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Parafunctional Habits and Their Relationship with Temporomandibular Joint Disorders in Iranian School Students

İranlı Öğrencilerin Parafonksiyonel Alışkanlıkları ve Temporomandibuler Eklem Hastalıklarıyla Olan İlişkileri

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Abstract

Objective: Unfavorable parafunctional habits affect the dentoalveolar structures and if they are diagnosed late and if the treatment is delayed, they will lead to severe problems that are either irreversible or are associated with high costs, difficult technical problems and severe patient suffering. The aim of this study was to determine the prevalence of parafunctional habits and their relationship with temporomandibular joint (TMJ) disorders in female high school students in Kerman, İran.

Materials and Methods: In the present descriptive-analytical study, data were collected by completing a questionnaire and through clinical examination. The study population consisted of first- to fourth-grade high school students in Kerman, İran. Clinical examinations were carried out by one last-year dental student who was instructed in the faculty of dentistry in the relevant field by one professor and became proficient in clinical examination. Statistical analyses were carried out with SPSS 13.5, using t-test, chi-squared test and ANOVA.

Results: A total of 368 questionnaires were completed in this study. Sixty-six students had no parafunctional habits and 78% of the subjects had at least one oral parafunctional habit; 1.2% of the subjects had all the eleven parafunctional habits and 22% of the subjects had only one parafunctional habit. The highest frequencies were related to chewing gums on one side, sleeping on one side and chewing pencils or pens. The prevalence of TMJ disorder symptoms and signs in the subjects was as follows: joint clicks (31%), pain in masticatory muscles (10%), pain during mastication of food (24%) and pain at mouth opening (14%). The results showed the greatest relationship between tooth clenching and tenderness to palpation in masticatory muscles. Of all the masticatory muscles, the most severe pain during palpation was detected in the masseter, followed by temporalis muscle.

Conclusion: This study showed that the highest frequency of parafunctional habits was related to chewing gums and the most frequent sign of TMJ disorders was joint clicks in subjects. In addition, there were significant relationships between TMJ disorder symptoms and signs and parafunctional habits such as bruxism, unilateral mastication and tooth clenching.

Öz

Amaç: İstenmeyen parafonksiyonel alışkanlıklar dentoalveoler yapıları etkiler ve eğer geç tanı konurlarsa ve tedavi gecikirse, ya geri döndürülemez ya da yüksek masraf, zorlu teknik problemler ve ciddi hasta çekimi ile ilişkili ciddi problemlere neden olurlar. Bu çalışmanın amacı, İran'da Kerman'daki lise öğrencilerinin parafonksiyonel alışkanlık prevalansını ve temporomandibular eklem (TME) hastalıklarıyla olan ilişkilerini belirlemektir.

Gereç ve Yöntemler: Mevcut betimsel-analitik çalışmada, anket doldurularak ve klinik muayene ile veriler toplandı. Çalışma grubu, İran'ın Kerman kentinde bulunan lise son sınıf öğrencilerinden dördüncü sınıf öğrencilerinden oluşmaktadır. Klinik muayene, bir profesör tarafından ilgili alanda diş hekimliği fakültesinde eğitim görmüş ve klinik muayeneye hakim bir önceki yıl diş hekimliği öğrencisi tarafından gerçekleştirilmiştir. İstatistiksel analizler SPSS 13.5 ile t-testi, ki-kare testi ve ANOVA kullanılarak gerçekleştirildi.

Bulgular: Bu çalışmada toplam 368 anket doldurulduu. Altmış altı öğrencinin parafonksiyonel alışkanlığı yoktu ve %78'inde en az bir adet oral parafonksiyonel alışkanlık vardı; olguların %1,2'sinde on parafonksiyonel alışkanlıkların hepsi vardı ve %22'sinde sadece bir parafonksiyonel alışkanlık vardı. En yüksek sıklıklar bir tarafta sakız çiğneme, bir tarafa doğru uyuma ve kurşun kalem ya da tükenmez kalem çiğneme ile ilgilidir. Deneklerde TME bozukluğu semptom ve bulguları prevalansı şu şekildedir: Eklem çıtlaması (%31), çiğneme kaslarındaki ağrı (%10), gıdaların çiğnenmesi sırasında ağrı (%24) ve ağız açmada ağrı (%14). Sonuçlar, diş kenetlenmesi ve çiğneme kaslarına palpasyon ile hassasiyet arasındaki en büyük ilişkiyi gösterdi. Tüm çiğneme kaslarının palpasyon sırasında en şiddetli ağrı, masseterde temporal kas izledi.

