



## Evaluation of Risk Factors Associated with Bruxism in Adult Turkish Population

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### Research Article

#### History

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#### ABSTRACT

**Objectives:** The aim of the study is to evaluate various risk factors thought to be associated with the etiology of bruxism in adults in Turkey.

**Materials and Methods:** 400 adults aged 17-60 years were examined in terms of probable bruxism using the bruxism survey and clinical examination findings. The survey method was used to evaluate the correlation of bruxism with gastroesophageal reflux, gastric ulcer, gastritis, migraine, antidepressant use, cigarette consumption, alcohol consumption, caffeine consumption, and marital status between bruxist and control groups.

**Results:** It was found that gastroesophageal reflux, gastric ulcer, migraine, antidepressant use, caffeine consumption, and cigarette consumption were significantly higher in bruxists ( $P=.000$ ,  $P=.004$ ,  $P=.000$ ,  $P=.000$ ,  $P=.000$ , and  $P=.008$ , respectively). No significant difference was observed between bruxist and control groups in terms of the presence of gastritis, alcohol consumption, and marital status ( $P=.163$ ,  $P=.221$ , and  $P=.913$ , respectively). While presence of migraine ( $P=.041$ ) was higher in bruxist females, cigarette and alcohol consumption was higher in bruxist males ( $P=.000$  and  $P=.001$ , respectively).

**Conclusions:** In conclusion, it was determined that medical disorders such as gastroesophageal reflux, gastric ulcer, and migraine as well as antidepressant use and cigarette consumption and caffeine consumption were risk factors associated with bruxism. If dentists are aware that these risk factors may cause or exacerbate bruxism, this may be beneficial in preventing damage to the mastication system before it occurs, and in planning treatment correctly.

**Keywords:** Bruxism, risk factor, etiology, probable bruxism, adults.

## Yetişkin Türk Popülasyonda Bruksizmle İlişkili Risk Faktörlerinin Değerlendirilmesi

#### Süreç

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#### ÖZ

**Amaç:** Türkiye’de, yetişkin bireylerde bruksizm etiyolojisi ile ilişkili olabileceği düşünülen çeşitli risk faktörlerini değerlendirmek amaçlanmıştır.

**Materyal ve Metod:** 17-60 yaş aralığındaki 400 yetişkin birey bruksizme yönelik anket ve klinik muayene bulguları ile muhtemel bruksizm açısından incelendi. Çalışmaya alınan bruksist ve kontrol gruplarında gastroözofajial reflü, gastrik ülser, gastrit, migren varlığı, antidepresan kullanımı, sigara, alkol, kafein tüketimi ve medeni durumun bruksizm ile ilişkisi anket yöntemiyle değerlendirildi.

**Bulgular:** Bruksistlerde gastroözofajial reflü, ülser, migren varlığı, antidepresan kullanımı, kafein ve sigara tüketimi anlamlı oranda daha yüksek bulundu ( $P=.000$ ,  $P=.004$ ,  $P=.000$ ,  $P=.000$ ,  $P=.000$ ,  $P=.008$  sırasıyla). Bruksist ve kontrol grubundaki bireyler arasında gastrit varlığı, alkol tüketimi ve medeni hal arasında anlamlı bir farklılık gözlenmedi ( $P=.163$ ,  $P=.221$ ,  $P=.913$  sırasıyla). Bruksist kadınlarda migren varlığı ( $P=.041$ ), bruksist erkeklerde ise sigara ve alkol tüketimi daha yüksek izlendi ( $P=.000$ ,  $P=.001$  sırasıyla).

**Sonuç:** Sonuç olarak gastroözofajial reflü, gastrik ülser, migren gibi tıbbi rahatsızlıklar, antidepresan kullanımı ve sigara, kafein tüketimi bruksizmle ilişkili risk faktörleridir. Diş hekimlerinin bu risk faktörlerinin bruksizme neden olabileceğinin ya da bruksizmi şiddetlendirebileceğinin farkında olması, çiğneme sistemi üzerinde oluşabilecek hasarların ortaya çıkmadan önce önlenmesinde ve tedavi planlamasının doğru yapılmasında fayda sağlayabilir.

