

# Nocturnal Bruxism Severity and Lifestyle-Driven Cardiovascular Risk: Population-Level Associations of Sleep Fragmentation, Psychosocial Stress, and Metabolic Markers

<sup>1</sup>\*Dipti Kanchan

<sup>1</sup>University of Saskatchewan, Canada.

ORCID ID: 0009-0007-8233-9532

## Abstract

Nocturnal bruxism, such as sleep grinding, has been increasingly recognised as more than just a dental issue; it can serve as a potential indicator for systemic cardiovascular CV risk. Research shows that individuals with sleep bruxism have a significantly higher estimate of 10-year risk for CV disease as compared to those who do not grind their teeth. This study used a quantitative design to investigate whether patients with sleep bruxism (SB) also have CV risk, analyzing sleep patterns, psychological stress, and metabolic markers. Non-probability purposive sampling was used to generalise sample size and research understanding. Data were collected through a survey of 250 participants, evenly split by gender. A cross-sectional approach was applied to an online questionnaire with five open-ended questions via Google Forms (see appendix). An alpha of 1 indicates perfect internal consistency in the data; for example, responses on sleep bruxism and CV disease showed nearly identical patterns, implying no disagreement. Dentists are now advised to consider referring patients for CV screening. Among SB treatments, botulinum toxin injections may reduce SB severity and could reduce associated blood pressure surges.

**Keywords:** SB, CV, AI, nocturnal bruxism, sleep fragments, metabolic markers, stress, BEI.

## 1. Introduction

### 1.1 Background

The term nocturnal bruxism has been understood as the involuntary, rhythmic clenching or grinding of teeth during sleep and is correlated with anxiety, stress, or sleep disorders like apnea. It has been defined as masticatory muscle activity during sleep, rhythmic/phasic or non-rhythmic/tonic. This can lead to worn enamel, fractured teeth, jaw pain, and morning headaches, and may include common treatments such as custom mouth guards, stress reduction, and addressing underlying sleep issues. The symptoms of nocturnal bruxism include, for instance, loud grinding noises that can wake people, dental damage (e.g., flattened or chipped teeth), and pain (e.g., a sore jaw or facial pain). Further, it involves muscle tension or limited movement upon waking up. The factors for nocturnal bruxism include higher levels of stress, anxiety, or tension, sleep disorders such as snoring, lifestyle factors such as alcohol intake, caffeine, or tobacco. It can be due to medications or substances, for example, certain antidepressants, recreational drugs, and smoking (Mahri

Hatamova et al., 2026).

The disease of nocturnal bruxism, such as sleep grinding, has been increasingly recognised as more than just a dental disease serving as a potential indicator for systemic cardiovascular CV risk. The research indicates that individuals with bruxism have a significantly higher estimate of 10-year risk of CV disease than those who do not grind their teeth. Further, literature shows the link between bruxism severity and cardiovascular risk by using a tool named the QRISK3 algorithm for calculating global CV risk, which finds the following, for instance, that higher severity equals higher risk (1), an independent factor (2), and higher odds (3). The scores for bruxism severity correlate moderately with higher QRISK3 scores. Bruxism remains an independent factor of high CVD disease even though it has been adjusted for traditional risks such as age, BMI, smoking, and diabetes. Adults who have been diagnosed with bruxism are roughly twice as likely to be categorised as having higher CVD risks, for instance, if the QRISK3 score is greater than or equal to 10 percent (Martynowicz et al., 2024).

**Dipti Kanchan**

University of Saskatchewan, Canada.

Email: drdipti1710@gmail.com

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The global prevalence of sleep bruxism (SB) is estimated to be 21 percent in adults, with 8.6 percent of the general population reporting current severity. Prevalence is higher among children, ranging from 14 percent to over 40 percent. Severity trends are linked to light sleep phases and transitions. They are often associated with high emotional stress, anxiety, and lifestyle factors such as alcohol consumption, smoking, and excessive smartphone use. While prevalence may be higher in females, gender differences are inconsistent. Lifestyle is acknowledged as main cause. The SB–CV connection is driven by increased sympathetic activity during sleep, leading to heart rate variability and an inflammatory response with raised CRP/fibrinogen, oxidative stress, and endothelial remodelling. SB episodes are closely linked with surges in blood pressure and heart rate (SOARES et al., 2020).

The clinical context reflects a transition from perceiving SB solely as a dental disorder to recognising it as a marker of autonomic and systemic dysregulation, notably related to lifestyle-driven CVD risk. SB is associated with sympathetic nervous system activity, nighttime blood pressure surges, and chronic inflammation. Severe episodes, with a BEI greater than 4/h, link SB with atherosclerosis (João Vicente Rosar et al., 2021). SB is also associated with elevated serum markers of endothelial damage and atherosclerosis, such as Tenascin-C and thrombospondin-1. The frequency of SB episodes correlates with elevated inflammatory markers, like C-reactive protein and fibrinogen. A higher percentage of sleep bruxists have coexisting obstructive sleep apnea (OSA). Restorative bruxism episodes during OSA events contribute to sleep fragmentation and sympathetic surges (Justyna Kanclerska et al., 2022).

