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ORIGINAL ARTICLE

Incidence and prevalence of myofascial pain in the jaw–face region. A one-year prospective study on dental students

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Abstract

Objective. The aims of this study were to examine the 1-year period prevalence, incidence, and course of myofascial pain in the jaw–face region, and to analyze whether female gender, dental occlusion, and oral parafunctions have any influence on these signs and symptoms. ***Material and methods.*** The study population comprised 308 dental students examined at the start of their dentistry course and re-examined after 1 year. Case histories were collected using a questionnaire. The clinical examination included palpation sites of muscles, a submaximal clenching test, measurements of maximal mandibular mobility, and classification of morphological and functional dental occlusion. ***Results.*** The 1-year period prevalence of frequent myofascial symptoms was 19%. The incidence of myofascial pain, according to the Research Diagnostic Criteria for TemporoMandibular Disorders (RDC/TMD), was 4%. The female students presented an almost 4-fold incidence rate of myofascial symptoms compared to the male students. Non-symptomatic subjects were found among those without awareness of braxism and with simultanious bilateral contact in the retruded contact position (RCP), and among those with a stable intercuspal position (ICP). Variations in morphological occlusion did not show any relation to myofascial symptoms, nor did contact patterns in eccentric positions. ***Conclusions.*** Female dental students were more prone to developing frequent myofascial pain and to perceiving local muscle soreness than were male students during a 1-year period. Both self-reported bruxism and registered mandibular instability in ICP showed association with the 1-year period prevalence of myofascial signs and symptoms in the jaw–face region.

Key Words: *Dental occlusion, longitudinal study, masticatory, risk factors, temporomandibular disorders*

Introduction

Myofascial pain was originally defined as symptoms caused by painful areas within the muscles [1]. These trigger areas were sensed as hypersensitive regions from which impulses aroused and bombarded the central nervous system to produce referred pain [2]. This perspective has since formed a foundation for management of muscle pain and dysfunction. Recent pain research has indicated sensitization of higher-order neurons in the nociceptive pathways as a possible pathophysiological mechanism involved in pain in the jaw–face region [3,4]. Hence, a pain response elicited during muscle palpation may be a sign of different combinations of local injury and centrally induced hypersensitivity or allodynia.

In several clinical, experimental, and epidemiological studies, pain and dysfunction in the jaw–face region have been associated with the presence of tender/painful muscle sites. In population-based studies, the prevalence of pain on palpation at jaw muscle sites has generally been found to be higher than the prevalence of reported pain [5,6]. The temporal sequence of pain at a muscle site, irrespective of its source, and the experience of pain and perceived local muscle soreness have not been fully investigated. Knowledge of factors predicting development of pain and dysfunction in the jaw–face region is an important element in relation to risk assessment, clinical decision-making, prevention, management, and treatment. There are few prospective studies available, however, concerning the course of events in relation to myofascial signs and symptoms.

One way to approach this question is through well-controlled, prospective observational studies. The hitherto longest prospective epidemiological study on temporomandibular disorders (TMDs), covering over two decades, was published recently [7]. Its

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point estimates of prevalence, made on four occasions, indicated both substantial fluctuations and an increase in symptoms with age up to young adulthood. Women reported more symptoms and had more clinical signs than men from late adolescence onwards. A similar pattern was found in a 10-year follow-up of another population-based sample [8]. In the former study, few predictive factors of TMD signs and symptoms were identified. The strongest correlation was found between jaw fatigue and reported bruxism, while the correlation between occlusal factors and TMDs was mainly weak and inconsistent. The significance of dental occlusion as a contributing factor in the development or maintenance of pain and dysfunction in the jaw–face region remains controversial. Most of the present knowledge in this field is, after all, based on predominantly case-control and cross-sectional studies. Controlled longitudinal studies may provide additional knowledge [9].

The primary aim of this study was to examine the incidence, prevalence, and disappearance of myofascial pain in the jaw–face region among dental students during their first year of dental education. The secondary aim was to analyze whether gender, oral parafunctional habits, and dental occlusion were related to presenting with, or without, myofascial pain during a 1-year period. The hypotheses were that: (a) the 1-year incidence of myofascial pain is higher than its disappearance, leading to increased prevalence; (b) the 1-year period prevalence and course of myofascial pain is related to gender; (c) the 1-year period prevalence of myofascial pain is not dependent on dental occlusion; and (d) the 1-year period prevalence and course of myofascial pain is related to awareness of bruxism.

