

Self-Reported Bruxism and Symptoms of Temporomandibular Disorders in Finnish University Students

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Aims: To evaluate the prevalence of self-reported bruxism and symptoms of temporomandibular disorders (TMD) and to investigate their association in academic and applied science university students in Finland. **Methods:** The data were gathered from 4,403 Finnish students included in the Finnish Student Health Survey 2012. The comprehensive questionnaire included five questions concerning bruxism and TMD symptoms. Bivariate associations between self-reported bruxism and TMD symptoms were evaluated using chi-square tests, and logistic regression model was used with age and gender as factors. **Results:** Sleep bruxism was reported by 21.0% of women and by 12.5% of men, awake bruxism by 2.0% of women and by 2.8% of men, and both sleep and awake bruxism by 7.2% of women and by 3.2% of men. TMD pain was reported by 25.9% of women and by 11.4% of men and temporomandibular joint (TMJ) pain on jaw movement by 9.6% of women and by 4.2% of men. Report of sleep bruxism increased the risk for all TMD symptoms in both genders. Among women, report of awake bruxism increased the risk for TMD pain and TMJ pain on jaw movement. Reporting stress as a perpetuating factor for TMD pain increased the risk for both sleep and awake bruxism in both genders. The logistic regression analysis (including age and gender) showed that report of sleep bruxism and/or awake bruxism was associated with TMD pain (Odds Ratio [OR] = 5.71; 95% confidence interval [CI] = 4.86–6.70), TMJ pain on jaw movement (OR = 4.49; 95% CI = 3.54–5.69), and TMJ locking (OR = 2.98; 95% CI = 2.17–4.10). **Conclusion:** Bruxism and TMD symptoms are frequent in Finnish university students. Self-reported bruxism is associated with TMD symptoms, confirming earlier findings. *J Oral Facial Pain Headache 2016;30:311–317. doi: 10.11607/ofph.1674*

Keywords: *bruxism, temporomandibular disorders, TMD, TMD pain, university students*

Temporomandibular disorders (TMD) are classified as musculoskeletal conditions that involve clinical problems in the masticatory muscles, the temporomandibular joints (TMJs), and associated anatomical tissues.¹ Common TMD signs and symptoms include facial pain, clicking or crepitation of the TMJ, limited jaw opening, and deviation in movements of the mandible.²

Bruxism is defined as repetitive jaw muscle activity, characterized as teeth clenching or grinding and/or bracing or thrusting of the mandible. It can be divided into two categories based on its circadian manifestation: occurring during sleep as sleep bruxism or during wakefulness as awake bruxism.³ The prevalence of sleep bruxism varies from 8% to 14% and the prevalence of awake bruxism from 20% to 31% in adult populations.^{4,5} Sleep bruxism has been reported to appear with equal frequency among females and males^{6,7} and to decline with increasing age.⁷ Accurate estimation of bruxism prevalence is complicated mainly because of the variety of diagnostic strategies used and populations investigated.^{8,9}

TMD signs and symptoms are frequent in the population. In the nationally representative Finnish Health 2000 study, the prevalence of having at least one TMD sign was 38% in the adult population, with

signs being more common among women than men.¹⁰ Epidemiologic studies have shown that TMD signs and symptoms are most prevalent among 20- to 40-year-olds.¹¹ In university students, the prevalence of TMD symptoms has been reported to vary from 26% to 69%,¹²⁻¹⁵ with levels being higher among women than men.¹² Moreover, an increase in frequent musculoskeletal pain symptoms has been reported during the period from 2000–2012 in Finnish university students.¹⁶

Several studies have found an association, albeit varied, between bruxism and TMD.⁸ Self-reported bruxism has been reported to be associated with the presence of TMD (especially among women and young adults^{9,17}) and with myofascial pain.¹⁸ However, additional investigations are needed to clarify this relationship.

The aim of this study was to evaluate the prevalence of self-reported bruxism and symptoms of TMD and to investigate their association in academic and applied science university students in Finland.

Materials and Methods

The data were derived from a nationally representative postal questionnaire survey, Finnish Student Health Survey 2012, performed by the Finnish Student Health Service (FSHS). More detailed information about the sampling procedures in English is presented elsewhere.¹⁹

The study plan was approved by the Medical Ethics Committee of the Hospital District of Southwest Finland. Permission for the study was given by the authorities of Finnish Student Health Service (FSHS).