### **1.2 Research Aim and Problem**

This research aims to evaluate population-level associations among nocturnal bruxism, SB severity, and cardiovascular risk, mediated by lifestyle and metabolic factors, focusing on sleep fragmentation, stress, and metabolic markers. The research problem is the existence of several critical research gaps, including: under-recognised pathophysiology (1), Bidirectional complexity (2), a fragmented understanding of mediators (3), and the need for holistic data (4). Precise mechanisms linking rhythmic masticatory muscle activity (RMMA) to systemic CV damage remain poorly elucidated, particularly at the population level. SB is intertwined with a stressful lifestyle, such as bad habits like alcohol consumption. Still, the specific cumulative contribution of

psychosocial stress versus metabolic markers, such as lipid profile and glucose, on its severity is not clearly mapped. While some studies link bruxism to oxidative stress or systemic inflammation, population-level data are limited. Few studies have concurrently synthesized the importance of nocturnal muscle activity, metabolic markers such as fibrinogen, and lifestyle factors in a population, thereby improving understanding of whether bruxism is a risk indicator or a causal factor for CVD.

### **1.3 Research Significance**

The significance of research lies in bridging the gap between dental medicine and cardiovascular medicine. It highlights bruxism as a potential early indicator of systemic vascular dysfunction. This research provides notes on clinical screening and prevention (1), mechanism identification (2), interdisciplinary impact (3), and population-level insight. The identification of a strong association between SB and CV risk markers would enable dental professionals to screen for CV risks. This research will help clarify whether the dose-response relationship between SB (BEI) and CV markers (BP variability and oxidative stress) suggests a direct pathogenic link, reinforcing the need for autonomic cardiac monitoring. The findings can lead to a shift from a purely symptom-oriented management, such as occlusal splints, to a holistic approach addressing psychosocial stressors and sleep hygiene, which is critical to reduce the comorbid insomnia and bruxism. To examine the population-level data rather than small clinical samples. The research will provide stronger evidence for public health initiatives aimed at improving sleep quality and stress management as part of cardiovascular prevention strategies.

## **2. Theoretical Framework For Constructing a Hypothesis**

### **2.1. Pathophysiological Mechanism**

The pathophysiological mechanism involves the autonomic dysfunction (1) which means the increased sympathetic activity precedes or follows SB episodes, leading to heart rate variability (HRV) and micro arousals, sleep fragmentation (2) means recurrent micro arousals during SB disrupt sleep architecture, which is known as a cardiovascular risk factor, blood pressure (BP) surges (3) means sleep bruxism is independently linked to nocturnal BP fluctuations and a lack of physiological nocturnal BP dip and Atherogenic markers (4) that have been reported in recent literature which suggest the association between

severe SB and proteins involved in atherosclerosis, such as Tenascin-C and Thrombospondin-1 (Enrica Giammarinaro et al., 2018).

SB has been closely linked to sleep microarousal, characterized by transient ECG changes. The studies reveal that an increase in sympathetic activity precedes the bruxism event, resulting in a sudden rise in heart rate and autonomic activation, which is more likely to culminate in RMMA. It involves the central nervous system, as bruxism is centrally mediated, encompassing the reticular formation arousal system, neurotransmitter dysregulation (e.g., dopamine, serotonin, and noradrenaline), and changes in brain neurochemical functions (Osborne et al., 2020). The TCR trigeminal cardiac reflex is due to the severity of SB, which might stimulate the TCR, a neurocardiac reflex that causes significant autonomic cardiovascular changes. About 50 percent of patients are adults who experience obstructive sleep apnea (OSA) and have comorbid sleep bruxism. The bruxism episode index (BEI) is often higher in them and is associated with the apnea-hypopnea index (AHI). This indicates the intensity of teeth grinding, which may be a protective or defensive response to airway collapse (Bayar et al., 2025).

Thus,

H1: SB has been closely linked to sleep micro arousal, which is known as the transient ECG changes.

## **2.2. Psychosocial and Lifestyle Factors**

High stress levels and emotional disorders are strongly associated with increased SB frequency and severity. It has been understood as the major factor for the etiology and severity of nocturnal sleep bruxism, which acts as a key trigger for rhythmic masticatory muscle activity RMMA. Recent literature and research reveal that higher-stress individuals often exhibit higher bruxism episodes per hour (bruxism index). Moreover, SB is currently considered a potential independent risk factor for CVD triggered by the fight or flight response during sleep. The central mediator concludes that stress, along with personality traits such as higher neuroticism, can act through the CNS to increase masticatory muscle tonicity and the production of involuntary grinding or clenching during sleep (Michalek-Zrabkowska et al., 2020). This leads to chronic fatigue and pain, which in turn increases the stress levels that result in a self-reinforcing perpetual motion loop of stress and tooth grinding. It activates the hypothalamic-pituitary-adrenal axis, leading to elevated salivary cortisol, a stress marker in bruxers. Patients then

develop coping mechanisms, such as self-distraction and avoidance, rather than active problem-solving strategies. And it correlates with higher perceived stress levels and higher bruxism severity (Singh et al., 2015).

High-stress professions such as pilots, police, and officers show higher SB prevalence. The occupational factor, particularly higher job demand, acts as a significant catalyst for nocturnal bruxism (sleep bruxism) and exacerbates the lifestyle-driven CV risk. The higher job demand, responsibility, and anxiety are strongly correlated with bruxism and a perpetuating factor for parafunctional habits of clenching and grinding. The exposure to environmental factors such as occupational noise is a stressor that often leads to insomnia, anxiety, and triggers SB. Workers working in high-stress roles, such as those with heavy and tight deadlines, often report having nocturnal bruxism. The IT professionals show higher rates of bruxism than manual labourers, who exhibit higher tooth wear (Walczyńska-Dragon et al., 2025).

