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Research Article

Investigation of the Relationship Between Bruxism Symptoms and Restless Leg Syndrome

Emre Balaban, Zeynep Gumrukcu, Ismail Burak Halat

Recep Tayyip Erdoğan University, Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, Rize, Türkiye

Abstract

Aim: This study aims to examine the relationship between bruxism symptoms and restless legs syndrome (RLS), focusing on the frequency and severity of RLS symptoms in patients with bruxism.

Material and Method: A total of 134 patients (50 males, 84 females) diagnosed with bruxism out of 212 patients presenting with jaw pain between April 10 and July 6, 2019, were included in the study. The average age of the participants was 47. Patients completed the Bruxism Determination Questionnaire and the RLS Severity Scale. Data were analyzed using SPSS (IBM SPSS for Windows, version 26). Relationships and correlations were determined using descriptive statistics and various statistical tests. Statistical significance was set at ($p<0.05$).

Results: No statistically significant difference was found between bruxism symptoms and RLS severity ($p>0.05$). However, a significant positive correlation was found between the number of bruxism symptoms and the RLS severity score (19.3%, $p=0.025$). Additionally, smoking was found to affect bruxism symptoms but not RLS severity.

Conclusion: Bruxism symptoms increase with the severity of RLS, but no significant inverse relationship was observed. While smoking affects bruxism symptoms, it does not affect RLS severity. Further research with larger sample sizes and more objective evaluation criteria is needed to better understand the relationship between these two conditions.

Keywords: Bruxism, sleep bruxism, restless leg syndrome, cigarette smoking

INTRODUCTION

Bruxism is a condition of significant interest in dentistry, neurology, and psychiatry, attracting the attention of both clinicians and researchers due to its impact on the temporomandibular joint. While various definitions exist in the literature, bruxism is generally characterized as a set of non-functional, pathological jaw movements, such as teeth grinding and clenching, that occur outside the normal physiological functions of the mandible, such as chewing and speaking (1,2). The prevalence of bruxism varies between 6% and 91%, depending on the age groups studied and the types of bruxism considered (3,4). The consequences of bruxism include wear on the occlusal surfaces of teeth, fractures of teeth and implants, hyperkeratotic areas in the buccal mucosa, indentations on the tongue and lips, displacement of the temporomandibular joint (TMJ) disk, pain and hypertrophic appearance in the masticatory muscles.

Restless Leg Syndrome (RLS) was first described by Ekbom in 1945 as a neurological disorder causing varying degrees of discomfort in the legs (5). Initially considered a rare disorder, a 2006 study reported the prevalence of moderate to severe RLS in the general population to be 4.4% (6).

The current literature presents mixed findings regarding the relationship between bruxism symptoms and RLS. The main objective of this study is to investigate the potential relationship between the increase in bruxism symptoms and the severity of RLS. This study is distinctive in that it examines not only the presence of RLS but also the extent to which the severity of RLS correlates with bruxism symptoms.

MATERIAL AND METHOD

This study received the necessary ethical approval from the Non-Invasive Clinical Research Ethics Committee of Recep Tayyip Erdoğan University (Protocol No: 2019/66). A total of 212 patients who presented with jaw pain to the Department of Oral and Maxillofacial Surgery at Recep Tayyip Erdoğan University Faculty of Dentistry between April 10, 2019, and July 6, 2019, were evaluated based on

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Corresponding Author: Emre Balaban, Recep Tayyip Erdoğan University, Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, Rize, Türkiye

E-mail: balabanemre@outlook.com

the clinical parameters listed in Table 1. Among these, 134 patients (50 males and 84 females) exhibiting bruxism symptoms were included in the study. The average age of the participants was 47 years, ranging from 21 to 69 years.

All patients were provided with an oral and written informed consent form. Those who consented were given the 'Bruxism Determination Questionnaire' listed in Table 2, which was developed based on the diagnostic criteria of the American Academy of Sleep Medicine (3). In this questionnaire, 'yes' answers were scored as '1', 'no' as '0', and 'unknown' as '2'. A score of '1' from any question was considered sufficient for a diagnosis of bruxism.

Patients diagnosed with bruxism were then assessed using the RLS Assessment Scale published by the International RLS Study Group in 2003, as listed in Table 3. This scale includes ten questions, each rated on a scale from 'very severe (4)' to 'none (0)'. The scores were categorized as 'Mild (1-10)', 'Moderate (11-20)', 'Severe (21-30)', and 'Very severe (31-40)'. Data obtained were analyzed using SPSS (IBM SPSS for Windows, version 26).