Subjects

The target population in 2011 consisted of 144,441 university (academic) and 131,838 university of applied science (applied science) students in Finland. Of these students, 9,998 (3.6%) were randomly selected and 9,992 were finally reached. The randomization was performed respective to the study location, and age group and gender were observed when the representativeness was evaluated. The response rate by the type of school was 48.5% in the academic students and 39.6% in the applied science students, and was 34.9% in men and 52.1% in women. Female university students under 25 years of age presented the best response rate (60.1%) while the response rate of male applied science students of the same age group (19 to 25 years) was 29.0%. The age range of the respondents was 19 to 35 years; the mean and standard deviation (SD) age in the men was 24.9 ± 3.6 years and in the women was 24.2

± 3.6 years. The mean \pm SD ages were 24.9 ± 3.7 and 23.9 ± 3.5 years for the academic and applied science students, respectively.¹⁹

Questionnaire

The postal questionnaire in Finnish included 168 comprehensive questions on health, health-related behavior, needs and habits for using health services, study ability, and social relationships. Alternatively, the questionnaire could be completed online. Five reminders were sent to the nonrespondents. Altogether, 4,403 students returned their answers between February and September 2012.¹⁹

The questionnaire included five questions on TMD symptoms and bruxism. The following two questions, which have been shown to be valid for screening TMD pain,²⁰ were used:

1. TMD pain: Do you experience pain in the temples, TMJ, face, or jaw once a week or more often? (no; yes, occasionally; yes, all the time)
2. TMJ pain on jaw movement: Do you experience pain once a week or more often while opening your mouth wide open or during chewing? (never or seldom; yes).

The questionnaire also included the following three questions concerning jaw locking, bruxism, and factors provoking TMD/facial pain, which have been used in other studies.²¹ The questions and reply options were:

1. TMJ locking: Does your jaw lock once a week or more often? (no; yes)
2. Sleep bruxism/awake bruxism: Do you grind or clench your teeth tight together? (no; only when sleeping; only awake; both asleep and awake)
3. Some factors may provoke your facial pain. Which factors provoke your facial pain? (I haven't noticed any provoking factors; cold; chewing; stress; something else [what?])

Statistical Analyses

The prevalence of sleep bruxism and awake bruxism as well as TMD symptoms were described as numbers and percentages and stratified by gender. The answers to the questions on TMD pain were dichotomized as yes (occasionally/all the time) or no. Bivariate associations between TMD symptoms and bruxism (sleep bruxism, awake bruxism, and both sleep and awake bruxism) were evaluated using chi-square tests and Pearson's correlation coefficients, as described by odds ratio (OR) with 95% confidence interval (CI). The difference was considered statistically significant at $P < .05$. Finally, the associations between self-reported bruxism (dichotomized

Table 1 Prevalence of Self-Reported Bruxism and TMD Symptoms in 4,403 Finnish University Students of Academic and Applied Science Universities

	Men		Women		Academic		Applied science		Total	
	n	%	n	%	n	%	n	%	n	%
Self-reported bruxism										
Sleep bruxism	204	12.5	582	21.0	456	18.8	330	16.7	786	17.9
Awake bruxism	45	2.8	55	2.0	45	1.9	55	2.8	100	2.3
Both sleep and awake	52	3.2	200	7.2	144	5.9	108	5.5	252	5.7
TMD pain										
Occasionally	169	10.5	609	22.1	434	18.0	344	17.6	778	17.8
All the time	15	0.9	105	3.8	67	2.8	53	2.7	120	2.7
TMJ pain on jaw movement	66	4.2	256	9.6	171	7.3	151	7.9	322	7.6
TMJ locking	40	2.5	123	4.5	90	3.8	73	3.8	163	3.8

as yes or no) and TMD symptoms were evaluated using logistic regression model including age and gender as factors. The statistical analysis was performed by IBM SPSS Statistics 21 for Windows.