The factors such as tobacco use, high alcohol intake, and excessive coffee consumption exacerbate SB and CV risk. Increased sympathetic activity leads to most bruxism episodes and an increase in heart rate. It correlates positively with plasma C-reactive protein and fibrinogen levels that are independent predictors of SV risk and inflammation. Patients with larger BMI and smoking are said to carry a higher chance or probability of disease with an adjusted odds ratio of 2.3. The lifestyle factors, such as heavier alcohol usage, tobacco smoking, and caffeine consumption, not only increase SB severity but also independently accelerate cardiovascular dysfunction. The maladaptive behaviours, for example, chronic stress, which is often linked with higher-pressure work or not keeping up with projects, particularly lead to a lifestyle of high caffeine consumption, poor diet, and lack of exercise. This further increases the burden on the CV system (Michalek-Zrabkowska et al., 2021).

Thus,

H2: The factors such as tobacco use, high alcohol intake, and excessive coffee consumption exacerbate SB and CV risk

## **2.3. Metabolic and Inflammatory Markers**

There is a positive correlation between the bruxism episode index (BEI) and inflammatory markers, including C-reactive protein (CRP) and fibrinogen. Recent literature indicates certain inflammatory markers correlate with the bruxism episode index (BEI) (Sharairh et al.,

2025). This index measures the frequency of clenching and grinding. The key markers include the BEI, which is greater than 4 and positively correlated with elevated CRP levels, which are significantly higher in severe bruxers than in non-bruxers. Higher serum fibrinogen levels are found in individuals with higher bruxism. Severity in SB is associated with markers of lipid and protein peroxidation, which contribute to endovascular damage. The increased urinary 17-hydroxycorticosteroids in sleep bruxers suggest chronic sympathetic activation. Despite associations and correlations, some studies suggest these markers may not always follow a strict linear relationship with BEI, indicating a complex, multifactorial pathophysiology (Fulek et al., 2024).

These lead to vascular effects, which have been shown to involve repetitive clenching that triggers inflammatory cascades and oxidative processes, marked by higher TBARs and AOPP levels, and promotes atherosclerosis, arterial hypertension, and vascular injury. The clinical implications depict that interdisciplinary care and prevention interventions can help solve the problem. The expert in the field recommends integrating CV risk screening into dental practices for patients with SB. The intervention helps manage modifiable lifestyle factors; for example, improving sleep hygiene and reducing stress can decrease the inflammatory burden and associated CV risks. Poor sleep quality, defined as less than 6 hours, is strongly associated with both metabolic syndrome (MetS) and severe bruxism (Fulek et al., 2023).

Thus,

H3: Inflammatory markers correlate with bruxism episode index (BEI).

### 3. Methodology

#### 3.1 Research design

The research design for this study has been quantitative because the topic investigates whether patients with SB also have CV, and to diagnose their sleep patterns or fragmentation, psychological stress, and metabolic markers. The research requires population-level association with the disease. A short survey has been conducted to determine the prevalence and impact of the disease, as well as related factors. For this purpose, a short survey with 5 open-ended questions was conducted via Google Forms for 250 participants from the private sector. The participant was asked for consent but not for their personal details. This method ensures the collection of raw and fresh data, which is later analysed.

#### 3.2 Sampling

A non-probability purposive sampling technique has been employed in this research to ensure the generalisation of the sample size and the understanding of the research topic. It reduced the biases of the representative through simple random and cluster samples. This survey was built based on drafted hypotheses H1-H3 to be proved. The selected target audience was from the United States of America (USA). It was generally the participants who had sleep problems, grinding and work in heavier deadlines, who had a smoking pattern, consumed alcohol, and were BP patients. The factors focused on in the sample are ID, age, gender, and work status of the selected target audience to understand nocturnal bruxism's relation to CV and its causes, including sleep fragmentation, psychological stress, and metabolic markers.

#### 3.3 Data collection

The data collection method for this research has been a survey comprising 250 participants with an equal number of males and females. Cross-sectional studies using an online questionnaire with 5 open-ended questions via Google Forms were employed (see the appendix). This technique allows the researcher to collect numerical data. The participant was asked for consent but not for their personal details. This survey was built based on drafted hypotheses H1-H3 to be proved. The selected target audience was from the United States of America (USA). The survey was carried out to test the objectives and aims of this research: whether psychological stress, sleep fragmentation, clenching of teeth, or metabolic markers contribute to SB and CV, or are the consequence, and to understand their relationship. This research encompasses a population of 250 participants, ranging from teenagers to adults (18-65 years old), who were selected from the United States of America (USA). The survey was carried out using an effective method: Google Forms, to reach the target audience. The form comprised 5 open-ended questions, and the answers were recorded. This helped collect numerical, measurable data. The statements in the survey are concise and unbiased. This method of collection would ensure informed consent from participants. The sample size was calculated using a standard formula that assumes a 95 percent confidence level for participants and a 5 percent error margin.

$$n = (Z^2 \cdot p \cdot (1-p)) / e^2$$

Where:

(n) = required sample size

(Z) = Z-score for 95% confidence level (1.96)

(p) = estimated population proportion (use 0.5 if unknown)

(e) = margin of error (0.05)

### 3.4 Data analysis

The raw, fresh, or numerical data were analysed using statistical methods, such as descriptive statistics, reliability statistics, correlation, ANOVA, and regression analysis to test the constructed hypothesis, using SPSS software. Tables and bar graphs were used to enhance understanding of the research findings. The statistical tools employed help in understanding the research topic; for instance, a higher arousal index is associated with higher sleep fragmentation. It also statistically analysed key metabolic health markers, including blood glucose, HDL cholesterol, and blood pressure. Moreover, it helped explain that the stressful occupants had higher sleep bruxism and cardiovascular disease.

