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# Evaluation of sleep quality and chronobiological patterns in bruxism

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**Abstract**

Bruxism is characterised by repetitive tooth contact and masticatory muscle activity and is further divided into wakefulness and sleep bruxism. The aetiology of the condition is multifactorial, with psychological and genetic factors, as well as the quality of sleep, playing a significant role. This study has been devised to evaluate the existence of chronotype variations, in addition to the relationship that exists between sleep quality and the occurrence of bruxism in individuals who suffer from sleep bruxism. Seventy-six patients diagnosed with bruxism who presented to the otorhinolaryngology, oral and maxillofacial surgery clinics in the last year and 68 patients without a history of bruxism and without clinical findings were involved in the investigation. The Pittsburgh Sleep Quality Index (PSQI) was utilised as a tool to assess the sleep quality of the participants and chronotype characteristics with the Morning-Evening Questionnaire (MEQ). Of the total 144 patients, 83 were female and 61 were male. The study revealed that the sleep quality of the bruxism group was found to be inferior, as evidenced by PSQI scores that were significantly higher ($p<0.001$). The investigation revealed no statistically significant differences between the groups with the characteristics of chronotype ($p>0.05$). In individuals with bruxism, no meaningful association was detected between PSQI scores and either gender or chronotype ($p>0.05$). It is imperative to consider the potential impact of bruxism on sleep quality, as a detailed examination of sleep quality in clinical evaluations is crucial.

**Keywords:** Bruxism, chronobiology, sleep quality

## Introduction

Bruxism is characterised by repetitive or continuous tooth contact or unconscious squeezing, rubbing or pushing of the mandible. Depending on the circadian rhythm, bruxism is divided into two subtypes: sleep bruxism and awake bruxism. Awake bruxism is defined as masticatory muscle activity occurring during wakefulness. Sleep bruxism is defined as rhythmic or non-rhythmic masticatory muscle activity that occurs during sleep [1]. The aetiology of the condition may be attributed to a number of factors, including psychological factors, genetic factors, nicotine and alcohol consumption, tooth bite dynamics and hormonal changes, and sleep quality [2-5]. These patients may experience pain in the temporamandibular joint and masticatory muscles, tooth wear, fractures or cracks, and damage to the prosthesis or implant [6]. The importance of sleep quality for the maintenance of both physical and mental health is well-documented [7]. The evaluation of sleep quality can be approached from two distinct perspectives. Firstly, an objective evaluation can be conducted utilising polysomnography, a comprehensive sleep evaluation technique. Secondly, a subjective approach can be taken through the administration of questionnaires, which are tools designed to assess individual experiences and perceptions related to sleep and related issues [8]. The Pittsburgh Sleep Quality Index (PSQI) is widely used in the evaluation of subjective sleep quality [9].

It is evident that the circadian rhythm has a significant impact on the determination of human chronotype [10]. In chronobiology, chronotypes are categorised according to the following classification system: morning types are defined by an earlier wake-up time and an earlier bedtime; in contrast, evening types are characterised by a later wake-up time and bedtime [11,12]. The Morning-Evening Questionnaire (MEQ), as devised by Horne and Ostberg, is a tool that can be utilised in both healthy and sick individuals with a view to determining chronotypes [13]. Individuals with different chronotype characteristics show marked

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variation in a range of psychological. biological. and behavioural variables. These variables include mood, attention, task effort, body temperature, cortisol and melatonin secretion [14,15]. Despite the existence of studies that have examined sleep quality in bruxism, there is a paucity of research investigating its relationship with chronotype. The aim of this study was to evaluate the differences between the chronotypes and the relationship between the quality of sleep and bruxism in patients with bruxism.