Results

The prevalence of self-reported bruxism and TMD symptoms stratified by gender and by type of school is presented in Table 1. Sleep bruxism was reported by 17.9% of the respondents (18.8% of the academic students, 16.7% of the applied science students, $P = .068$), while awake bruxism was reported by 2.3% of the respondents (1.9% of the academic students and 2.8% of the applied science students, $P = .040$). The prevalence of combined bruxism (reporting both sleep and awake bruxism) was 7.2% in women and 3.2% in men ($P = .000$; OR = 2.35; 95% CI = 1.72–3.21). Sleep bruxism was reported by 21.0% of the women and 12.5% of the men ($P = .000$; OR = 1.86; 95% CI = 1.56–2.20), while awake bruxism was reported by 2.0% of the women and by 2.8% of the men ($P = .093$; OR = 0.71; 95% CI = 0.48–1.06).

The prevalence of self-reported TMD symptoms varied from 3.8% (TMD locking) to 20.6% (jaw, facial, temple, or jaw pain). TMD pain (pain in the temples, TMJs, face, or jaw once a week or more often) was reported by 25.9% of the women and by 11.4% of the men ($P = .000$; OR = 2.70; 95% CI = 2.27–3.22). Occasional TMD pain was reported by 17.8% and continuous TMD pain by 2.7% of the subjects. TMJ pain on jaw movement was reported by 9.6% of the women and by 4.2% of the men ($P = .000$; OR = 2.40; 95% CI = 1.81–3.17). TMJ locking once a week or more often was reported by 3.8% of the subjects (4.5% of the women, 2.5% of the men; $P = .001$; OR = 1.84; 95% CI = 1.28–2.64). In the case of the factors provoking TMD pain, 1.5% of the subjects (2.1% of the women, 0.7% of the men) re-

ported cold, 5.8% (7.5% of the women, 2.9% of the men) biting, 8.2% (10.6% of the women, 4.0% of the men) stress, and 3.0% (3.9% of the women, 1.5% of the men) other factors. Of those reporting stress as a provoking factor, 81.9% ($n = 295$) were women and 18.1% ($n = 65$) were men. Reporting stress as a perpetuating factor for TMD pain increased the risk for report of sleep bruxism (OR = 3.4; 95% CI = 2.8–4.0), awake bruxism (OR = 1.7; 95% CI = 1.1–2.6), and both sleep and awake bruxism (OR = 4.4; 95% CI = 3.3–6.0).

According to the bivariate analysis, self-report of sleep bruxism was associated with all TMD symptoms in both genders (Tables 2a and 2b). Among women, self-report of awake bruxism was associated with TMD pain (OR = 4.96; 95% CI = 2.86–8.59) and with TMJ pain on jaw movement (OR = 4.80; 95% CI = 2.40–9.60) (Table 2b). In the students who reported both sleep and awake bruxism, up to a 15-fold increased risk for TMD symptoms was noted. Furthermore, the sleep bruxers reported significantly more TMJ locking and TMD pain both at jaw rest and during jaw movement as compared to nonbruxers or awake bruxers. The logistic analysis showed that bruxism (sleep and/or awake) and gender were significantly associated with all TMD symptoms (Table 3).

Discussion

The present study showed that sleep bruxism was reported by almost one-fifth of the Finnish university students while the prevalence of self-reported awake bruxism was much lower. Women showed almost a two-fold risk for reporting sleep bruxism than men. Furthermore, almost one-fourth of the female students reported TMD pain occurring at least once a week and the women reported TMD symptoms two times more often than the men did. Report of sleep bruxism increased the risk for all TMD symptoms in

Table 2a Association of Self-Reported Bruxism, Age, and Study Sectors with Symptoms of Temporomandibular Disorders in 1,628 Finnish Male University Students, as Described by Odds Ratio (OR) and 95% Confidence Interval (CI)

	TMD pain					TMJ pain on movement					TMJ locking				
	n	%	P	OR	95% CI	n	%	P	OR	95% CI	n	%	P	OR	95% CI
Sleep bruxism															
Yes	52	25.6	.000	4.20	2.89–6.12	19	9.8	.000	3.64	2.05–6.46	11	5.5	.000	3.36	1.61–7.05
No	132	9.4				47	3.4				29	2.1			
Awake bruxism															
Yes	5	11.1	.000	1.53	0.59–3.95	0	0.0	.000	–	–	1	2.2	.000	1.31	0.17–9.96
No	179	11.5				66	4.3				39	2.5			
Both sleep and awake bruxism															
Yes	28	53.8	.000	14.24	7.95–25.49	10	19.6	.000	8.17	3.80–17.55	6	11.5	.000	7.54	2.92–19.47
No	156	10.0				56	3.7				34	2.2			
Age (y)															
18–25	101	10.0	.013	1.48	1.08–2.01	39	3.9	.476	1.20	0.73–1.98	24	2.4	.627	1.17	0.62–2.23
26–35	83	14.0				27	4.7				16	2.8			
Type of school															
Academic	108	11.9	.547	0.91	0.67–1.24	35	4.0	.626	1.13	0.69–1.85	28	3.1	.072	0.54	0.27–1.07
Applied science	76	10.9				31	4.5				12	1.7			