Table 1. Bruxism clinical parameters

- **Is there abnormal wear on the occlusal surfaces of the teeth?**
- **Is there hypertrophy of the masticatory muscles?**
- **Do you feel fatigue and pain in the masticatory muscles?**
- **Do you have cold sensitivity in your teeth or tooth?**
- **Is there any sound from the TMJ during function?**
- **Are there teeth marks on the buccal mucosa and lateral sides of the tongue?**

Table 2. Bruxism identification questionnaire

	Yes	No	Don't know
Do you grind your teeth while sleeping?			
Do your relatives hear you grinding your teeth while sleeping?			
Do you wake up with your teeth clenched?			
Do you experience jaw pain or fatigue upon waking?			
Do you feel your teeth are loose when you wake up?			
Do you experience sensitivity in your teeth or gums upon waking?			
Do you feel pain in your temples upon waking?			
Do you feel your jaw is locked upon waking?			

Table 3. Restless legs syndrome (RLS) assessment scale

Overall, how would you evaluate the discomfort of RLS in your arms or legs?	(4) Very severe (3) Severe (2) Moderate (1) Mild (0) None	**Overall, assess the severity of your RLS**	(4) Very severe (3) Severe (2) Moderate (1) Mild (0) None
Overall, how do you evaluate the urge to move due to RLS symptoms?	(4) Very frequent (3) Frequent (2) Moderate (1) Infrequent (0) None	**Evaluate how often your RLS symptoms occur**	(4) Very often (6-7 days/week) (3) Often (4-5 days/week) (2) Occasionally (2-3 days/week) (1) Rarely (1 day/week) (0) Never
Overall, how would you rate the relief of your RLS symptoms with movement?	(4) No relief (3) Slight relief (2) Moderate relief (1) Complete/nearly complete relief (0) No discomfort	**Evaluate the average severity of your RLS symptoms**	(4) Very severe (8 hours or more/24 hours) (3) Severe (3-8 hours/24 hours) (2) Moderate (1-3 hours/24 hours) (1) Mild (less than 1 hour/24 hours) (0) None
Evaluate your sleep disturbance due to RLS	(4) Very much (3) Much (2) Moderate (1) Little (0) None	**Evaluate how much RLS symptoms negatively impact your daily life (social, familial, work/school)**	(4) Very much (3) Much (2) Moderate (1) Little (0) None
Evaluate your fatigue and insomnia due to RLS	(4) Very much (3) Much (2) Moderate (1) Little (0) None	**Evaluate your psychological changes due to RLS symptoms (irritability, depression, sadness, anxiety, etc.)**	(4) Very much (3) Much (2) Moderate (1) Little (0) None
Scoring criteria: mild (1-10); moderate (11-20); severe (21-30); very severe (31-40)			

RESULTS

The sample size for this study was calculated to ensure a power of at least 80% and a Type-1 error of 5% for each variable. The normality of continuous measurements was assessed using the Kolmogorov-Smirnov (n>50) and Skewness-Kurtosis tests, and parametric tests were applied as the measurements were normally distributed. Descriptive statistics for the variables were expressed as mean, standard deviation, number (n), and percentage (%). The Independent T-test and One-Way ANOVA were used to compare continuous measurements based on categorical factors, followed by the Duncan test for group comparisons. Multiple Correspondence Analysis was performed to examine the relationships between categorical variables, and the Chi-square (Fisher's exact) test was used to determine relationships between categorical variables. Pearson correlation coefficients were calculated to assess relationships between scales, with a significance level (α) of 5%. Data were analyzed using SPSS (IBM SPSS for Windows, version 26).

Table 4 presents the general descriptive statistics of the 'Demographic, RLS, and Bruxism' measurements of the patients. According to these statistics, 17.9% of patients were categorized as having 'Mild' and 'Moderate' RLS severity; 21.6% were smokers. Additionally, the average RLS severity score was 6.3, and the mean number of Bruxism Symptoms was 3.9.

Table 4. General descriptive statistics of data

		Count	Percentage (%)
Severity of RLS	None	73	54.5
	Mild	24	17.9
	Moderete	24	17.9
	Severe	10	7.5
	Very severe	3	2.2
Smoking status	Non-smoker	105	78.4
	Smoker	29	21.6
		Mean	Std. Dev.
Severity of RLS		6.31	8.83
Bruxism symptoms		3.92	1.88

Table 5 compares the 'Bruxism symptoms' according to the 'RLS severity range'. No statistically significant difference was observed between 'Bruxism symptoms' and the 'RLS severity range' (p>0.05). Although there was a trend of increasing 'Bruxism Symptoms' with increasing 'RLS severity', this increase was not significant.