## Material and Methods

The Declaration of Helsinki was adhered to, and ethical approval was granted by Recep Tayyip Erdoğan University Ethics Committee (Approval Date: 24 April 2025; Approval No: 2025/173). Patients who presented to the Department of Otolaryngology and the Department of Oral and Maxillofacial Surgery within the last year and were subsequently diagnosed with bruxism were included in the study. Individuals without bruxism complaints or clinical findings were used as the control group. The participants were informed of the aims of the study and of the procedures that would be followed. The diagnosis of sleep bruxism was made according to the latest international consensus. It was based on either a positive self-report or, in the absence of this, a positive clinical examination. [1]. The fallowing patients were not included in the study: individuals with neurological disorders, those who were pregnant, those using sleep medications, those taking anxiolytic or antidepressant drugs, those with systemic diseases, and individuals with total or partial dental prostheses. Participants were assessed using the PSQI and the MEQ. The Turkish version of the PSQI has been used to assess the quality of sleep [16]. The scale consists of 24 items, categorized into four Likert-type scales. Of these, 19 items are self-reported and answered by the patient, while the remaining five items, which do not contribute to the scoring, are answered by the patient's roommate. The portion of the scale that is scored is divided into seven subdomains, with the purpose of evaluating, subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disruptions, sleep medication use and daytime functional disturbances are assessed. The responses to each question were evaluated on a scale from 0 to 3, based on frequency. The response of 0 was assigned if the condition did not occur during the past month; the response of 1 was assigned if the condition occurred less than once a week; the response of 2 was assigned if the condition occurred once or twice a week; and the response of 3 was assigned if the condition occurred three or more times a week. The total score obtained on the PSQI is derived from the summation of the scores obtained across the seven subdomains of this scale. The total score is subject to a range of values between 0 and 21. It has been established that scores of 5 and below are indicative of sleep quality that is satisfactory. Scores of more than 5, by contrast, are suggestive of poor sleep quality [16]. The Turkish adaptation of MEQ was utilised for chronotyping. A 19-item questionnaire was employed to assess habitual bedtime patterns, preferred times for optimal physical and mental performance, and subjective sensations of alertness upon awakening and prior to sleep. There are four possible responses to choose from. The questionnaire utilised in this study ranges from 16 to 86 points. Scores ranging from 16 to 41 are indicative of an evening type, while scores between 42 and 58 are considered to indicate neither a morning nor an evening type. Scores falling between 59 and 86 are classified as morning type [13,17]

### Statistical Analysis

The statistical analysis was conducted utilising IBM SPSS Statistics version 25.0. Descriptive statistics encompassed the mean value, standard deviation, median, minimum and maximum values for numerical variables, whereas numbers and percentages were employed for categorical variables. The comparison of categorical variables was performed using Pearson's chi-squared test and Fisher's exact test. In instances where numerical variables were found to be non-normal, the Mann-Whitney U test and the Kruskal-Wallis test were employed, as appropriate. In order to assess the relationships between two numerical variables which were not normally distributed, the researchers employed Spearman's correlation analysis. Statistical significance was defined as a p-value less than 0.05.

## Results

In total, the study comprised 144 subjects, consisting of 76 individuals diagnosed with bruxism and 68 controls. The demographic breakdown of the sample included 83 females (57.6%) and 61 males (42.4%). The sociodemographic characteristics of the participants, along with their mean scores on the PSQI and MEQ scales, are summarized in Table 1. The mean MEQ score was 49.25±7.69. Based on this, 27 participants (18.8%) were identified as morning types, 101 participants (70.1%) as neither types, and 16 participants (11.1%) as evening types.

**Table 1.** Sociodemographic characteristics of the participants and their mean scores on the PSQI and MEQ scales

| | Number (n) | Percent (%) |
|---|---|---|
| **Group** | | |
| **Patient** | 76 | 52.8 |
| **Control** | 68 | 47.2 |
| **Gender** | | |
| **Female** | 83 | 57.6 |
| **Male** | 61 | 42.4 |
| **PSQI** | | |
| **≤5** | 62 | 43.1 |
| **>5** | 82 | 56.9 |
| **MEQ** | | |
| **Morning-type** | 27 | 18.8 |
| **Neither-type** | 101 | 70.1 |
| **Evening-type** | 16 | 11.1 |
| | **Mean±SD** | **Median (min-max)** |
| **Age** | 27.71±6.41 | 26.00 (14.00-47.00) |
| **PSQI** | 6.32±3.78 | 6.00 (0.00-18.00) |
| **MEQ** | 49.25±7.69 | 49.00 (31.00-70.00) |

PSQI: Pittsburgh Sleep Quality Index, MEQ: Morning-Evening Questionnaire

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Age and gender distributions were statistically comparable between bruxers and control group (p>0.05) (Table 2).

In terms of PSQI scores, a statistically significant difference was found between patients with bruxism and the control group. The proportion of participants exhibiting 'poor' sleep quality was found to be higher in the bruxism group, and their PSQI scores were found to be significantly elevated (p<0.001). Nevertheless, no substantial disparities were identified between the groups with regard to MEQ scores or chronotype categorisations (p>0.05) (Table 3).