Furthermore, it helped in the dependence and independence of certain variables, the variables that are directly proportional to each other, and the average of numerical data. The findings were reported using tables and pie charts to better convey the meaning and results of the data. This

was done to interpret the quantitative research design. It also performed regression analysis to prove the constructed hypotheses H1-H3 and a theoretical framework.

## 4. Quantitative Results

### 4.1 Demographics

250 participants from the USA aged 18 to 65 years were recruited from the private sector, of whom 121 were male and 129 were female. The highest prevalence of sleep bruxism is observed in the 25-44 age range. The participants were from different occupations such as artists, cleaners, doctors, engineers, firefighters, high school students, journalists, nurses, part-time job, PHD, pilots, police, salespeople, surgeons, and writers. Healthcare professionals experience life-or-death scenarios, long hours, and emotional exhaustion. The professionals in emergency services operate under extreme danger and trauma. The professionals in the aviation industry face intense responsibility for safety, combined with fatigue and irregular or unpredictable hours. Whereas, less stressful occupations were writers, artists, part-time jobs, and high school. Tables 1, 2, 3 presents the demographics, including the numbers of males and females, their work status, and age.

Table 1 Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Females	129	51.6	51.6	51.6
	Males	121	48.4	48.4	100.0
	Total	250	100.0	100.0	

### 4.2 Descriptive statistics of mean variables

Descriptive statistics (Table 4) is used for summarising and simplifying larger datasets into interpretable and meaningful information (mean, median, mode). It provides the statistical description in such a manner that the total number of samples is 250. The minimum age of the sample size is 18, and the maximum age of the sample size is 65. Only two variables have been coded for gender description, such as female (1) and male (2). Five variables have been coded for work status from 1 to 5. Stress indicator SI has been coded with five variables, 1-5. AI is the arousal index that demonstrates the range of normal to severely elevated experienced individuals, ranging from less than 5 to greater than 50 (Later, this section was coded with four variables 1-4). Metabolic markers range from 0 to 3. For MM, the coded variables are

blood glucose (1), cholesterol (2), blood pressure (3), and none (0). For AI, the coded variable has been demonstrated by Table 5, such as < 5, Normal (1), 2-25, Mildly elevated (2), 26-50, Moderately elevated (3), and >50, Severely elevated (4). For stress indicators, participants were linked to their occupation and coded from 1 (lighter occupation, or less stressful) to 5 (Most stressful occupation).

### 4.3 Reliability statistics

To demonstrate the authenticity of the research, it is conducted in SPSS using Cronbach's Alpha. The coefficient alpha needs to be in the acceptable or optimal range from 0 to 1. Table 6 shows a Cronbach's alpha of 1, indicating high internal consistency reliability for the research scale. The value closer to 1 indicates higher reliability. An alpha equal to 1 signifies perfect internal consistency in the

*Table 2 Age*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18.00	8	3.2	3.2	3.2
	19.00	8	3.2	3.2	6.4
	20.00	16	6.4	6.4	12.8
	21.00	8	3.2	3.2	16.0
	22.00	8	3.2	3.2	19.2
	23.00	8	3.2	3.2	22.4
	24.00	8	3.2	3.2	25.6
	25.00	8	3.2	3.2	28.8
	26.00	8	3.2	3.2	32.0
	27.00	8	3.2	3.2	35.2
	28.00	8	3.2	3.2	38.4
	30.00	8	3.2	3.2	41.6
	32.00	8	3.2	3.2	44.8
	33.00	8	3.2	3.2	48.0
	35.00	8	3.2	3.2	51.2
	37.00	8	3.2	3.2	54.4
	38.00	8	3.2	3.2	57.6
	39.00	8	3.2	3.2	60.8
	40.00	7	2.8	2.8	63.6
	42.00	7	2.8	2.8	66.4
	44.00	7	2.8	2.8	69.2
	45.00	7	2.8	2.8	72.0
	48.00	7	2.8	2.8	74.8
	50.00	7	2.8	2.8	77.6
	52.00	7	2.8	2.8	80.4
	55.00	7	2.8	2.8	83.2
	59.00	7	2.8	2.8	86.0
60.00	7	2.8	2.8	88.8	
61.00	7	2.8	2.8	91.6	
62.00	7	2.8	2.8	94.4	
63.00	7	2.8	2.8	97.2	
65.00	7	2.8	2.8	100.0	
	Total	250	100.0	100.0	

collected data; the two items, for example, sleep bruxism and cardiovascular disease, show an almost identical pattern across participants in the study, indicating no disagreement. The Alpha calculation in SPSS is performed after standardising the items, for instance, putting them on the same scale (Table 7). As it is 1, the standardisation

made no difference, indicating that items are still perfectly consistent. N of items equals 2, which indicates that with only two items, Alpha is mathematically identical to the correlation between them; here, it implies a correlation of 1.0, as they move perfectly together. This proves that patients experiencing sleep bruxism are cardiovascular

*Table 3 Work status*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	artist	26	10.4	10.4	10.4
	cleaner	3	1.2	1.2	11.6
	doctor	16	6.4	6.4	18.0
	engineer	22	8.8	8.8	26.8
	firefighters	13	5.2	5.2	32.0
	high school	3	1.2	1.2	33.2
	journalists	22	8.8	8.8	42.0
	nurses	19	7.6	7.6	49.6
	part_time_job	18	7.2	7.2	56.8
	PHD	16	6.4	6.4	63.2
	pilot	24	9.6	9.6	72.8
	police	18	7.2	7.2	80.0
	salesperson	14	5.6	5.6	85.6
	surgeons	14	5.6	5.6	91.2
	writer	22	8.8	8.8	100.0
Total	250	100.0	100.0		