Sonuç: Bu çalışma, deneklerde parafonksiyonel alışkanlıkların en yüksek sıklığının çiğneme sakızıyla ilişkili olduğunu ve en sık görülen TME bozuklukluğu belirtisinin eklem çıtlamaları olduğunu göstermiştir. Buna ek olarak, TME bozukluğu semptomları ile brusizm, tek taraflı çiğneme ve diş kenetlenmesi gibi parafonksiyonel alışkanlıklar arasında anlamlı ilişkiler vardı.

Introduction

Temporomandibular joint (TMJ) disorders are a diverse group of disorders that cause pain and tenderness in the TMJ. Several factors lead to TMJ disorders that consist of erosion, tearing, inflammation and swelling of the joint, trauma, stress, some dental plaques and bruxism and tooth grinding. The pain associated with TMJ disorders might vary from mild to severe. Such disorders might be transient or chronic. Virtually 15% of adults in the US have experienced chronic facial pains (1-3).

Some bad oral habits result in the exertion of abnormal forces to teeth, dental arches and muscles; these habits include nail biting, chewing gums, tooth grinding and playing with the jaws. On the other hand, some studies have reported that TMJ disorders originate from malocclusion, parafunctional habits, stress and trauma (1-4). However, the contribution of each factor to TMJ disorders is still unknown (5-8) because each factor not only contributes to TMJ disorder but also affects other factors, too. For example, if stress is considered a kind of energy, when stressful conditions affect an individual, energy is produced in the body (psycho-physic logical theory) (1).

Each structure in the masticatory system can tolerate the increase in stress, resulting from increased activity of muscles, up to a certain level.

When the stresses exerted on tissues exceed this vital threshold which is referred to as structural tolerance, the process of injury and destruction begins. The first signs of destruction appear in components of the masticatory system that have the lowest level of tolerance. Therefore, the location of the emergence of injury is different from one individual to another individual (1-3).

Deleterious parafunctional habits affect the dentoalveolar structures. If these habits are diagnosed late, resulting in delayed treatment, they will give rise to severe problems which might be irreversible or associated with high costs, difficult technical problems and severe patient suffering.

Therefore, it is necessary to decrease these habits through proper intervention and correct treatment planning, which is not possible without acquiring good statistics. Therefore, the present study was undertaken to acquire data on the prevalence of parafunctional habits and determine their relationship with TMJ disorders in female high school students in Kerman, İran, as a sample of the Iranian population.

Materials and Methods

This study had received ethical approval from Ethics and Research Committee of Kerman University (IR.kmu.ac.ir.1395.34; approval no: 2016/124).

In this descriptive-analytical study, data were collected by completing a checklist in the form of a questionnaire and by carrying out clinical examinations. The questions on the checklist were designed by two pedodontists. Then the checklist was submitted to 5 pedodontists in the faculty of dentistry for evaluation. These pedodontists confirmed that the checklist was favorable. The study population consisted of first- to fourth-grade high school students in Kerman, İran. The aims of the study were explained to all the participants who took part in the study voluntarily. Subjects with severe malocclusion and toothache were excluded from the study. Cluster samples technique was used in the present study. To this end, the high school lists were obtained in Kerman with the cooperation of the city's General Education Organization. Then 8 high schools were randomly selected from each municipal district of the city (2 high schools from each district) as a cluster. Then the questionnaires were explained to the subjects and 368 first- to fourth-grade students in each level completed the questionnaires. Then each student was examined on a conventional chair with the use of a dental mirror, an electric torch, a Vernier caliper (for the evaluation of mouth opening), and a stethoscope (for evaluations of joint sounds) and by palpating the masticatory muscles, while each subject held the questionnaire in her hand.