A subsequent analysis of the PSQI type in relation to gender, age, MEQ type and MEQ scores among bruxism patients revealed no statistically significant variations (p>0.05) (Table 4).

In addition, no substantial disparities were identified between the PSQI scores and gender or MEQ type in patients diagnosed with bruxism (p>0.05) (Table 5).

**Table 2.** Comparison of sociodemographic characteristics between the patient and control groups

| | Group | | | | $X^2$ (p) |
|---|---|---|---|---|---|
| | Patient | | Control | | |
| | Number (Percent) | | Number (Percent) | | |
| **Gender** | | | | | |
| **Female** | 44 (53.0) | | 39 (47.0) | | 0.004 (0.948) |
| **Male** | 32 (52.5) | | 29 (47.5) | | |
| | **Mean±SD** | **Median (min-max)** | **Mean±SD** | **Median (min-max)** | **Z (p)** |
| **Age** | 27.05±5.79 | 24.00 (22.00-47.00) | 28.44±7.00 | 28.00 (14.00-41.00) | -1.762 (0.078) |

$X^2$: Chi square, Z: Mann Whitney U test

**Table 3.** Comparison of PSQI and MEQ scores and types between patient and control groups

| | Group | | | | $X^2$ (p) |
|---|---|---|---|---|---|
| | Patient | | Control | | |
| | Number (Percent) | | Number (Percent) | | |
| **PSQI** | | | | | |
| **≤5** | 20 (32.3) | | 42 (67.7) | | 18.394 (<0.001) |
| **>5** | 56 (68.3) | | 26 (31.7) | | |
| **MEQ** | | | | | |
| **Morning-type** | 13 (48.1) | | 14 (51.9) | | 0.843 (0.656) |
| **Neither-type** | 53 (52.5) | | 48 (47.5) | | |
| **Evening-type** | 10 (62.5) | | 6 (37.5) | | |
| | **Mean±SD** | **Median (min-max)** | **Mean±SD** | **Median (min-max)** | **Z (p)** |
| **PSQI** | 7.46±3.14 | 7.00 (1.00-18.00) | 5.04±4.05 | 4.00 (0.00-14.00) | -4.213 (<0.001) |
| **MEQ** | 49.67±7.76 | 49.00 (37.00-70.00) | 48.78±7.65 | 49.00 (31.00-70.00) | -0.703 (0.482) |

$X^2$: Chi square, Z: Mann Whitney U test, PSQI: Pittsburgh Sleep Quality Index, MEQ: Morning-Evening Questionnaire

**Table 4.** Comparison of PSQI type with sociodemographic characteristics. MEQ scores. and MEQ type in patients with bruxism

| | PSQI | | | | $X^2$ (p) |
|---|---|---|---|---|---|
| | ≤5 | | >5 | | |
| | Number (Percent) | | Number (Percent) | | |
| **Gender** | | | | | |
| **Female** | 13 (29.5) | | 31 (70.5) | | 0.562 (0.453) |
| **Male** | 7 (21.9) | | 25 (78.1) | | |
| **MEQ** | | | | | |
| **Morning-type** | 3 (23.1) | | 10 (76.9) | | 1.241 (0.613) |
| **Neither-type** | 13 (24.5) | | 40 (75.5) | | |
| **Evening-type** | 4 (40.0) | | 6 (60.0) | | |
| | **Mean±SD** | **Median (min-max)** | **Mean±SD** | **Median (min-max)** | **Z (p)** |
| **Age** | 25.20±3.76 | 23.50 (22.00-35.00) | 27.71±6.26 | 24.50 (22.00-47.00) | -1.778 (0.075) |
| **MEQ** | 51.05±7.18 | 53.00 (37.00-61.00) | 49.18±7.96 | 48.00 (37.00-70.00) | -1.140 (0.254) |

$X^2$: Chi square, Z: Mann Whitney U test, PSQI: Pittsburgh Sleep Quality Index, MEQ: Morning-Evening Questionnaire