Material and methods

Study population

All students who attended the dentistry program at Umeå University, Umeå, Sweden, during 1998–2005 were invited to participate in a 2-year prospective study concerning the risk of developing pain and/or dysfunction in the jaw–neck region. The study was approved by the Ethics Committee of Umeå University.

In total, 371 individuals (142 M and 229 F) agreed to participate. Their mean age at the start of the study was 23 (range 18–48) years. At the 1-year follow-up, 308 individuals (112 M and 196 F) were re-examined. The 63 subjects who dropped out between the first and the second examination had all interrupted their studies. They had not shown any crucial differences compared to the remaining individuals at the baseline examination. Altogether 98% of the study population was Caucasian. A detailed description of the subjects and examination methods has been presented elsewhere [10]. A short summary is given here.

Case history

The participants filled out a questionnaire on presence and frequency of fatigue, stiffness, or pain in the jaw muscle region, difficulties in opening or closing the jaw, presence and location of headaches (right temple, left temple, or forehead), neck pain, and shoulder or back pain. Symptoms occurring once a week or more frequently were included in the analyses as presence of symptoms. The questionnaire included questions regarding awareness of parafunctions (tooth-clenching, tooth-grinding) and of tooth contact at jaw closing.

Clinical examination

A standardized clinical examination [10] was performed by two experienced specialists in clinical oral physiology (the authors). Subjects were examined by the same examiner at baseline and at the follow-up. During the examination, the examiner was blinded to the subject's response to the questionnaire.

The clinical examination comprised registration of number of teeth, overbite and overjet, morphological dental occlusion, and contact patterns in the retruded contact position (RCP) and intercuspal position (ICP), respectively. The latter was measured in the molar segments with the aid of Arti-Fol®, 0.008 mm (Bausch Articulating Papers, Inc., Nashua, N.H., USA). Mandibular stability in the ICP was registered if the molar teeth could keep a firm grip on the foil during moderate clenching. Mandibular instability in the ICP was accordingly registered if the teeth could not keep a firm grip on the foil. Contact in eccentric positions was registered at 3 and 9 mm lateral excursion. Mediotrusive side interference was defined as a single contact between maxillary and mandibular teeth on the mediotrusive side, inhibiting contact on the laterotrusive side. The following muscle sites were palpated: the tendon, the anterior and posterior part of the temporal muscles, the superficial and deep parts of the masseter muscles, the lateral pterygoid region, and the medial pterygoid muscles. Pain at palpation was registered if the palpation elicited a palpebral reflex or a withdrawal reaction. Each subject was asked to clench their teeth hard in the ICP for 30 s. Development of fatigue or pain in the head, face, or jaws during the clenching was registered as muscular symptoms to static load (clench symptoms).

Subjects who reported frequent jaw muscle fatigue/tiredness or stiffness (local muscle sourness) or muscle pain were classified as having muscular symptoms in the jaw–face region. Those with pain at palpation of jaw muscle sites or clench symptoms were classified as having jaw muscle signs. A classification was also made in accordance with the Research Diagnostic Criteria for TemporoMandibular Disorders (RDC/TMD), Axis I, Group 1a: myofascial pain [11].

Statistical methods

Data analysis was done in SPSS, version 14.0 (SPSS, Inc., Chicago, Ill., USA). Univariate statistical analyses of associations between variables were carried out using the chi-square test or, if expected observations were less than five, Fisher's exact test. Changes between baseline and follow-up were tested with McNemar's test. Associations between gender, dental occlusion, and 1-year muscular signs and symptoms were assessed by odds ratios (ORs) in unconditional logistic regression models. The sample was dichotomized based on presence of signs and symptoms at baseline and follow-up. Three cohorts were used in the analysis of putative risk factors (Table II): (a) Cohort 1 – those who presented neither signs nor symptoms during the 1-year period ($n = 140$); (b) Cohort 2 – those who reported jaw muscle symptoms and/or had signs of jaw muscle pain during the 1-year period ($n = 168$); (c) Cohort 3 – those who, at baseline or at the follow-up, reported jaw muscle symptoms and had signs of jaw muscle pain or who fulfilled the criteria for myofascial pain (RDC/TMD) ($n = 56$).

The 1-year incidence was calculated among those with reported symptoms or clinical signs at the follow-up, but without such symptoms or signs at baseline. The null hypothesis was rejected if $p < 0.05$.