Before completing the questionnaires, the subjects were informed about the reasons for and the importance of the study and all the variables and factors on the questionnaire were explained to avoid any ambiguities so that the students could complete the questionnaire after completely understanding the importance of the study and the items on the questionnaire. In addition, the aim of the study was individually explained to each student and they were included in the study after they gave their informed consent. In addition, the subjects were reassured that all the data would be kept confidential and the results only would be reported.

Clinical examinations were carried out by one last-year dental student who was trained for one week by one professor in the field in the faculty of dentistry and mastered all the principals of clinical examination. In clinical examinations, first the extent of mouth opening was determined with the use of a Veriner caliper by measuring the distance from the incisal edge of maxillary incisors to the incisal edge of mandibular incisors. Then each subject was asked to open and close her mouth several times so that any joint clicking could be heard with the use of a stethoscope which was placed anterior to the tragus for the evaluation of crepitus and other joint sounds. Then the masticatory mucus was palpated for any tenderness and muscle trismus. In addition, mandibular deviation during mouth opening and closing was evaluated.

Functional Terms

Pain: A feeling of pain anterior to tragus at mouth opening and closing and also during palpation,

Joint sound: Sounds anterior to tragus at mouth opening and closing (crepitus),

Morning headache: Headache in the temporal area at waking up from sleep,

Pain in the ear area: Earache or pain anterior to tragus.

In addition, at the end of clinical examination, a lecture was given to the students who had problems in relation to kicking the habits, the techniques used to kick the habits and the possible future consequences if the habits are not kicked; finally, subjects with problems were referred for treatment.

Protection of human and animal subjects: the authors declare that no experiments were performed in humans and animals.

Statistical Analysis

Statistical analyses were carried out with SPSS 13.5, t-test, chi-squared and ANOVA.

Results

A total of 368 questionnaires were completed in the present study. The mean age of the subjects was

15.0±1.1 years, with an age range of 14-18 years. A total of 66 subjects did not exhibit any parafunctional habits and 78% of the subjects had at least one oral parafunctional habit; 1.2% of the subjects exhibited all the 11 parafunctional habits and 22% of the subject had only one parafunctional habit. The most frequent habits were chewing gums, chewing foods on only one side, sleeping on only one side and chewing pens or pencils (Tables 1, 2).

The prevalence of TMJ disorders in the subjects was as follows: crepitus (31%), pain in masticatory muscles (10%), pain at food mastication (24%) and pain at mouth opening (14%) (Table 3).

Table 1. Distribution of absolute and relative frequency of parafunctional habit

Parafunctional habit	Yes		No	
	n	%	n	%
Chewing gums	302	82	66	18
Chewing cheeks	41	11	327	89
Nail biting	45	12	323	88
Chewing a pen or a pencil	178	48	190	52
Playing with the jaws	25	6	343	94
Leaning the jaw on the hand	112	30	256	70
Leaning the jaw on the arm	21	5	347	95
Tooth clenching	26	7	342	93
Tooth grinding	28	7	340	93
Mastication of food on one side	250	68	118	32
Sleeping on one side	278	75	90	25

Table 2. The relationship between parafunctional habits and symptoms of temporomandibular joint disorders

Parafunctional habit	Symptoms of TMJ disorders					p value
	<3			≥3		
		n	%	n	%	
Chewing gums	Yes	142	39	25	7	0.001
	No	45	12	156	42	
Chewing cheeks	Yes	85	23	36	10	0.021
	No	41	11	206	56	
Nail biting	Yes	58	16	45	12	0.09
	No	15	4	250	68	
Chewing a pen or a pencil	Yes	87	24	54	15	0.001
	No	51	14	176	47	
Playing with the jaws	Yes	49	13	22	6	0.08
	No	21	6	276	75	
Leaning the jaw on the hand	Yes	15	4	41	11	0.040
	No	21	6	291	79	
Leaning the jaw on the arm	Yes	94	26	15	4	0.615
	No	17	5	242	65	
Tooth clenching	Yes	18	5	24	6	0.010
	No	54	15	272	74	
Tooth grinding	Yes	47	13	51	14	0.314
	No	45	12	225	61	
Mastication of food on one side	Yes	91	25	84	23	0.001
	No	25	7	168	45	
Sleeping on one side	Yes	94	26	82	22	0.001
	No	31	8	161	44	

