[2] The incidence of this disorder is estimated to be about 8 to 31.4% in adults, while its rate is in the range of 3.5 to 40.6% among the children and is significantly reduced with age.[3,4] Bruxism has developed various problems for involved individuals and affect their quality of life. These complications generally include tooth abrasion, masseter muscle pain, constant headaches, as well as chewing or swallowing abnormalities in severe cases of bruxism.[5] The etiology of bruxism is divided into three psychosocial, environmental and pathophysiological categories.[6] It seems that in addition to mentioned factors, condition such as smoking, trauma, alcohol, drugs, systemic diseases and hereditary factors also have an important role in its development. Attention deficit/hyperactivity disorder (ADHD) has recently been shown as one of the leading causes of bruxism all around the world.[7]

ADHD is a developmental behavioral disorder characterized by loss of concentration, hyperactivity and impulsive behaviors. It is one of the most common psychiatric disorders and its prevalence is estimated to be approximately 7.2%, worldwide.[8] According to the DSM-5 diagnostic criteria, ADHD patients must have at least six signs that indicate a lack of concentration (such as the inability to stay focused while doing an activity, fail to listen when spoken to directly) or hyperactivity (such as Jabber, fidgeting with hands or feet).[9] Several studies have reported that children with ADHD have poor oral hygiene that may increase the risk of getting mouth diseases.[10] There are also some high-incidence of dyskinesia, tooth trauma and chattering problems in such patients.[11]

Considering the numerous complications of bruxism in ADHD children, investigating the incidence and risk factors associated with bruxism can lead to prevention and early detection of this disorder in such patients. This study aimed to determine the prevalence of bruxism in children with ADHD compared to healthy individuals.

## MATERIALS AND METHODS

A total of 100 patients with ADHD and 100 healthy subjects were included in this case-control study as the cases and control groups, respectively. ADHD cases were selected from children who were referred to the psychiatric ward of Golestan hospital and a private psychiatric clinic, Ahvaz, Iran. They were evaluated by Conners scale in the following and ADHD was confirmed for those who had scores equivalent or above 15 points, based on the clinical interview as well as Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV-TR) criteria. Control subjects were selected from the children who were referred to a language institute in Ahvaz and their health status was confirmed by 10 question Conners test. Healthy individuals had a Conners score of less than 15 points. Conners Scale contains 10 questions in order to evaluate the signs of hyperactivity and inattention through the diagnosis and scoring the severity of ADHD disorder for both parents and teachers. The sensitivity and specificity of the scale are 90% and 77 to 98%, as well as the correct classification rate of 84 to 96%. The scoring system is done using the 4-point Likert-style ratings (never, rarely, sometimes and frequently.). This tool is the most common measurement scale of the severity of ADHD symptoms and is normalized in Iran. The 10 question Conners scale was used in the study for parents and each item scored from 0 to 3. The inclusion criteria were owning the diagnostic criteria based on the DSM.IV-TR and the Connors test, as well as the individuals between 4-16 years of age and exclusion criteria include the existence of psychotic disorder, mental retardation, and the history of seizures.

All the patient parents were participating in conscious awareness and the research has been approved by the Research Ethics Committee of Ahvaz Jundishapur University of Medical Sciences. The incidence of bruxism was evaluated based on the standardized questionnaire of International Classification of Sleep Disorders (ICSD). According to the American academy of sleep medicine, the bruxism is defined as the teeth grinding or clenching during the day or when sleeping.

Finally, the obtained data were analyzed using descriptive statistics and the chi-square test as well as Mann-Whitney test were performed by SPSS, in the following. The Mantel-Haenszel test was used in order to eliminate the interference caused by the drug. The results were considered significant with a P-value of less than 0.05.

## RESULTS

Among 200 cases studied, 100 cases were ADHD patients with a median age of 7.8 years and 100 cases were healthy individuals with a median age of 7.78 years. There were no significant difference in the mean age, gender distribution and the parental educational level between the both groups (Table 1). The prevalence of bruxism in patients with ADHD and the control group were 35% and 25%, respectively. However, the difference is not statistically significant (p=0.16). The results of the Mantel-Haenszel test revealed that the prevalence of symptoms associated with bruxism in ADHD patients were not statistically different compared to healthy subjects (Table 2). The results in table 3 found no significant difference between two groups related to the prevalence of risk factors predisposing to the bruxism development. However, a significant difference was observed in both groups while comparing the history of dental problems (Table 3). At the same time, the incidence of teeth grinding during sleep and masseter muscle pain while waking up were significantly higher among the patients taking methylphenidate compared to non-users (Table 4).