**Keywords:** Bruksizm, risk faktörü, etiyoloji, muhtemel bruksizm, yetişkinler.

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## Introduction

Bruxism is a non-physiological masticatory muscle activity characterized by clenching or grinding of the teeth whilst asleep (rhythmically or non-rhythmically) or awake (repetitive or continuous).<sup>1</sup>

“Diurnal bruxism” refers to involuntary clenching and/or grinding of the teeth during the day while “nocturnal bruxism” refers to clenching and/or grinding activities during sleep at night.<sup>2</sup> While the prevalence of diurnal bruxism among adults ranges from 22% to 30%, the prevalence of nocturnal bruxism ranges from 1% to 15%.<sup>3</sup>

There are three clinical definitions for bruxism: ‘possible bruxism’ is defined as bruxism diagnosed based on patient report and/or the anamnesis-based part of the clinical examination; ‘probable bruxism’ is defined as bruxism diagnosed by patient report and clinical examination based on inspection; ‘definitive bruxism’ is defined as bruxism confirmed by polysomnographic or electromyographic recordings in addition to patient report and clinical examination.<sup>4</sup>

The lack of consensus on the definition and diagnostic methods of bruxism makes it difficult to explain the etiology of bruxism. The well accepted view is that multiple risk factors are effective in the pathogenesis of bruxism, the etiology of which cannot be exactly determined.<sup>1,4</sup>

A risk factor indicates a high risk of disease without causing a causal effect on the development of the disease, while a causal risk factor contributes to increase the risk of disease etiologically.<sup>5</sup> Determination of risk and etiological factors of bruxism and the physician's awareness of these factors can be guiding during the anamnesis and treatment of patients complaining of bruxism. It has been stated that systemic and psychological factors play a role in the pathogenesis of bruxism, but it is controversial which of these factors is more effective.<sup>6</sup> Numerous studies have reported that psychosocial factors such as stress, anxiety, and depression and exogenous factors such as antidepressant use, cigarette consumption, alcohol consumption, and caffeine consumption<sup>4</sup>, as well as diseases such as migraine and gastroesophageal reflux may be among the major risk factors associated with bruxism.<sup>3,7-11</sup>

This study aimed to evaluate various risk factors thought to be associated with the etiology of bruxism in adults and to examine the impact degrees of these risk factors. Two null hypotheses were established:

There is no correlation between bruxism and gastroesophageal reflux, gastric ulcer, gastritis, migraine, antidepressant use, cigarette consumption, alcohol consumption, caffeine consumption and marital status.

There is no correlation between these factors and gender in bruxists.

## Materials and Methods

### Patient selection

This study was conducted in accordance with the principles of the Declaration of Helsinki, and upon approval of the X University Non-Invasive Clinical Trials Ethics Committee with the decision dated 19.04.2023 and numbered 2023-04/13. The study was carried out on 200 bruxists and 200 controls who applied to the Department of Oral and Maxillofacial Radiology, Faculty of Dentistry of X University. All the participants aged 17-60 years who were voluntary to participate in the study signed the informed consent form.

### Clinical examination

Survey recommended by Pintado *et al.*<sup>12</sup>, and clinical selection criteria recommended by Rompre *et al.*<sup>13</sup>, were used to select the bruxist patients in this study.

The survey questions suggested by Pintado *et al.*<sup>12</sup>, are as follows:

1. Has anyone ever told you that you grind your teeth at night?
2. Have you ever had a feeling of tiredness in your jaw when you woke up in the morning?
3. Do you feel pain in your teeth and gums when you wake up in the morning?
4. Have you ever had a headache when you woke up in the morning?
5. Have you noticed that you grind your teeth during the day before?
6. Have you noticed that you've clenched your teeth during the day before?

Clinical diagnostic criteria for bruxism recommended by Rompre *et al.*<sup>13</sup>, are as follows:

1. Presence of teeth clenching / grinding sound for at least 6 months, more than 3 nights a week in the patient
2. Tooth wear in accordance with the movements of the jaw in the normal or eccentric position
3. Presence of hypertrophy in the masseter muscle in voluntary contraction
4. Presence of feeling of discomfort, tiredness or stiffness in the masticatory muscles in the morning.