Tablo 5. Comparison of bruxism symptoms and RLS severity levels

	RLS severity	N	Mean	Std. dev.	Min.	Max.	F	*p
Bruxism Symptoms	None	73	3.62	2.05	1.00	9.00	1.597	0.179
	Mild	24	3.92	1.28	1.00	6.00		
	Moderate	24	4.42	1.89	2.00	9.00		
	Severe	10	4.90	1.66	2.00	7.00		
	Very severe	3	4.00	1.00	3.00	5.00		

* Significance levels according to one-way ANOVA results; a,b,c: Shows the difference between groups (Tukey post-hoc test)

Table 6 presents the correlation analysis between the 'number of Bruxism symptoms' and 'RLS severity scores'. A statistically significant positive correlation of 19.3% was found between the 'Number of Bruxism Symptoms' and 'RLS severity score' (p=0.025). This indicates that as 'Bruxism Symptoms' increase, 'RLS severity score' also increases.

Table 6. Correlation analysis between bruxism symptoms and RLS severity

		RLS severity
Bruxism symptoms	r	.193
	p	**.025**
	n	134

r: pearson correlation coefficients, p: significance levels for the correlation coefficient, n: participant count

Table 7 compares 'Bruxism symptoms' and 'RLS severity' scores according to 'Smoking status'. No statistically significant difference was observed in the 'RLS severity score' based on 'Smoking status' (p>0.05). However, a significant difference was found in 'Bruxism symptoms' based on 'Smoking status' (p=0.011), with lower 'Bruxism symptoms' observed among smokers.

Table 7. Comparison of bruxism and RLS scores by smoking status

	Cigarette	N	Mean	Std. Dev.	t	*p
RLS severity	None	105	6.97	9.07	1.672	.097
	Yes	29	3.90	7.52		
Bruxism symptoms	None	105	4.13	1.90	2.571	.011
	Yes	29	3.14	1.62		

*Independent sample t-test results indicating significance levels

DISCUSSION

This study set out to evaluate the relationship between 'Bruxism Symptoms' and 'RLS' through three different research questions. The first aimed to measure the incidence of RLS in patients with bruxism symptoms. The second investigated the effect of increased bruxism symptoms on RLS scores. The final research question explored the impact of smoking on the number of bruxism symptoms and RLS scores.

Bruxism is characterized by parafunctional habits such as teeth grinding and clenching, leading to tooth wear, hypertrophy, and pain in the masticatory muscles (7). Clinical studies report a bruxism prevalence ranging from

6.5% to 88%, while epidemiological studies typically report lower figures (6-8%) (8-14).

The etiology of bruxism is multifactorial. Historically, it was thought to result primarily from maladaptive prosthetic and restorative rehabilitations applied to the dentition, occlusal discrepancies from tooth tissue damage, and anatomical deviations due to congenital/acquired factors. However, it is now accepted that these factors play a minimal role, with stress, social life, genetics, personality traits, exogenous factors (smoking), and central nervous system dysfunctions being the primary etiological factors (15).

There is no consensus on specific diagnostic criteria or grading systems for bruxism in the literature. Lobezzo et al. advocated for the use of electromyography (EMG) to assess chewing activity and polysomnography (PSG) records for diagnosing sleep bruxism to obtain more objective results (16). Conversely, some studies argue that patient questionnaires, verbal and written anamnesis records, intraoral and extraoral examination findings are preferred diagnostic tools despite their relatively subjective results, due to their clinical applicability, ease of access, short application time, no need for additional equipment, and cost-effectiveness (17,18).

RLS is a neurological disorder causing an urge to move the legs due to unpleasant sensations, primarily at rest, which is alleviated by movement and worsens in the evening or night. Epidemiological studies using diagnostic criteria report an RLS prevalence between 5% and 15% (19,20).

Since its definition, various subjective and objective diagnostic tools have been used for RLS. Clinical findings such as an urge to move the legs due to unpleasant sensations, onset during periods of rest or inactivity, relief with movement, and worsening of symptoms in the evening or night are crucial for diagnosis (21). Additional parameters include periodic limb movements during wakefulness and sleep, functional MRI recordings of neuronal activation in the CNS, and low ferritin levels in serum and cerebrospinal fluid (22-25). In 2003, the International RLS Study Group standardized RLS diagnosis and grading with a 10-question scale (26).