**Table1. Demographic Characteristics among participants in study.**

| **Characteristics** | | **ADHD n=100** | **non-ADHD n= 100** | **p Value** |
|---|---|---|---|---|
| Age | 7.8(1-16) | | 7.78(3-16) | p=0.95 |
| Sex | Boy | 46 | 49 | p= 0.39 |
| | Girl | 54 | 51 | |
| Parent's education | Under Diploma | 29.2% | 24% | p=0.10 |
| | Diploma | 36.4% | 32.7% | |
| | Bachelor | 31.3% | 37.6% | |
| | Master | 2% | 5.9% | |
| | PhD | 1% | 0 | |

**Table2 . Results of the Mantel-Haenszel tests for the answers to the questionnaire.**

| **Characteristics** | | **ADHD n=100** | **non-ADHD n= 100** | **p Value** |
|---|---|---|---|---|
| Sign | Headache | 13% | 8% | p=0.2 |
| | Jaw pain | 6% | 4% | p=0.5 |
| | Earache | 13% | 12% | p=0.83 |
| | Facial pain | 2% | 2% | p=1 |
| Pain onset time | Morning | 13% | 4% | p=0.023 |
| | After Noon | 4% | 5% | p=1 |
| | Evening | 7% | 7% | p=1 |
| | Night | 10% | 10% | p=1 |
| Does he/she experience jaw pain while eating | | 7% | 11% | p=0.39 |
| Does your child wake up in the middle of the | | 4% | 10% | p=0.16 |

| | | | | |
|---|---|---|---|---|
| night complaining of facial pain? | | | | |
| Does your child experience morning headaches? | | 11% | 20% | p=0.11 |
| Does your child have history of head, neck or jaw trauma ? | | 17% | 22% | p=0.43 |
| Does your child clench or grind his/her teeth during the day? | | 11% | 10% | p=0.82 |
| Does your child clench or grind his/her teeth during sleep? | | 23% | 15% | p=0.15 |
| frequency of bruxism | Never | 65% | 75% | p=0.16 |
| | Fewer than once in month | 3% | 3% | p=1 |
| | Once to twice in month | 5% | 3% | p=0.44 |
| | Once in week | 8% | 11% | p=0.48 |
| | Thrice in week | 16% | 7% | p=0.041 |

**Table3.Comparison of bruxism risk factors prevalence between ADHD and non-ADHD children.**

| **Characteristics** | | **ADHD n=100** | **non-ADHD n= 100** | **P Value** |
|---|---|---|---|---|
| Do you have history of bruxism in your family | | 28% | 25% | p=0.63 |
| Does your child have history dental problems ? | | 31% | 18% | p=0.033 |
| Does your child have history of certain disease? | Allergy | 16% | 16% | p=1 |
| | Asthma | 9% | 11% | p=0.81 |
| | Sinusitis | 13% | 7% | p=0.16 |
| | Tonsillectomy | 8% | 8% | p=1 |
| | Seizure | 5% | 2% | p=0.27 |
| | Anxiety | 14% | 8% | p=0.18 |
| | Depression | 7% | 4% | p=0.37 |
| Does your child have history of sleep disorders? | Snoring | 18% | 23% | p=0.48 |
| | Walking | 4% | 3% | p=0.54 |
| | Talking | 21% | 11% | p=0.55 |
| | Insomnia | 11% | 8% | p=0.47 |
| | Apnea | 2% | 0 | p=0.24 |

**Table4. Compression of prevalence of bruxism sign and symptoms in the Methylphenidate used ADHD.**

| **Characteristics** | | **Medication** | | **p Value** |
|---|---|---|---|---|
| | | **Methylphenidate n=26** | **None n=74** | |
| Sign | Headache | 4(15.3%) | 9(12.2%) | NS* |
| | Jaw pain | 4(15.3%) | 2(2.7%) | p=0.034 |
| | Earache | 5(19.2%) | 8(10.8%) | NS |
| | Facial pain | 1(3.8%) | 1(1.4%) | NS |
| Does he/she experience jaw pain while eating | | 1(3.8%) | 6(8.1%) | NS |
| Does your child wake up in the middle of the night complaining of facial pain? | | 1(3.8%) | 3(4.1%) | NS |
| Does your child experience morning headaches? | | 3(11.5%) | 8(10.8%) | NS |

| | | | |
|---|---|---|---|
| Does your child have history of head, neck or jaw trauma ? | 7(26.9%) | 10(13.5%) | NS |
| Does your child clench or grind his/her teeth during the day? | 5(19.2%) | 6(8.1%) | NS |
| Does your child clench or grind his/her teeth during sleep? | 13(50%) | 10(13.5%) | p<0.0001 |