Individuals who answered positively to at least two of the survey questions recommended by Pintado *et al.*<sup>12</sup>, and those who met all of clinical diagnostic criteria for bruxism recommended by Rompre *et al.*<sup>13</sup>, were accepted as probable bruxist.

Survey and clinical findings were assessed by an oral and maxillofacial radiologist having a 12 years of clinical experience including 6 years of maxillofacial radiology.

### Survey Assessment

In the questions asked to individuals in the bruxist and control groups, the patient's socio-demographic information, systemic disorders and drug use, if any, were recorded. The presence of gastroesophageal reflux, gastric ulcer, gastritis, migraine, which are thought to be associated with bruxism, was questioned in the individuals included in the study, and information was obtained about the antidepressant use and consumption of cigarette,

alcohol, and caffeine. In addition, it was determined whether or not the individuals included in the bruxist group had diurnal and nocturnal bruxism and how individuals with nocturnal bruxism had awareness.

In this study, the calculation formula of sample with finite population was used to calculate the sample size ( $n = Nt^2PQ / (N-1) d^2 + t^2PQ$ ). According to this formula, the precision was taken as 5%, the population size (population) was 6920, and the prevalence was taken as 15%. The sample size was determined as  $n=200$  at margin of error of 5% and confidence interval of 95%.

### Statistical analysis

The data of the study were analyzed using the SPSS Statistics 25.0 (Armonk, NY: IBM Corp) software. Whether or not the numerical data were normally distributed was checked by analyzing the skewness and kurtosis coefficients. Huck<sup>14</sup>, states that skewness and kurtosis values should range between -1 and +1 in order for the data to show normal distribution. The difference between age and groups was evaluated using the Mann Whitney U test. The mean, standard deviation, and frequency distributions of the data were analyzed. Chi-square test or Fisher's Exact Test was used to evaluate the correlation between bruxism and risk factors in individuals in the bruxist and control groups and to evaluate the correlation between gender and risk factors in bruxists. Significance level was taken as 0.05 and  $P < 0.05$  was considered as statistically significant.

### Results

It was found that the mean age of all the adults aged 17-60 years participating in the study was  $26.56 \pm 7.539$ . The mean age of the bruxists was  $27.17 \pm 8.060$ , and the mean age of the individuals in the control group was  $25.94 \pm 6.945$ . The difference between the groups in terms of age was insignificant ( $P = .109$ ).

The study was conducted on 400 individuals including 200 bruxists and 200 individuals in the control group, and the gender distribution was kept equal in each group.

When compared to the control group, gastroesophageal reflux, gastric ulcer, migraine, antidepressant use, cigarette consumption, and caffeine consumption were significantly higher in bruxists ( $P = .000$ ,  $P = .004$ ,  $P = .000$ ,  $P = .000$ ,  $P = .008$ , and  $P = .000$ , respectively); whereas, presence of gastritis and alcohol consumption did not show a significant difference between the groups ( $P = .163$ ,  $P = .221$ ) (Table 1).

Additionally, no significant difference was found between the bruxist and control groups in terms of marital status. ( $P = .913$ ) (Table 1).

When examining according to gender, there were significant differences between the presence of migraine, cigarette consumption and alcohol consumption in bruxists. Accordingly, the presence of migraine was higher in women ( $P = .041$ ) and cigarette and alcohol consumption was higher in men among bruxist individuals. ( $P = .000$  and  $P = .001$ , respectively) (Table 2).

It was found that 84 (42%) of the bruxist individuals had only nocturnal bruxism and 116 (58%) had both nocturnal and diurnal bruxism.