Although many studies have investigated the relationship between these two conditions, few have compared the incidence of RLS in patients with bruxism. Lavigne et al. reported that 9.6% to 10.9% of patients with bruxism symptoms exhibited RLS symptoms in a study of 2019 patients. In another experimental group of 93 individuals diagnosed with RLS, they found that 12.2% had bruxism symptoms (11). Saletu et al. conducted a control study using polysomnography and found a higher PLMS index in patients with sleep bruxism (SB) compared to controls (27). However, these studies only evaluated the presence of symptoms, not the severity of RLS. In our study, this rate varied between 2.2% and 17.9%, inversely proportional to the severity of RLS, partially supporting the literature.

There are some physiological and electrochemical similarities between bruxism and RLS. These similarities are seen in genetic factors, stress, anxiety, poor sleep quality, and various drug effects. Genetic predisposition is an important risk factor for both conditions. RLS often follows an autosomal dominant inheritance pattern, making it more likely to be passed from parent to child. Some genetic markers associated with RLS have been identified (e.g., MEIS1 and BTBD9 genes). These genes might contribute to symptoms by affecting the dopamine system. Although genetic markers for bruxism are less clear, similar inheritance patterns have been observed. Genetic predisposition, combined with environmental factors, may increase the risk of developing bruxism or RLS. This suggests that gene-environment interactions may play a key role in the development of both conditions (28,29).

Psychological factors such as stress, anxiety, and depression can trigger or worsen both conditions. Chronic stress disrupts the balance of dopamine and other neurotransmitters, increasing symptoms of bruxism and RLS. Stress raises hormones like cortisol, which affects dopamine activity in the brain. Bruxism during sleep is often seen as a result of stress. Psychological treatments (e.g., cognitive behavioral therapy) can help manage both bruxism and RLS. Stress management techniques and relaxation therapies may help reduce symptoms (30,31).

Bruxism usually occurs during sleep and is more common in certain stages of the sleep cycle, especially REM sleep. Increased muscle activity during these stages is linked to bruxism. RLS typically occurs when falling asleep or throughout the night and can severely affect sleep quality. People with RLS often experience insomnia and frequent awakenings. Good sleep hygiene is important for both conditions. Regular sleep schedules, a comfortable sleep environment, and limiting caffeine and alcohol can significantly help control symptoms (32,33).

Medications like antidepressants and antipsychotics can trigger symptoms of both bruxism and RLS. SSRIs (selective serotonin reuptake inhibitors) may increase the risk of bruxism, while antipsychotics, which block dopamine receptors, can worsen RLS. Caffeine and alcohol can both worsen symptoms; caffeine stimulates the central nervous system, which can aggravate bruxism and RLS. Alcohol may initially help with falling asleep but can decrease sleep quality and worsen symptoms. Stopping substances like nicotine or alcohol suddenly can also worsen symptoms. Nicotine withdrawal, in particular, can increase RLS symptoms by affecting dopamine levels (34,35).

Both conditions are known to be related to dopamine. While RLS responds positively to dopamine-containing drugs, the role of dopamine in bruxism is still debated (36). Despite these similarities, no consensus exists on the causative role of dopamine in either condition. Our study did not reveal a significant effect of increased bruxism symptoms on RLS scores, but we observed an increasing

trend, although it was not statistically significant. Additionally, we found a significant correlation between the number of bruxism symptoms and RLS severity score, indicating that as bruxism symptoms increase, RLS severity score also increases. These results suggest a potential relationship between the two conditions, with shared pathophysiological mechanisms possibly involving dopaminergic pathways.

Regarding smoking, our study found a significant difference in bruxism symptoms based on smoking status, with smokers exhibiting lower bruxism symptoms. However, no significant difference was observed in RLS severity score based on smoking status. This finding contrasts with previous studies suggesting that smoking may exacerbate bruxism and RLS symptoms (37,38). Further research is needed to explore the complex interactions between smoking, bruxism, and RLS.

CONCLUSION

This study provides insights into the relationship between bruxism symptoms and RLS. While no significant difference was observed between bruxism symptoms and RLS severity range, a significant positive correlation was found between the number of bruxism symptoms and RLS severity score. Additionally, a significant difference in bruxism symptoms was observed based on smoking status, with smokers exhibiting lower bruxism symptoms. These findings suggest a potential relationship between bruxism and RLS, with shared pathophysiological mechanisms possibly involving dopaminergic pathways. Further research is needed to elucidate the complex interactions between these conditions and to explore the role of smoking in their manifestation.

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