Results

Course of jaw muscle signs and symptoms

During the 1-year observation period, 45% of the study population neither reported any presence of frequently occurring muscular symptoms in the jaw–face region nor had any clinically registered muscular pain signs. There was a significantly (chi-square test, $p < 0.0001$) greater percentage of men than of women in this category (Table I). The OR of being an incidence case for muscular signs or symptoms among female students was 3.9 (95% confidence interval (CI) 1.9–8.0) compared with male students. There was no difference in recovery between genders. The 1-year longitudinal course of signs and symptoms of muscular involvement differed significantly between men and women (chi-square test, $p < 0.0001$). The prevalence of muscular signs and/or symptoms increased significantly for the total sample (McNemar's test, $p < 0.0001$), but in a subanalysis of men and women separately, the increase was significant for women (McNemar's test, $p < 0.0001$) and not for men (McNemar's test, $p = 0.36$).

The prevalence, 1-year incidence, and disappearance of reported jaw muscle symptoms are presented in Figure 1A, and of clinically registered signs in 1B. The relationship between registered signs and reported jaw muscle symptoms, at baseline as well as at the follow-up examination, was statistically significant (chi-square test, $p < 0.0001$). The negative predictive value of muscle signs was high (0.96), while the positive predictive value was low (0.2) at baseline as well as at the follow-up (0.95 and 0.28, respectively). The incidence of jaw muscle symptoms was 11%. Forty-one percent of those with jaw muscle symptoms at baseline had no such symptoms at the follow-up. During the observation period, the prevalence of muscle symptoms increased significantly for the total study population (McNemar's test, $p = 0.008$). When analyzing men and women separately, the increase was significant for women (McNemar's test, $p = 0.011$) but not for men (McNemar's test, $p = 0.69$). The incidence of signs of muscle pain was 27%, while signs disappeared among 20% of subjects, between baseline and the follow-up. The increase in signs for the total sample was statistically significant ($p < 0.0001$). The subsample analysis revealed that the increase was significant only for female subjects ($p < 0.0001$), not for male ($p = 0.38$). The risk of developing jaw muscle symptoms at the follow-up increased significantly with the presence of registered muscular signs at baseline (OR 2.7; 95% CI 1.2–5.7).

The 1-year course of myofascial pain, according to the RDC/TMD, is presented in Figure 2. Myofascial pain was registered among 6% at baseline and among 8% at the follow-up. The incidence was 4%. Presence of myofascial pain did not increase significantly during the observation period (McNemar's test, $p = 0.17$).

Table I. Jaw muscle signs and/or symptoms among university students over a 1-year period.

	No signs or symptoms		Incidence		Disappearance		Persistence		
	n	%	*n*	%	*n*	%	*n*	%	*p*-value
Men $n = 112$	72	64	12	11	7	6	21	19	
Women $n = 196$	68	35	44	22	14	7	70	36	<0.001
Total $n = 308$	140	45	56	18	21	7	91	30	