Table 2b Association of Self-Reported Bruxism, Age, and Study Sectors with Symptoms of Temporomandibular Disorders in 2,775 Finnish Female University Students, as Described by Odds Ratio (OR) and 95% Confidence Intervals (CI)

	TMD pain					TMJ pain on movement					TMJ locking				
	n	%	P	OR	95% CI	n	%	P	OR	95% CI	n	%	P	OR	95% CI
Sleep bruxism															
Yes	259	44.7	.000	4.64	3.78–5.70	94	16.5	.000	3.79	2.80–5.14	37	6.4	.000	2.20	1.44–3.36
No	455	20.9				162	7.7				86	4.0			
Awake bruxism															
Yes	25	46.3	.000	4.96	2.86–8.59	11	20.0	.000	4.80	2.40–9.60	4	7.3	.000	2.52	0.88–7.21
No	689	25.5				245	9.3				119	4.5			
Both sleep and awake bruxism															
Yes	145	72.5	.000	15.16	10.85–21.19	59	30.1	.000	8.27	5.71–11.98	25	12.6	.000	4.61	2.81–7.57
No	569	22.2				197	7.9				98	3.9			
Age (y)															
18–25	476	24.8	.039	1.21	1.01–1.46	163	8.7	.028	1.35	1.03–1.77	85	4.5	.848	1.04	0.70–1.54
26–35	238	28.5				93	11.4				38	4.6			
Type of school															
Academic	393	26.3	.618	0.96	0.81–1.14	136	9.4	.712	1.05	0.81–1.36	62	4.2	.381	1.18	0.82–1.69
Applied science	321	25.4				120	9.8				61	4.9			

Table 3 Factors Associated with TMD Symptoms Using Logistic Regression Analysis in 4,403 Finnish University Students, as Described by Odds Ratio (OR) and 95% Confidence Intervals (CI)

	TMD pain OR (95% CI)	TMJ pain on movement OR (95% CI)	TMJ locking OR (95% CI)
Self-reported bruxism			
Yes	5.71 (4.86–6.70)	4.49 (3.54–5.69)	2.98 (2.17–4.10)
No (Ref)			
Gender			
Women	2.37 (1.97–2.85)	1.99 (1.49–2.64)	1.58 (1.09–2.28)
Men (Ref)			
Age (y)			
26–35	1.14 (0.97–1.35)	1.18 (0.93–1.51)	0.99 (0.71–1.37)
18–25 (Ref)			

Report of sleep and/or awake bruxism was assessed using a questionnaire.

both genders while the association between awake bruxism and pain-related TMD symptoms was noted only among the women.

The results of the present study are supported by several earlier findings from student samples. A study by Mizutani et al²² from 2,101 students showed similar prevalence of both sleep bruxism and awake bruxism, both of which were also based on self-report measures. In the present study, women acknowledged bruxism more often than men did, which is also in accordance with previous studies.^{12,13,23} However, the present findings showed a discrepancy with a recent systematic review of the literature that did not find any gender differences in bruxism.⁴ This discrepancy may be explained by the sample of the present study, which did not represent the general population.

These levels correspond well with the findings from two earlier Finnish population-based studies, the Finnish Health 2000¹⁰ and the Northern Finland 1966 Birth Cohort studies,²¹ in which TMD signs and symptoms were reported. However, other studies on university students have noted a considerably higher prevalence of TMD symptoms, in the range of 50% to 68%.¹²⁻¹⁵ The differences between the studies may be explained by variations in the questionnaires used. In the present study, the questions assessing pain-related TMD symptoms concerned the symptoms occurring once a week or more often, whereas the studies mentioned above from university students used Fonseca's questionnaire with 10 questions indicating the current occurrence of pain or parafunctional activity. Studies based on both a questionnaire and a clinical examination have reported results congruent with the present findings.²³