*Table 4 Descriptive Statistics*

	N	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Gender	250	1	2	1.48	.032	.501	.251
Age	250	18	65	37.43	.930	14.700	216.086
Work_status	250	1	5	3.26	.096	1.524	2.322
SI	250	1	5	3.52	.087	1.383	1.913
AI	250	3	52	32.78	1.136	17.956	322.435
MM	250	0	3	1.89	.057	.901	.812
Valid N (listwise)	250						

*Table 5 AI (Arousal index for sleep fragmentation)*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< 5, Normal	25	10.0	10.0	10.0
	2-25, Mildly elevated	59	23.6	23.6	33.6
	26-50, Moderately elevated	100	40.0	40.0	73.6
	>50, Severely elevated	66	26.4	26.4	100.0
	Total	250	100.0	100.0	

patients too. They need to have both screening and dental screening. On the other hand, this kind of Alpha is very rare in real data. It can provide limitations that can indicate

extremely similar or redundant items, for example, almost the same questions asked twice from participants, or data or coding issues such as duplicated item columns.

*Table 6 Reliability Statistics*

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
1.000	1.000	2

*Table 7 Scale Statistics*

Mean	Variance	Std. Deviation	N of Items
7.9280	2.228	1.49256	2

Nonetheless, the reliability statistics support the hypothesis and the direct relation between SB and CV in patients, including items that essentially measure the same underlying construct.

#### 4.4 Regression analysis for hypothesis

It is done to test a hypothesis formulated within a theoretical framework to determine whether the relationship between two variables, such as X independent and Y dependent, is statistically significant. For the first

hypothesis, H1, SB has been closely linked to sleep microarousals, which are transient ECG changes. This shows that sleep bruxism is directly related to sleep fragmentation, which is the interruption of sleep and leads to excessive daytime sleepiness and cognitive impairment. Table 8 and 9 presents the model summary and ANOVA results, respectively. A regression has been carried out to identify the correlation and assess the relevance of the data or deviations.

*Table 8 Model Summary*

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate
1	1.000a	1.000	1.000	.000

a. Predictors: (Constant), SB

*Table 9 ANOVA<sup>a</sup>*

Model	Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	138.676	1	138.676	.	. <sup>b</sup>
	Residual	.000	248	.000		
	Total	138.676	249			

a. Dependent Variable: AI  
b. Predictors: (Constant), SB

For the first hypothesis, H2, the factors such as tobacco use, high alcohol intake, and excessive coffee consumption exacerbate SB and CV risk. This shows that sleep bruxism is directly related to lifestyle factors such as tobacco use, high alcohol intake, and excessive coffee consumption. Tables 10 and 11 shows the model summary and ANOVA, respectively. A regression has been carried

out to identify the correlation and assess the relevance of the data or deviations.

For the first hypothesis (H3), inflammatory markers correlate with the bruxism episode index (BEI). The inflammatory markers are blood-based biomarkers that have been shown to positively correlate with levels of

*Table 10 Model Summary*

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate
1	1.000a	1.000	1.000	.000

a. Predictors: (Constant), Alcohol\_intake

*Table 11 ANOVA<sup>a</sup>*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	138.676	1	138.676	.	. <sup>b</sup>
	Residual	.000	248	.000		
	Total	138.676	249			
a. Dependent Variable: SB_CV						
b. Predictors: (Constant), Alcohol_intake						

CRP, fibrinogen, and 17-hydroxycorticosteroids (a stress marker). Tables 12 and 13 shows the model summary and ANOVA, respectively. A regression has been carried out to identify the correlation and assess the relevance of the data

or deviations. The relationship between these two in some research has yielded mixed results, with some indicating a positive association while others find no linear correlation with BEI.

*Table 12 Model Summary*

Model	R	R Square	Adjusted R-Square	Std. Error of the Estimate
1	1.000a	1.000	1.000	.000
a. Predictors: (Constant), BEI				

*Table 13 ANOVA<sup>a</sup>*

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	138.676	1	138.676	.	. <sup>b</sup>
	Residual	.000	248	.000		
	Total	138.676	249			
a. Dependent Variable: Inflammatory_markers						
b. Predictors: (Constant), BEI						

#### 4.5 Correlations

Statistical method for assessing the strength and direction of the relationship between two continuous variables. The evaluation is done by the Pearson Correlation coefficient  $\gamma$ . Tables 14 and 15 shows the perfect correlation as SB increased, the CV increases in a perfectly linear manner, and vice versa, as depicted

by Pearson Correlation. The significance (Sig (2 tailed) = 0.000) shows the following, such as  $p=.000$ , which is usually written as  $p<.001$ , which means this correlation is statistically significant. This also tells that the perfect correlation has happened by chance, which is less than 1 percent. N tells the 150 participants for each variable, which is a strong sample size for this research.

*Table 14 Correlations*

		SB	CV
SB	Pearson Correlation	1	1.000**
	Sig. (2-tailed)		.000
	N	250	250
CV	Pearson Correlation	1.000**	1
	Sig. (2-tailed)	.000	
	N	250	250
**. Correlation is significant at the 0.01 level (2-tailed).			