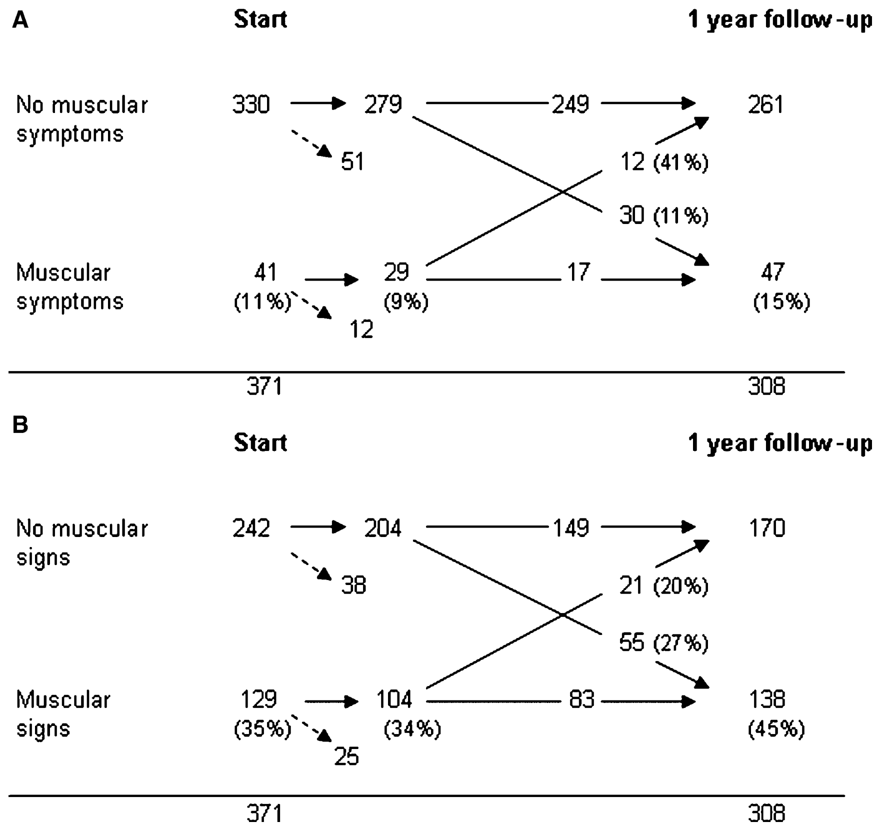

Figure 1. A. One-year longitudinal course of reported jaw muscular symptoms (pain or fatigue/tiredness/stiffness) among first-year dental students. B. One-year longitudinal course of jaw muscle signs (tenderness/pain to palpation or clench symptoms) among first-year dental students. Broken arrows indicate dropouts.

Factors associated with a 1-year cumulative prevalence of jaw muscle signs and symptoms

In total, 168 individuals (55%) had jaw muscle signs or reported symptoms during the 1-year study period (Cohort 2). The outcome of the comparison between these subjects and the 140 non-symptomatic individuals (Cohort 1) with regard to associated factors is presented in Table II. Female gender was associated with a slightly more than 3-fold risk of being a symptomatic subject during the study period (OR 3.4; 95% CI 2.1–5.5). Unilateral contact in RCP (OR 1.7; 95% CI 1.1–2.7) as well as a registered mandibular instability in ICP (OR 3.6; 95% CI 1.5–8.6) at baseline was associated with the presence of muscular pain and perceived local muscle soreness. In a backward logistic regression analysis, female gender (OR 3.4; 95% CI 2.1–5.6) and signs of mandibular instability in ICP (OR 3.6; 95% CI 1.5–8.9) remained the strongest predictive factors of those included in the model. Stated awareness of tooth-grinding increased slightly, but not significantly (McNemar's test, $p = 0.06$), from 25% at

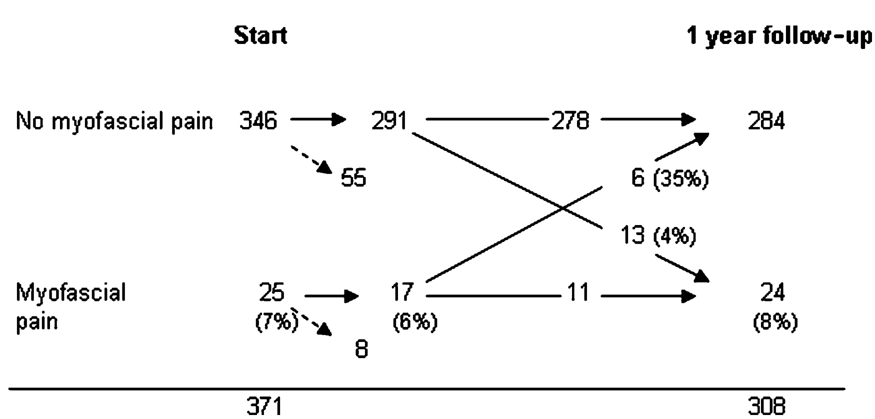

Figure 2. One-year longitudinal course of myofascial pain, according to the Research Diagnostic Criteria for TemporoMandibular Disorders (RDC/TMD), among first-year dental students. Broken arrows indicate dropouts.

Table II. Logistic regression analysis of baseline factors as independent variables. (I) One-year period prevalence of jaw muscle signs or symptoms (Cohort 2); and (II) 1-year period prevalence of jaw muscle signs and symptoms or myofascial pain, according to the Research Diagnostic Criteria for TemporoMandibular Disorders (RDC/TMD) (Cohort 3) as dependent variable. The Table gives percentage distribution and odds ratios (ORs) and 95% confidence intervals (95% CIs). Significant associations are given in boldface type.