TMJ: Temporomandibular joint

The following results were achieved on the relationship between each parafunctional habit and the presence of at least one of the symptoms and signs of TMJ disorders. There were significant relationships between bruxism, unilateral mastication and chewing gums, pens and pencils, tooth grinding and sleeping on one side and the symptoms and sings of TMJ disorders. In relation to nail biting, too, a relationship was detected with the symptoms and signs of TMJ disorders; however, there were no significant relationships between other habits and symptoms and signs of TMJ disorders (Table 4).

The results of this study showed the strongest relationship between bruxism and palpation tenderness of masticatory muscles (p=0.001). In addition, there were significant relationships between

Table 3. Absolute and relative frequency of symptoms of temporomandibular disorders

Symptom	Yes		No	
	n	%	n	%
Joint clicking	114	31	254	69
Morning headaches	38	10	330	89
Clicking in the ear region	41	11	327	89
Pain in the ear region	28	7	340	92
Muscular fatigue	64	17	304	82
Pain at mouth opening	52	14	316	86
Facial muscle pain	37	10	331	90
Jaw pain at food mastication	88	24	280	76

Table 4. The relationship between parafunction habits with temporomandibular disorder

Parafunctional habit	p value	Correlation coefficient
Chewing gums	0.001*	0.645**
Chewing cheeks	0.341	0.085
Nail biting	0.010*	0. 421**
Chewing a pen or a pencil	0.020*	0.215**
Playing with the jaws	0.214	0.045
Leaning the jaw on the hand	0.317	0.051
Leaning the jaw on the arm	0.09	0.080
Tooth clenching	0.001*	0.345**
Tooth grinding	0.001*	0.189**
Mastication of food on one side	0.001*	0.124**
Sleeping on one side	0.001*	0.254**

*p value <0.05 is significant, **Correlation coefficient t>0.1 is significant

the signs of TMJ disorders and bruxism, unilateral mastication, chewing gums and sleeping on one side only.

The mean extent of mouth opening was 38.0±2.01 mm, with a range of 31-48 mm. The results of this study showed that of all the masticatory muscles, the most severe pain at palpation was related to masseter, followed by the temporalis muscle.

Discussion

TMJ is one of the most complex joints in the human body and is closely related to the profession of dentistry. The disorders of this joint consist of clinical problems that involve the masticatory muscles system and/or the joint itself. Based on the definition provided by the American Dental Association, the symptoms and signs of TMJ disorders consist of pain, tenderness to palpation in TMJ area or masticatory muscles, limitations in the jaw movements, mandibular deviation at mouth opening and closing, and TMJ sounds during mandibular movements (1). The etiologic factors of these disorders have not fully been elucidated and different factors have been proposed. One of the possible predisposing factors is parafunctional habits, which are described as activities of the masticatory system that do not have functional aims and do not play a role in mastication, swallowing and speaking. These habits can lead to trauma since they exert extra loads on the masticatory system. These factors include bruxism, tooth clenching, chewing of hard objects such as pencils, chewing gums, nail biting, sleeping on only one side, habitual chewing of the tongue, lips or cheeks and placing the hand under the chin (1-8).

This study showed that 66 subjects did not exhibit any parafunctional habits and 78% of the subjects had at least one oral parafunctional habit; 1.2% of the subjects exhibited all the 11 para-functional habits and 22% of the subject had only one parafunctional habit. The most frequent habits were chewing gums, chewing foods on only one side, sleeping on only one side and chewing pens or pencils, consistent with the results of other studies. In addition, in a study by Gavish et al. (2), the most important finding was the prevalence of chewing gums (58%). In a study by de Oliveira et al. (9) on 10-12-year-old subjects 47% had at least one oral parafunctional habit. In addition, Schiffman et al. (8) evaluated 269 nursing students, aged 19- 22 years, and reported that the most prevalent habit was chewing gums (87%), with a positive relationship between parafunctional habits and mandibular disorders. Gavish et al. (2) evaluated 248 girls, aged 15-16 years, and reported that the most prevalent parafunctional habit was chewing gums.