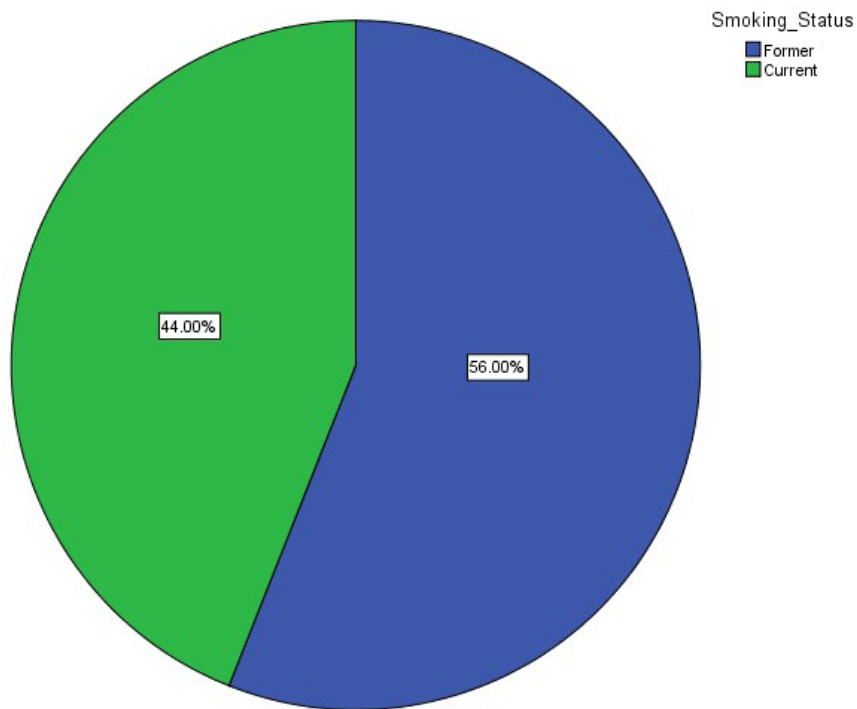
*Table 15 Correlations*

			SB	CV
Spearman's rho	SB	Correlation Coefficient	1.000	1.000**
		Sig. (2-tailed)	.	.
		N	250	250
	CV	Correlation Coefficient	1.000**	1.000
		Sig. (2-tailed)	.	.
		N	250	250
**. Correlation is significant at the 0.01 level (2-tailed).				

**4.6 Survey results**

Figure 1-5 demonstrate pie chart illustrations to depict the results collected from a survey or questionnaire (see the appendix). Figure 1 shows the result for section 1 (see the appendix), the percentage of participants who were current and former smokers, including males and females.

It tells the close relation between Nocturnal Bruxism and Cardio-Metabolic Risk. As per the research conducted, including the survey, people who were smokers were diagnosed with Nocturnal Bruxism and Cardio-Metabolic Risk (HY, 2020). The majority of the smokers have quit smoking, while the rest have started smoking.



*Figure 1*

Figure 2 shows the results for section 2 (see the appendix), which shows the percentage of participants who experience jaw pain and soreness after waking up in the morning. The majority of the participants experience jaw and soreness for less than a week, while the rest experience jaw pain and soreness almost daily. The results were recorded for the past six months. According to research, patients with SB and CV experience higher frequencies of

jaw pain and soreness (Al-Jewair et al., 2024).

Figure 3 shows the results for section 3 (see the appendix), which shows the percentage of participants with their hours of sleep. The ratio tells or depicts the sleep fragmentation, and that participants had not slept peacefully. The majority of the participants sleep for 3 hours, while the least number of participants sleep for