Baseline factors	*n* (308)	%	I OR	*n* (196)	%	II OR
Age						
≤21 yrs	173	56.6	1.0	108	30.6	1.0
>21 yrs	135	51.9	0.8 (0.5–1.3)	88	26.1	0.8 (0.4–1.5)
Gender						
M	112	35.7	1.0	82	12.2	1.0
F	196	65.3	**3.4** (2.1–5.5)	114	40.4	**4.9** (2.3–10.4)
Tooth-clenching						
No	191	52.9	1.0	80	22.4	1.0
Yes	117	57.3	1.2 (0.8–1.9)	116	37.5	**2.1** (1.1–3.9)
Tooth-grinding						
No	232	53	1.0	144	24.3	1.0
Yes	76	59.2	1.3 (0.8–2.2)	52	40.4	**2.1** (1.1–4.1)
Morphological occlusion:						
Normal occlusion	199	57.3	1.0	123	30.9	1.0
Any deviation	109	49.5	0.7 (0.5–1.2)	73	24.7	0.7 (0.4–1.4)
Sagittal occlusion:						
Neutro-occlusion	270	54.8	1.0	174	29.9	1.0
Mesio-occlusion	7	28.6	0.3 (0.1–1.7)	5	0	
Distocclusion	31	58.1	1.1 (0.5–2.4)	17	23.5	0.7 (0.2–2.3)
Vertical occlusion:						
Normal	232	56.5	1.0	142	28.9	1
Open or edge-to-edge	32	46.9	0.7 (0.3–1.4)	21	19	0.6 (0.2–1.8)
Deep bite	44	50	0.8 (0.4–1.5)	33	33.3	1.2 (0.5–2.8)
Transversal occlusion:						
Normal	277*	55.6	1.0	176	30.1	1.0
Cross-bite	29	48.3	0.7 (0.3–1.6)	18	16.7	0.5 (0.1–1.7)
Overjet						
<5 mm	264	54.9	1.0	170	30	1.0
≥5 mm	37	56.8	1.1 (0.5–2.2)	20	20	0.6 (0.2–1.8)
Contact in the RCP:						
Bilateral	117	46.2	1.0	77	18.2	1.0
Unilateral	191	59.7	**1.7** (1.1–2.7)	119	35.3	**2.5** (1.2–4.9)
Lateral slide in centric						
<1 mm	284	53.9	1.0	181	27.6	1.0
≥1 mm	24	62.5	1.4 (0.6–3.4)	15	40	1.7 (0.6–5.2)
Mandibular stability in the ICP:						
Stability	274	51.5	1.0	181	26.5	1.0
Instability	34	79.4	**3.6** (1.5–8.6)	15	53.3	**3.2** (1.1–9.2)
Perceived occlusal stability:						
Equal	223	52.9	1.0	145	27.6	1.0
Unequal	85	58.8	1.3 (0.8–2.1)	51	31.4	1.2 (0.6–2.4)
Mediotrusive (side) interference (MI)						
No	209	54.5	1.0	135	29.6	1.0
Yes	99	54.5	1.0 (0.6–1.6)	61	26.2	0.8 (0.4–1.7)
MI at 3 mm lateral excursion						
No	280	53.6	1.0	179	27.4	1.0
Yes	28	64.3	1.6 (0.7–3.5)	17	41.2	1.9 (0.7–5.2)
MI at 9 mm lateral excursion						
No	219	55.3	1.0	139	29.5	1.0
Yes	89	52.8	0.9 (0.6–1.5)	57	26.3	0.9 (0.4–1.7)

ICP = intercuspal position; RCP = retruded contact position.
*Two subjects with scissors bite excluded.

baseline to 29% at the follow-up. Grinding was significantly associated with myofascial symptoms (chi-square test, $p = 0.001$) and the RDC/TMD definition of myofascial pain (Fisher's exact test, $p = 0.04$) at baseline as well as at follow-up ($p < 0.001$ and $p = 0.02$, respectively). Reported clenching habits increased significantly (McNemar's test, $p = 0.001$) from 38% at baseline to 48% at the follow-up. Clenching was significantly associated with myofascial symptoms and the RDC/TMD definition of myofascial pain at baseline as well as at the follow-up (chi-square test, $p < 0.001$).

In the univariate statistical analysis between Cohorts 1 and 3, the same significantly associated factors for signs and symptoms of TMD as in the analyses between Cohorts 1 and 2 appeared, but grinding and clenching were also found to be significantly associated (Table II). In a backward logistic regression analysis, female gender (OR 4.2; 95% CI 1.9–9.2) and reported awareness of clenching (OR 2.0; 95% CI 1.003–3.9) remained as predictive factors of those included in the model.