**Table 1.** Distribution of Risk Factors among Bruxist and Control Group Individuals.

		Bruxist	Control	Total	Result
Gastroesophageal Reflux	Yes	29 (14.5%)	5 (2.5%)	34 (8.5%)	$X^2 = 18.515$
	No	171 (85.5%)	195 (97.5%)	366 (91.5%)	$P = .000^*$
Gastric Ulcer	Yes	9 (4.5%)	-	9 (2.25%)	$X^2 = 9.207$
	No	191 (95.5%)	200 (100%)	391 (97.75%)	$P = .004^a$
Gastritis	Yes	17 (8.5%)	10 (5%)	27 (6.75%)	$X^2 = 1.946$
	No	183 (91.5%)	190 (95%)	373 (93.25%)	$P = .163$
Migraine	Yes	44 (22%)	16 (8%)	60 (15%)	$X^2 = 15.373$
	No	156 (78%)	184 (92%)	340 (85%)	$P = .000^*$
Antidepressant use	Yes	19 (9.5%)	2 (1%)	21 (5.25%)	$X^2 = 14.524$
	No	181 (90.5%)	198 (99%)	379 (94.75%)	$P = .000^*$
Cigarette consumption	Yes	90 (45%)	64 (32%)	154 (38.5%)	$X^2 = 7.138$
	No	110 (55%)	136 (68%)	246 (61.5%)	$P = .008^*$
Caffeine consumption	Yes	82 (41%)	46 (23%)	128 (32%)	$X^2 = 14.133$
	No	118 (59%)	154 (77%)	272 (68%)	$P = .000^*$
Alcohol consumption	Yes	21 (10.5%)	14 (7%)	35 (8.75%)	$X^2 = 1.496$
	No	179 (89.5%)	186 (93%)	365 (91.25%)	$P = .221$
Marital status	Married	60 (30%)	61 (30.5%)	121 (30.25%)	$X^2 = 0.12$
	Single	140 (70%)	139 (69.5%)	279 (69.75%)	$P = .913$
Total		200 (100.0%)	200 (100.0%)	400 (100.0%)	

\*Chi-square test, <sup>a</sup>Fisher's exact test ( $P < .05$  denotes significance)

**Table 2.** Distribution of Possible Risk Factors among Bruxists by Gender.

		Female	Male	Total (N%)	Result
Gastroesophageal Reflux	Yes	13 (13%)	16 (16%)	29 (14.5%)	X <sup>2</sup> =0.363
	No	87 (87%)	84 (84%)	171 (85.5%)	P=.547
Gastric Ulcer	Yes	6 (6%)	3 (3%)	9 (4.5%)	X <sup>2</sup> =1.047
	No	94 (94%)	97 (97%)	191 (95.5%)	P=.498
Gastritis	Yes	8 (8%)	9 (9%)	17 (8.5%)	X <sup>2</sup> =0.064
	No	92 (92%)	91 (91%)	183 (91.5%)	P=.800
Migraine	Yes	28 (28%)	16 (16%)	44 (22%)	X <sup>2</sup> =4.196
	No	72 (72%)	84 (84%)	156 (78%)	P=.041*
Antidepressant use	Yes	11 (11%)	8 (8%)	19 (9.5%)	X <sup>2</sup> =0.523
	No	89 (89%)	92 (92%)	181 (90.5%)	P=.469
Cigarette consumption	Yes	31 (31%)	59 (59%)	90 (45%)	X <sup>2</sup> =13.657
	No	69 (69%)	41 (41%)	110 (55%)	P=.000*
Caffeine consumption	Yes	36 (36%)	46 (46%)	82 (41%)	X <sup>2</sup> =1.681
	No	64 (64%)	54 (54%)	118 (59%)	P=.195
Alcohol consumption	Yes	3 (3%)	18 (18%)	21 (10.5%)	X <sup>2</sup> =11.971
	No	97 (97%)	82 (82%)	179 (89.5%)	P=.001*
Marital status	Married	26 (26%)	34 (34%)	60 (30%)	X <sup>2</sup> =1.524
	Single	74 (74%)	66 (66%)	140 (70%)	P=.217
<b>Total</b>		<b>100 (100.0%)</b>	<b>100 (100.0%)</b>	<b>200 (100.0%)</b>	

\* Chi-square test, <sup>a</sup>Fisher's exact test (P<.05 denotes significance)

## Discussion

It was determined that bruxism, which tended to decrease with increasing age, was most common in the age group of 20-40 years.<sup>15</sup> The mean age of individuals aged 17-60 years included in this study was found to be 26.56±7.539 and these results were consistent with the view that bruxism is more effective on the young population.