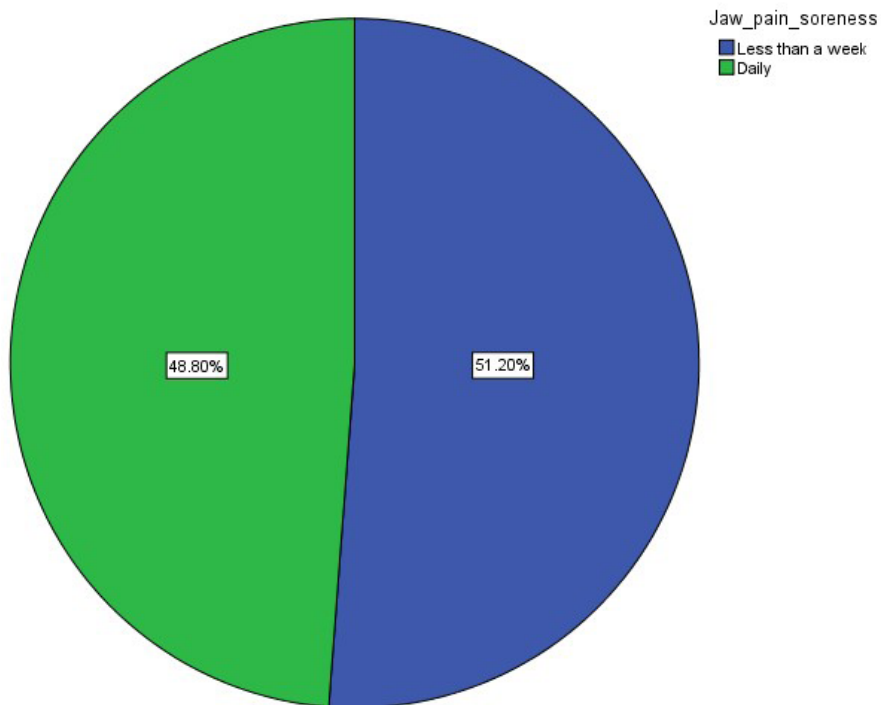


Figure 2

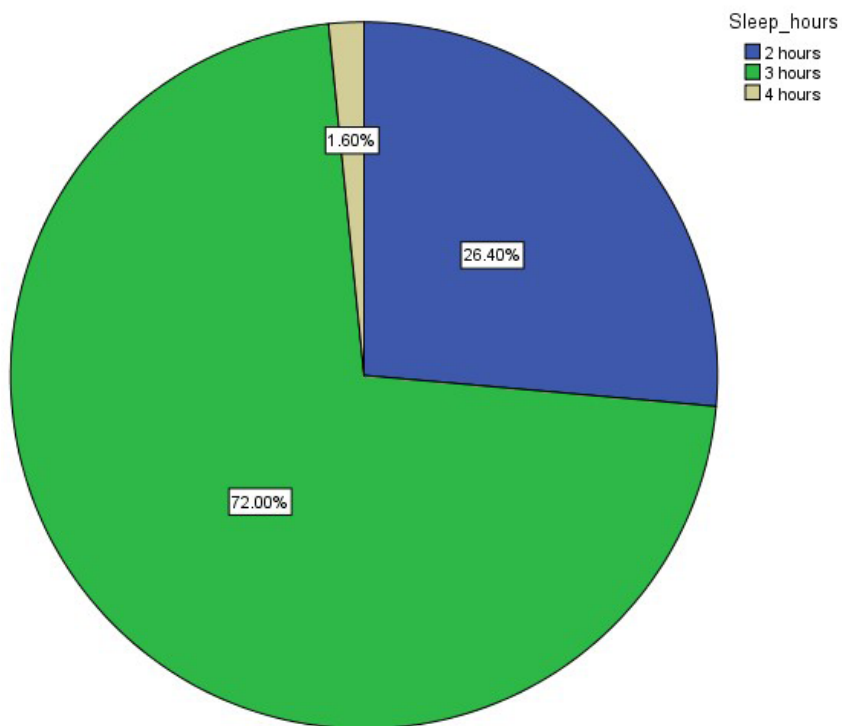


Figure 3

4 hours. The episodes of sleep are the non-restorative episodes of sleep, causing fatigue and increased risk of cardiovascular and metabolic issues.

Figure 4 shows the results for section 4 (see the appendix), which shows the percentage of participants who experienced psychological stress. The majority of

participants experience this stress very often, while the rest experience slightly lower stress, naming it “often.”

The results are based on the past 10 months.