Discussion

This study demonstrates a preponderance of myofascial signs and symptoms among women in fertile ages compared to men. The gender difference was found in both incidence rate and maintenance of myofascial pain during the 1-year observation period. The probability of not presenting with myofascial pain was highest among men, among those with a stable dental occlusion in centric mandibular positions, and in those without reported bruxism.

Prevalence is composed of the incidence rate and duration of the condition in focus. In order to understand the course and analyze the temporal sequence of cause and effect, longitudinal studies are needed. Knowledge of contributing factors to incidence may help in preventing the onset of a disorder/disease, whose natural course and impact will influence decisions regarding treatment and management. With regard to interventions, it is also important to elucidate factors that add to the risk of a long duration and deterioration.

In this study, incidence should be understood as new cases with signs and symptoms of myofascial pain in the jaw–face region following 1 year. This should not be interpreted as being synonymous with the first onset of symptoms. Epidemiological studies [12–14] seem to agree that TMD commonly starts during adolescence, but that the symptoms have a predominantly fluctuating course. Some of the identified incidence cases in this study may therefore previously have had myofascial pain, but had no such indications at the start of the study. In a recent 3-year follow-up of young adolescents, the annual onset of TMD pain was reported to be 2.3% [15]. In a 4-year longitudinal study of female Japanese adolescents, the calculated annual incidence of facial pain was 2.4% [13]. Nilsson et al. [14] report a slightly higher point estimate of annual incidence of frequent TMD pain (2.9%) among 13 to 19-year-olds, with girls having a significantly higher incidence from 15 to 19 years of age. These estimates of pain related to TMDs in the jaw–face region are slightly lower than the incidence of myofascial pain presented in this study. Differences in age and data sampling may account for some of the differences. Another reason could be that subjects entering university studies can perceive higher levels of stress following the process of adapting to changes in their psychosocial environment and related new demands. In this study population, there was a higher proportion of women than of men. After adjusting for differences in proportion between the sexes, the incidence rate of myofascial pain, according to the RDC/TMD, was calculated to be 3.5%, a figure that comes close to previous estimates. In a 2-year observational study on the course of tiredness/fatigue in the jaws in older teenagers, the annual incidence of these symptoms was 3.5% [16], indicating a slightly higher incidence rate of myofascial pain and perceived local muscle soreness in the presented sample of university students.

The course of myofascial signs and symptoms during the observation period reveals a complex pattern of persistence, recovery, and onset. The female preponderance was related to both higher onset and higher prevalence of a maintained disorder. Duration may be one important factor in utilizing health care, as previously suggested [8,17], and female patients outnumber men in getting referrals to specialist clinics for TMD [18]. Why the prevalence of TMD tends to increase especially among women from the start of puberty to retirement age is not known. Differences in coping strategies, attention paid to health, stress behavior, and social conditions have been offered as possible psychosocial explanations [19,20]. Several studies have recently pointed to possible physiological mechanisms that relate craniofacial nociception to sex hormones [21] and polymorphism in catecholamine O-methyl transferase [22]. Female individuals have been found to have lower pain thresholds to manual palpation [6,23] and some studies have indicated that such thresholds may be influenced by phases in the menstrual cycle [24,25]. We did not control for these phases in the examination procedure and this may be one factor of variability in clinically registered pain to palpation. The dominating pattern in this sample, however, was a maintained status among those both with and without the presence of such signs during the observation period. Signs of pain in the jaw–face region, elicited during palpation, among those who did not report pain symptoms at the start of the study were associated with a significantly increased risk of pain onset in the following year. However, this risk should not be overemphasized in the clinical setting with reference to the low positive predictive values. Neither should it be disregarded. An observational approach seems at present to be the most justifiable recommendation, with higher attention paid to the development of the symptom among affected women. Men without any registered tender points in the jaw muscles and with stable dental occlusion seem to be at very low risk of contracting pain in the jaw–face region in the following year.