Lobbezoo et al. (10) and Restrepo et al. (11) reported that the most prevalent parafunctional habits were bruxism, tooth clenching, tooth grinding and nail biting.

In relation to the prevalence of parafunctional habits, tooth grinding, and chewing were reported in 9.8% and 9.5% of the subjects, respectively. In the study by Choi et al. (12), these prevalence rates were 8.4% and 9.9%, respectively, among 19-year-old Korean subjects.

Therefore, the prevalence of this parafunctional habit is different in different communities, which might be attributed to differences in the study populations in different studies. In addition, factors such as individual's psychological status, habits and sleep status can affect these two factors.

The results of the present study showed that the most prevalent symptoms and signs of TMJ disorders in the subjects were joint sounds (crepitus) (31%), pain in masticatory muscles (10%), jaw pain during food mastication (24%) and pain at mouth opening (14%). In a study by Miyake et al. (13), the most prevalent sign of TMJ disorders was joint crepitus. This study showed significant relationships between nail biting, tooth clenching, unilateral chewing, chewing gums, pens and pencils, tooth grinding and sleeping on one side and the signs of TMJ disorders, consistent with the results of other studies (14).

In a study by Motghare et al. (15), too, there were significant relationships between nail biting, lip biting, tooth grinding and symptoms and signs of TMJ disorders. Based on the results of a study by Alamoudi on 3-7-year-old children, there was a definitive and significant relationship between tooth grinding and TMJ pain, muscle tenderness and limitations in mouth opening (7).

In a study by Sonmez (3) on 182 children aged 5-8 years, there was a definite relationship between thumb sucking and nail biting on one hand and TMJ disorders on the other hand during mixed dentition period. In addition, in a study by de Oliveira et al.

(9) on 10-12-year-old subjects, there was a strong relationship between parafunctional habits and tenderness of masticatory muscles to palpation. Gavish et al. (2) showed significant relationships between chewing gums, playing with the jaws and leaning on the jaw and tenderness of masticatory muscles to palpation and TMJ disorders. However, there was no significant relationship between tenderness to palpation of masticatory muscles and TMJ disorders.

A study by Motghare et al. (15) showed the strongest relationship between clenching and tenderness to palpation in masticatory muscles. In addition, there were significant relationships between tooth clenching, unilateral food chewing, chewing gums and sleeping on one side and the symptoms and signs of TMJ disorders. In a study by Ciancaglini et al. (16), there was a strong relationship between bruxism and the symptoms and signs of TMJ disorders, especially limitation of jaw movements. However, in a study by Choi et al. (12) it was reported that bruxism was not possibly a direct risk factor for inducing TMJ disorders and tooth clenching was considered much more dangerous than bruxism. Furthermore, Pullinger et al. (17) reported a relationship between tooth clenching and pain in facial muscles. In a study by Gavish et al. (2), there was a strong and significant relationship between chewing gums and muscular tenderness and joint clicks. In the present study, too, there was a significant relationship between unilateral chewing and joint pain.

The results of the present study showed that of all the masticatory muscles, the most severe muscular pain at palpation was related to the masseter. In a study by Morrant and Taylor (18) in Glasgow University, 18% of the subjects exhibited pain and muscle tenderness in the masseter muscle during palpation. In a study by Agerberg and Inkapool (19), muscle pain was the most severe in the temporalis muscle.

Conclusion

The results of the present study showed that the highest frequency of parafunctional habits was related to chewing gums and the most frequent sign of TMJ disorder in the subjects was joint clicks. In addition, there were significant relationships between all the symptoms and signs of TMJ disorders and the parafunctional habits of bruxism, unilateral mastication and tooth clenching.

Ethics

Ethics Committee Approval: For study, approval of Ethics Committee of Kerman University of Medical science was obtained (approval no: 2016/124).

Informed Consent: Protection of human and animal subjects: The authors declare that no experiments were performed in humans and animals.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: M.A.H., Concept: M.A.H., Design: M.A.H., Data Collection or Processing: F.M., Analysis or Interpretation: A.M., Literature Search: F.M., Writing: M.A.H., A.M.

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