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**Table 5.** Comparison of PSQI scores by gender and MEQ type in patients with bruxism

| | PSQI | | Z or H (p) |
|---|---|---|---|
| | Mean±SD | Median (min-max) | |
| **Gender** | | | |
| **Female** | 7.25±3.37 | 7.00 (1.00-18.00) | -1.113 (0.266) |
| **Male** | 7.75±2.83 | 7.50 (2.00-12.00) | |
| **MEQ** | | | |
| **Morning-type** | 7.62±2.69 | 7.00 (3.00-13.00) | |
| **Neither-type** | 7.66±3.28 | 7.00 (1.00-18.00) | 2.014 (0.365) |
| **Evening-type** | 6.20±2.94 | 6.50 (2.00-12.00) | |

Z: Mann Whitney U test, H: Kruskal Wallis test, PSQI: Pittsburgh Sleep Quality Index, MEQ: Morning-Evening Questionnaire

## Discussion

The present study aimed to explore the relationship between sleep bruxism, sleep quality, and chronotype. The results indicated that sleep quality was significantly poorer in bruxism patients compared to the control group. However, no significant differences were found between the two groups in terms of chronotype characteristics.

The present findings are consistent with those of previous studies that employed subjective assessment tools, such as the PSQI, and which also found poor sleep quality in individuals with bruxism [18-21].

In their study, Palinkas et al. demonstrated that patients suffering from sleep bruxism, as objectively evaluated by polysomnography, exhibited impaired total sleep time. This finding was substantiated by various parameters associated with sleep efficiency [22]. Lavigne et al. also stated that individuals suffering from sleep bruxism sleep well [23]. Camara-Souza and their associates discovered that patients who had been diagnosed using Bruxoff (Spes Medica, Battipaglia, Italy) exhibited substandard sleep quality [24]. Schmitter et al. initiated a study on patients with myofascial pain in the temporomandibular region. The study revealed a decline in sleep quality and an increased prevalence of bruxism among these patients [25]. Despite a number of studies, including the present one, indicating that sleep quality is impaired in patients with sleep bruxism, some studies have found no such effect. Ohlmann et al., for instance, found no difference in sleep quality when evaluating it with the PSQI in patients with sleep bruxism compared to a control group [26]. A relationship between poor sleep quality and sleep bruxism was indicated in a systematic review of the literature. This relationship was observed in patients diagnosed with bruxism through subjective assessment. while no such relationship was found in patients diagnosed with sleep bruxism using instrumental methods [27]. A recent meta-analysis, although with low evidence quality, found that sleep bruxism was not associated with objective measures of sleep quality and duration in adults, but was associated with subjective measures [28]. Although there are studies on sleep quality in bruxism, the number of studies evaluating chronotype remains limited. Recent studies have indicated a potential association between bruxism and a heightened demand for activities undertaken during periods which do not align with an individual's chronotype [29]. In a study examining circadian preference in adult bruxism, a 19% decrease in the likelihood of bruxism was observed in morning types, as determined by the MEQ, compared to evening types [30]. In a study of 85 pediatric bruxism patients, the most common chronotype was the intermediate type, and no significant relationship was found between chronotype and bruxism [31].

Studies examining the relationship between bruxism and sleep in children are limited; however, two of these studies have shown no direct relationship between circadian rhythm and the presence of sleep bruxism [31,32].

Although polysomnography is recognised as the gold standard for diagnosis, its cost and equipment requirements make it an impractical option for large sample sizes, and self-reported bruxism, although not definitive, is often accepted as a viable method for diagnosis in such cases [33,34]. However, the lack of objective diagnostic methods in our study constitutes one of its limitations. Moreover, the cross-sectional design of the study in question limits the ability of the researchers to establish causal relationships between the variables. To accurately determine causality, prospective and longitudinal studies are necessary.

## Conclusion

In order to mitigate the detrimental effects of bruxism, it is crucial to perform a detailed evaluation and develop a treatment plan that considers the individual characteristics of each patient. Furthermore, the impact of sleep quality on overall health should not be overlooked, and in the evaluation of patients with bruxism, the screening of sleep disturbances and the inclusion of psychiatric diagnostic assessments should be incorporated into clinical practice.

**Conflict of Interests**
*The authors declare that there is no conflict of interest in the study.*

**Financial Disclosure**
*The authors declare that they have received no financial support for the study.*

**Ethical Approval**
*The Declaration of Helsinki was adhered to, and ethical approval was granted by Recep Tayyip Erdoğan University Ethics CommitteAe p(roval Date: 24 April 2025; Approval No: 2025/173).*

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