Approximately 50% of the subjects stated awareness of tooth-grinding or clenching. The significant association found between bruxism and presence of myofascial signs and symptoms supports the hypothesis of bruxism as a contributing factor in the development of TMD [26,27]. Behavioral patterns related to stress and increased muscle tension may therefore contribute to TMD. It should be noted, however, that the negative predictive value of presence, or absence, of bruxism in relation to presence of TMDs was high (0.96 at baseline and 0.98 at the follow-up), although the positive predictive value was low (0.17 at baseline and 0.25 at follow-up), indicating that symptoms will not develop in every subject with awareness of bruxism. The prevalence of oral parafunctions was fairly high in this sample. Self-reports of bruxism may be overestimated if they are based on the subject's regular dentist's findings. It should be emphasized that the students' report of tooth-clenching and tooth-grinding habits was not validated. The interpretation should therefore be made with caution. In a large, questionnaire-based epidemiological study of 50-year-olds in Sweden, reported bruxism was associated with several social and general health factors, with the authors concluding that the mechanisms behind these associations were not well known [28]. Another, 20-year, follow-up study reports significant correlations between reported bruxism and TMD symptoms, and states that a baseline report of tooth-grinding was a predictor of TMD treatment during the observation period [7]. Further population-based, longitudinal studies are needed to clarify the nature of these relations.

One of the major aims of the present study was to evaluate whether factors in dental occlusion, in this cohort of first-year dentistry students, could be ruled out as a contributing factor to myofascial pain and perceived local muscle soreness. The rationale behind the choice of study population has been presented previously [10] and involves factors such as a wish to control for variations in the subjects' daily social environment, educational level, and accessibility to examination. The subjects also presented a variability of both dental morphology and functional occlusion, similar to the Scandinavian population at similar ages [10]. The sample constitutes a specific cohort of university students, and inference to the general population should be made with caution. The etiology of TMDs is considered multifactorial, with recent emphasis on biopsychosocial models, in which the role of factors in dental occlusion has been tuned down [29]. It has also been argued that occlusion may be the only objective factor, besides hormonal and psychosocial factors, that plays a role in the etiopathogenesis of TMD [30]. Functional strain and overuse, in combination with vulnerability, may impair the jaw function, regardless of the contribution of biomechanical, psychosocial, and genetic factors or of general disease [31].

The analysis of this study population showed comorbidity between mandibular instability and myofascial signs and symptoms. The association resembles associations previously reported, with the focus on temporomandibular joint (TMJ) signs and symptoms [10]. These relationships between mandibular instability and myofascial pain, on the one hand, and between mandibular instability and TMJ signs and symptoms, on the other, point to biomechanical mechanisms as a possible contributing factor in some subjects with TMDs, and warrant further studies. In another study in university students, subjects with TMDs had greater bilateral asymmetry in the number of contacts compared with subjects without TMDs [32]. The studies may therefore capture a similar phenomenon, but with different techniques. As in all cross-sectional studies, the direction of an association cannot be judged and the results should be appraised with due caution. If the period prevalence of both TMJ signs and symptoms, and myofascial signs and symptoms, is clustered, 88% of those with signs of mandibular instability, as defined, presented with one or more symptoms of TMDs during the observation period. Hence, the finding may be of clinical significance and may therefore be recommended as part of the dentist's examination procedure.

In a 2-year follow-up study, widespread pain was identified as a risk factor for the onset of dysfunctional TMD pain among women [33]. Recently, chronic musculoskeletal pain outside the jaw–face region was reported to have appeared early in a sample of dental students and to have increased during their education [34], suggesting that dental students are exposed to factors involved in the development of musculoskeletal pain. Analyzing the relationship between temporal sequences of different local and regional pain conditions may add further knowledge of importance to the understanding of pathophysiological mechanisms of the onset and course of myofascial pain and perceived local muscle soreness.

In conclusion, the first and second hypotheses were accepted in part. The 1-year incidence of myofascial pain in the jaw–face region was higher than the disappearance of pain, leading to an increased prevalence. The increase was only significant for the female gender. The third hypothesis was partly rejected. Signs of mandibular instability in static centric positions (i.e. in the RCP and ICP) were associated with an approximately 3-fold risk of having myofascial signs and symptoms. Variations in morphological occlusion did not show any relation to myofascial symptoms, and neither did contact patterns in eccentric positions. The fourth hypothesis, of a positive relationship between awareness of bruxism and myofascial pain, was not rejected; however, only a minor proportion of subjects with awareness of bruxism actually presented signs and symptoms of TMDs. The strongest factor found in this 1-year follow-up study in relation to the course of myofascial pain and perceived local muscle soreness was female gender.

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