Gastroesophageal reflux disease (GORD) is a condition that results from the reflux of stomach contents into the esophagus and causes disturbing symptoms and/or complications.<sup>16</sup> Chemical wear is mostly seen in the palatal/lingual areas of the teeth in GORD and mechanical wear is seen on the contacting surfaces of the teeth in bruxism.<sup>11,13</sup> Few studies have addressed and analyzed the possible relationship between GORD and bruxism.<sup>11,17</sup> In the study conducted by Li *et al.*, in 2018<sup>11,17</sup>, reported that GORD was associated with diurnal and nocturnal bruxism and GORD seen with bruxism was more common in women. Moreover, individuals with GORD having longer-lasting symptoms were more likely to develop bruxism.<sup>11</sup>

In the present study, a significant correlation was found between bruxism and GORD, which was seen in 14.5% of the bruxists. In the light of these results, GORD appears to be a risk factor for bruxism. Bruxism should also be investigated in individuals with GORD, reflux symptoms and erosion-related tooth wear should be checked in bruxist individuals, and this disease should also be taken into account in planning of bruxism treatment. Differently from the study by Li *et al.*<sup>11</sup>, no difference was observed between genders in terms of GORD in the present study, which may be caused by racial differences.

A review study mentioned that abdominal diseases such as gastric ulcer and gastritis may be included in the physiological factors in the etiology of bruxism.<sup>18</sup> Hormones such as adrenaline and cortisol released under stress may contribute to the development of ulcers as a

result of increasing secretions such as acid that irritates the stomach.<sup>19</sup> To the best of the author's knowledge, there is no human research on the correlation of bruxism with gastric ulcer and gastritis in the literature. In the present study, it was thought that there may be an indirect relationship between bruxism and these diseases, since bruxism, gastric ulcer and gastritis are associated with psychological factors such as stress. In this study, in which gastric ulcer was found as a risk factor for bruxism, there was no significant correlation between gastritis and bruxism. It is thought that future studies with a larger sample group consisting of bruxist individuals with ulcer will increase the reliability of the data. Furthermore, gastric ulcer and gastritis in bruxists did not differ between genders.

In their study, Fernandes *et al.*<sup>20</sup>, reported that the prevalence of nocturnal bruxism was higher in individuals with headache and found a significant correlation between migraine and nocturnal bruxism in individuals who had chronic migraine and 74.6% of whom had nocturnal bruxism. In another systematic review, it was reported that migraine cannot be definitively considered as a potential risk factor due to the lack of a cause-effect relationship between bruxism and migraine.<sup>21</sup> In the present study, in which a significant correlation was determined between migraine and bruxism, migraine appears to be a risk factor for bruxism, and further studies on etiopathogenesis are needed to evaluate whether or not migraine is an etiological factor for bruxism.

Bruxism may develop due to anxiety, stress and depression.<sup>22</sup> Recently, there are studies reporting that the use of antidepressants increases the prevalence of bruxism.<sup>23-25</sup> However, the mechanism of antidepressant-induced bruxism is unknown. It has been reported that various antidepressant drugs may inhibit dopamine release from the midbrain cortical pathway as a result of overstimulation of neurons by acting on the midbrain cortex in the ventral tegmental area, which may cause masticatory muscle dystonia and teeth grinding.<sup>26,27</sup> Uca

*et al.*<sup>24</sup>, evaluated the prevalence of bruxism on 807 patients (506 in the antidepressant group, 301 in the control group) and found that the frequency of bruxism was significantly higher in the antidepressant group (24.3%) than in the control group (15.3%). Likewise Melo *et al.*<sup>25</sup>, reported that sleep bruxism increased with the use of antidepressants among adults. It was also reported that antidepressant-induced bruxism developed in pediatric and adult patients, mostly in female patients.<sup>23</sup> It was reported that teeth grinding symptoms may start after short and long-term use of antidepressants in patients and these symptoms may disappear within 3-4 weeks after discontinuing the drug or changing it with another drug.<sup>23</sup> The fact that antidepressant use was significantly higher in bruxists in the current study similar to the data in the literature supports the view that bruxism is affected by depression or antidepressant drug use.