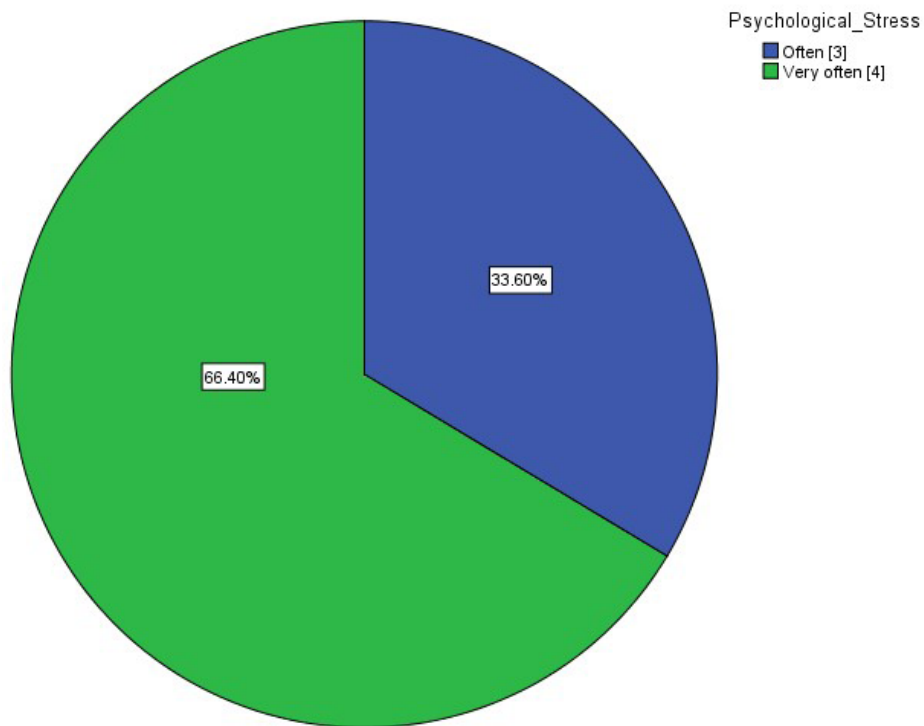


Figure 4

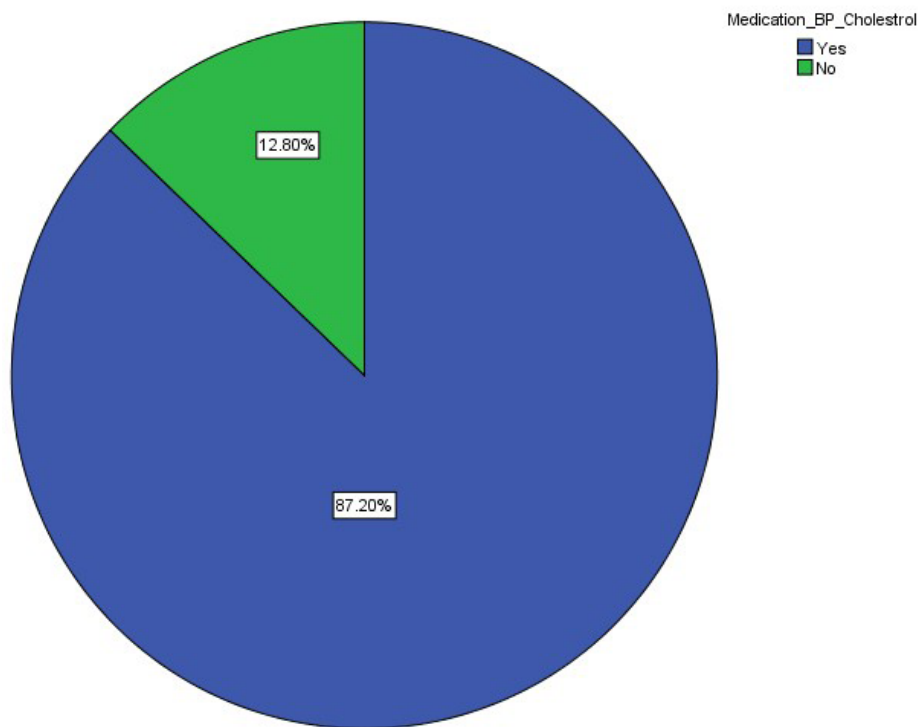


Figure 5

Figure 5 shows the results for section 5 (see the appendix), the percentage of participants who take medication for blood pressure and cholesterol. These results are self-reported by the individuals. The majority said that they had to take the medications regularly. Only 12.8 percent of participants were not taking medicine.

## 5. Discussion

Based on the research and questionnaire findings, all the hypotheses are positively correlated with one another and with other variables. Stressful professions, metabolic markers, and arousal index have been higher for people experiencing sleep bruxism and cardiovascular disease (Fulek et al., 2025). Due to their tight deadlines, they experience psychological stress and burden, and sleep fragmentation. The recent and current consensus suggests that sleep bruxism, especially with a higher index, is linked positively with stress-related hormonal disturbances and sometimes increased inflammatory markers. This would contribute to a higher cardiovascular CV disease risk in individuals, likely due to stress and sympathetic nervous system activity. The studies have also shown that oxidative stress is linked to BEI (Korkosz-Wróbel et al., 2025). The clinical reverence for sleep fragmentation suggests that higher AI indicates fragmented, non-restorative sleep. These values also reflect poor sleep quality, increased daytime sleepiness, and fatigue. The type of arousals experienced by patients involves brief waking events that can be caused by respiratory events, limb movements, and spontaneous causes (Sobhan Salari Shahrabaki et al., 2021). The management of metabolic markers involves reducing intake of ultra-processed foods, engaging in regular physical activity, managing stress, and maintaining healthy sleep patterns (MedlinePlus, 2023).

## 6. Research Strengths and Limitations

The research strengths are as follows: the use of quantitative methodology, which helps collect fresh data compared to other methods that provide older data. This helped ensure the idea's visibility and the originality of the work done. To strengthen it, several authentic statistical analyses were conducted to ensure the reliability and measurement of data relevant to the research topic. Strengths include the SPSS method, demonstrating reliability and a larger sample size, which yields more reliable results.

However, the limitations include time constraints in understanding the topic and collecting data, and a lack

of skills in using SPSS, a statistical software tool. The research has been lengthy, and it took time to learn SPSS. The authors are still looking for a positive correlation coefficient. The interpretation of data and different tests required strong mathematical skills and knowledge, which the authors lacked.

## 7. Conclusion

The integration of cardiovascular risk tools, such as QRISK3, into dental practice for patients with severe bruxism. The emerging clinical perspective provides three directions: (1) dental cardiology link, (2) therapeutic overlap, and (3) multidisciplinary management. The dental field has now been identifying severe tooth wear, enamel wear, or attrition, as it has been hearing reports of SB severity, morning jaw, and headaches. The field of dentistry is now advised to consider referring patients for CV screening. Few treatments for SB encompass botulinum toxin injections that might have the dual benefit of reducing SB severity and potentially attenuating associated BP surges. Moving beyond mouth guards to address underlying sleep fragmentation and stress through multidisciplinary management is important for this research. The optimal management of this disease requires a team approach that includes dentistry, cardiology, and sleep medicine, focusing on reducing systemic inflammation and sympathetic tone rather than just protecting teeth. The research gap is addressed, as longitudinal studies are needed to establish a direct causal link between SB severity and subsequent cardiovascular events.

## 8. List of abbreviations

Cardiovascular (CV)  
Q Research Cardiovascular Risk Algorithm version 3 (QRISK3)  
Body mass index (BMI)  
Cardiovascular disease (CVD)  
Sleep bruxism (SB)  
Bruxism episode index (BEI)  
Tenascin-c (TNC)  
Thrombospondin-1 (TSP-1)  
C-reactive protein (CRP)  
Obstructive sleep apnea (OSA)  
Rhythmic masticatory muscle activity (RMMA)  
Heart rate variability (HRV)  
Electrocardiogram (ECG)  
Trigeminal cardiac reflex (TCR)  
Thiobarbituric Acid Reactive Substances (TBARS)

Advanced Oxidation Protein Products (AOPP)  
Metabolic syndrome (METS)  
Arousal Index (AI)

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**Consent for Publication:** The consent for publication was given by all authors, and none had any objections to doing so after they completed and revised the manuscript. The personal details of participants were not sought; hence, they were not included in consent for publication.

**Availability of data and materials:** Data was available online, and participants were taken from different private sectors. The answers were recorded on a questionnaire. The materials were provided by the authors, such as a desk, PC, writing note pad, and internet.

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