The gender differences in the prevalence of TMD symptoms were also significant (in a ratio of 2:1) in the present study. Corresponding gender differences have also been shown with regard to clinical TMD findings in the Finnish Health 2000 Study¹⁰ and in a Polish study of university students.¹²

The present study showed that self-reported bruxism is significantly associated with pain-related TMD symptoms in particular, which is in accordance with findings from other studies.^{8,24-26} In a study by Fernandes et al,²⁴ TMD was assessed clinically using the Research Diagnostic Criteria for TMD (RDC/TMD).²⁵ The study found an association between self-reported sleep bruxism and pain-related TMD, although no causal relationship could be shown.^{24,26} Furthermore, Velly et al²⁷ reported a strong association between clenching and grinding and TMD symptoms. It should be noted that in the present study a questionnaire was used to assess bruxism and in studies using polysomnographic measurements, no relationship between pain and bruxism has been established.^{28,29} A recent study that used both objective polysomno-

graphic recordings of sleep bruxism and self-report measures in the assessment of bruxism showed no difference in sleep bruxism activity between patients with TMD and non-TMD controls, but the TMD patients reported more bruxism than controls.¹⁸ Consequently, the self-report of bruxism may overestimate the condition, which is also why the results of the present study may be regarded only as indicative.

University students are at high risk for stress, possibly due to their age and life situation.³⁰ Studies have shown that stress as a psychosocial factor is associated with muscular pain and bruxism.^{12,31} In the present study, stress as a provoking factor for TMD pain was reported by 8.2% of the study population, more than twice as much by the women as by the men. Additionally, reporting stress as a perpetuating factor for TMD pain increased the risk for report of any form of bruxism. These findings give some indication of the role stress plays in the background of bruxism and TMD. However, further studies are needed to evaluate the role of psychosocial factors in TMD symptoms and bruxism in the present study population.

In the present study, the sleep bruxers reported significantly more TMJ locking and TMD pain both at jaw rest and during jaw movement as compared to nonbruxers or awake bruxers. This finding emphasizes the difference between the two forms of bruxism and thus the importance of differentiating sleep bruxism and awake bruxism. In those students who reported both sleep and awake bruxism, up to a 15-fold increased risk for TMD symptoms was noted. Similarly, Blanco Aguilera et al⁹ found a positive association between sleep bruxism and painful TMD in women 18 to 60 years of age. Furthermore, a Japanese study observed in a student sample that TMJ clicking was closely related to severe sleep bruxism as assessed by polysomnography.³² One explanation for the association between bruxism and TMD symptoms may be the increased awareness of the symptoms, which may lead to increased sensitivity to report them. Furthermore, studies have shown that more quantitative and specific diagnostic studies are needed to clarify the relationship between sleep and awake bruxism and TMD symptoms.⁸

The main strength of the present study is the large sample size. Except for the low male response rate, the respondents were well representative of the target population (students). A limitation of the study was that the assessment of bruxism was based on self-report, a method that has been criticized as it may lead only to possible diagnosis of bruxism³ or overestimation of bruxism.³³ On the other hand, the advantage of a questionnaire is that it can be easily used for large samples, which may not be possible with polysomnography. Additionally, due to the fluctuating nature

of bruxism, the sole use of polysomnography for the diagnosis of bruxism may be problematic. In a population study using both a questionnaire and polysomnography, some subjects who did not acknowledge bruxism were identified as bruxers by polysomnography and many who reported bruxism were classified as nonbruxers by polysomnography.³⁴ Another limitation was that questions 3 to 5 of the questionnaire lack validation, although the questions have been previously used in national studies in Finland.²¹

Using the term TMD pain to describe both muscular and joint pain without separation of the individual components was also a limitation of the study. Another weakness of the present study was the relatively low response rate, especially among male applied science students (29.0%). Female academic university students presented the best response rate (60.1%). It should also be noted that the student population here was not generalizable to the general population.

Conclusions

The present study indicates that both self-reported bruxism and TMD symptoms are relatively frequent in Finnish university students. Self-reported bruxism was associated with TMD symptoms, which confirms earlier findings of bruxism's role in the background of TMD. The dental health care system should effectively cover students as a special group having health problems possibly related to their stressful life situation. Due to the high prevalence of TMD symptoms, dental care that includes examination and treatment of TMD with a low threshold for diagnosis should be offered for this target population.

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