Tobacco products, caffeine, and alcohol are legal psychoactive substances that can affect the central nervous system, behaviors, cognitive functions, and mood.<sup>28</sup> Numerous studies have reported that tobacco products containing nicotine, which is an acetylcholine agonist, stimulate and suppress the central nervous system<sup>28</sup>, may cause sleep disorders<sup>29</sup> and also may be a predisposing factor for bruxism.<sup>8,9,30</sup> In a systematic review, smokers were approximately 1.5 times more likely to have nocturnal bruxism than non-smokers.<sup>9</sup> In a survey conducted by Alajbeg *et al.*<sup>30</sup>, on 1092 Croatian navy employees, they found a 2.72 times higher risk of nocturnal bruxism in smokers. Again, studies conducted using polysomnographic evaluations revealed that smokers suffered from bruxism attacks with a higher number of arousal.<sup>31</sup> As nicotine accumulating during wakefulness gradually decreases during sleep, oromotor activity may increase as a result of induction of glutamatergic synaptic transmission and increase in dopamine release.<sup>32</sup> It is also thought that smoking affects sleep bruxism due to its proinflammatory effect on increased inflammation markers and cytokine levels in individuals.<sup>31</sup>

Contrary to these studies, Wincour *et al.*<sup>33</sup>, conducted a study in a small group of Israeli adolescents and found no correlation between smoking and nocturnal bruxism.

The results of the current study showed that smoking is a risk factor for bruxism, especially in men, in parallel with most examples in the literature. The fact that smoking is more common in men may explain the different result between the genders.

Regarding the correlation between caffeine consumption and bruxism, Rintakoski *et al.*, conducted a cohort study of 12502 twins in 2013.<sup>10</sup> In that study<sup>10</sup> and also a systematic review<sup>9</sup> caffeine consumption was significantly positively associated with bruxism, and the findings of the present study support these results. Positive correlations found between cigarette and caffeine consumption in the studies<sup>34</sup> may explain significant correlation of both risk factors with bruxism.

Alcohol contains ethanol, a central nervous system depressant<sup>28</sup> and alcohol consumption is known to have negative effects on health and sleep.<sup>35,36</sup> While alcohol makes it easier to fall asleep, it also disrupts sleep balance.<sup>36</sup> There are studies reporting that alcohol consumption is positively correlated with bruxism<sup>9,10</sup>; whereas, some other studies have also reported that alcohol do not have a significant effect on bruxism parameters.<sup>31,33</sup> The lack of a significant correlation between alcohol consumption and bruxism in the present study may be due to the very low alcohol consumption in the study group (8.75%). Evaluation of bruxism in a larger sample group with alcohol consumption will give more meaningful and reliable results.

There are studies in the literature that marital status can affect the psychological life of the individual and indirectly trigger parafunctional behaviors such as bruxism.<sup>30,37</sup> However, unlike the present study, the effect of marital status on bruxism was not observed. This result may have been caused by the low mean age in the sample group.

Diurnal bruxism is thought to have a pathophysiology different from nocturnal bruxism. While psychosocial factors (stress, anxiety) are especially effective in diurnal bruxism<sup>38</sup>, alcohol, caffeine consumption, cigarette consumption, various psychotropic drugs, and gastroesophageal reflux have been associated with nocturnal bruxism.<sup>3,8,9</sup> Although their etiopathogenesis is different, it has been observed that the causes of diurnal and nocturnal bruxism trigger each other.<sup>39</sup> According to the survey recommended by Pintado *et al.*<sup>12</sup>, and the clinical examination findings recommended by Rompre *et al.*<sup>13</sup>, nocturnal bruxism was present in all bruxist individuals in this study, who were diagnosed with probable bruxism, and nocturnal bruxism and diurnal bruxism were seen together in 58% of the bruxist individuals. This may indicate that nocturnal and diurnal bruxism affected each other. However, the factors thought to be effective in nocturnal and diurnal bruxism could not be compared, since individuals with only diurnal bruxism were not found in the study.

## Conclusions

Consequently, medical disorders such as gastroesophageal reflux, gastric ulcer, migraine, as well as antidepressant use, cigarette consumption, and caffeine consumption are associated with bruxism, and dentists should be aware that these risk factors may cause or exacerbate bruxism. The etiology and pathogenesis of bruxism will be elucidated by comprehensively evaluating these risk factors and investigating the causal relationships between them and bruxism. This may be beneficial in preventing the damage of bruxism on the mastication system before it occurs and in planning the bruxism treatment correctly.



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