**not significant*

## DISCUSSION

Improving the prevention, diagnosis and management of almost every disease require more detailed knowledge of symptoms and risk factors predisposing to the development of the disease, as well as the assessment of therapeutic strategies for such conditions. This study aimed to compare the prevalence of bruxism and its predisposing risk factors between the patients with ADHD and healthy controls and also evaluate the rate of bruxism symptoms in ADHD patients with or without taking methylphenidate.

The results of the study have not shown significant differences related to the prevalence of bruxism symptoms between the patients with ADHD and healthy controls. However, previous studies have yielded conflicting evidence regarding this issue, as Bimstein E, et al., Malki GA, et al. and Shur-Fen Gau demonstrated that the prevalence of bruxism was significantly higher among the patients with ADHD.[7,11,13] Considering a reduction rate of bruxism with increasing age, the major cause of discrepancy of previous findings could be the differences in the age distribution of the studied population.[13] So that the average age of patients in Malki GA, et al. and Shur-Fen Gau studies were 10.6 and 10.8 years, respectively.[11,13]

Our findings also have indicated that the prevalence of risk factors predisposing to the development of bruxism as other concurrent psychiatric disorders (tension, stress, anxiety and depression) or diseases such as asthma, allergies, sinusitis and tonsillectomy do not show a significant difference in both groups. Ghanizadeh also reveals that the existence of other psychiatric disorders such as anxiety and depression is not associated with an increased risk of bruxism in patients with ADHD.[14] However, demographic studies have shown such disorders as important risk factors through the development of bruxism.[15]

Recently, some studies have attempted to determine the effect of methylphenidate, a central nervous system stimulant that widely used for the treatment of ADHD, on the onset of symptoms associated with bruxism. Our findings also suggested that the incidence rate of

bruxism symptoms such as masseter muscle pain while waking up or teeth grinding during sleep were significantly higher among the patients taking methylphenidate. These results are in parallel with Malki GA, et al. and Gau SS, et al. studies, as they found that there is no relationship between the consumption of methylphenidate and the development of sleep disorders except the bruxism.[11,17]Although the exact cause of bruxism onset is not known following the consumption of methylphenidate, but such findings have strengthened the assumptions of the increased incidence of bruxism linked to methylphenidate in patients with ADHD. Previous studies have demonstrated that the methylphenidate may cause disruptions in dopaminergic system, as the drug users have shown an increased extracellular dopamine concentrations in the brain.[18] Several studies have emphasized that the changes in neurotransmitter levels, especially the dopaminergic neurotransmitters and the pathways related to dopamine synthesis, such as mesocortical pathway are the main cause of bruxism development.[19,20]

## CONCLUSION

Briefly, our findings indicated that there is no difference related to the prevalence of bruxism symptoms and its predisposing factors between the ADHD patients and the healthy subjects, while just the methylphenidate users displayed symptoms related to bruxism. Based on these findings, it appears that the ADHD disorder itself is not the cause of the bruxism onset, but the medication raises the risk of teeth chattering in such patients. The strengths of this study is the large sample size and comprehensive analysis of symptoms and risk factors related to the development of bruxism. However, the only use of questionnaires and lack of physical and laboratory evaluation of symptoms associated with bruxism are the weak points of this study.

It is suggested that the future studies perform a physical examination in every patient, as well as to investigate the level of dopamine activity. It appears that the cause of bruxism in healthy subjects requires further investigation in order to find its pathologic reason. Finally, conducting a wide range of research studies would be beneficial using the high precision instruments.

## ACKNOWLEDGEMENTS

This study was supported by a grant from Tehran University of Medical Sciences. The authors also thank This study was supported by a grant from Tehran University of Medical

Sciences. The authors also thank This study was supported by a grant from Ahvaz Jundishapur University of Medical Sciences.

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