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Are Occlusal Characteristics, Headache, Parafunctional Habits and Clicking Sounds Associated with the Signs and Symptoms of Temporomandibular Disorder in Adolescents?

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Abstract. [Purpose] To assess the association between the oclusal characteristics, headache, parafunctional habits and clicking sounds and signs/symptoms of TMD in adolescents. [Subjects] Adolescents between 14 and 18 years of age. [Methods] The participants were evaluated using the Helkimo Index and a clinical examination to track clicking sounds, parafunctional habits and other signs/symptoms of temporomandibular disorder (TMD). Subjects were classified according to the presence or absence of headache, type of occlusion, facial pattern and type of bite. In statistical analyse we used the chi-square test and Fisher's exact test, with a level of significance of 5%. [Results] The sample was made up of 81 adolescents with a mean age of 15.64 years; 51.9% were male. The prevalence of signals/symptoms of TMD was 74.1%, predominantly affecting females. Signals/symptoms of TMD were significantly associated with clicking sounds, headache and nail biting. No associations were found between signals/symptoms of TMD and angle classification, type of bite and facial pattern. [Conclusion] Headache is one of the most closely associated symptoms of TMD. Clicking sounds were found in the majority of cases. Therefore, the sum of two or more factors may be necessary for the onset and perpetuation of TMD.
Key words: Temporomandibular joint disorders, Adolescent, Headache

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INTRODUCTION

Temporomandibular disorder (TMD) is a blanket term for a group of conditions that generate pain and involve the muscles and/or anatomic components of the temporomandibular joint. This disorder affects approximately 34.7% of adolescents, predominant among females[1)].

The most common signs and symptoms of TMD are sensitivity of the muscles of the head and neck (including the muscle of mastication), pain in one or both joints, limited mouth opening, limited lateral movements and protrusion of the mandible, clicking sounds (clicking and crackling), facial deformity and headache[2, 3)]. Ringing in the ears, the sensation of ear fullness, earache, sensation of hypoacusis (diminished hearing) and dizziness may also be present[4)].

A multifactor etiology involving structural and psychological factors has been attributed to TMD[5)]. Numerous clinical conditions, such as poor posture, malocclusion and bruxism (teeth clenching/grinding), may be related to the muscles of mastication, the temporomandibular joint and associated structures, giving rise to TMD[2)]. The literature also suggests that occlusal abnormalities may be causes of headache, TMD and facial pain[6, 7)] and may affect facial growth and esthetics, leading to a tendency toward either vertical or horizontal facial growth (long face or short face pattern, respectively)[8)]. Our research group previoulsy showed that the occurrence of headache in children and adolescentes with signs/symptoms of TMD is frequent, regardless of gender and intensity of signs and symptoms of TMD[9)].

Considering these aspects, the aim of the present study was to test associations between signs/symptoms of TMD and aspects of facial profile, parafunctional habits and the number of occlusal contacts in adolescents to determine which of these factors are associated with clinical symptoms/signals of TMD in adolescents.

SUBJECTS AND METHODS

An observational, cross-sectional study was carried out involving male and female adolescents enrolled at the José de Paiva Neto Education Institute, Sao Paulo, Brazil. Par-

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ents/guardians received information regarding the objectives and procedures of the study and agreed to their child's participation by signing a statement of informed consent in compliance with Resolution 196/96 of the Brazilian National Health Council. This study received approval from the local Human Research Ethics Committee under process number 332780.

The inclusion criteria were an age between 14 and 18 years and having all four first molars erupted. The exclusion criteria were current medical or psychological treatment, dento-facial anomalies, history of surgery or trauma in the region of the temporomandibular joint and orthopedic or orthodontic treatment of the jaws.

All participants were assessed using to the Helkimo Index, which is an assessment tool for the diagnosis of TMD that is frequently administered to the age group in question[10, 11]. This index classifies individuals in to severity categories based on clinical signs of TMD, and is divided into five subscales addressing limitations in mandibular range of motion, limitations in temporomandibular joint function, pain in the muscles of mastication, pain in the temporomandibular joint, and pain during mandibular movements[12].

Data from the clinical examination were recorded on a specific chart. The clinical examination consisted of an extraoral and intraoral inspection of the teeth, the determination of the type of occlusion and occlusal abnormalities as well as palpation of the muscles of mastication and the temporomandibular joint. Subjects were interviewed about addressing clicking sounds, facial pain, difficulty with chewing, and parafunctional habits. Based on the criteria of the Helkimo Index, each item received a score of 0, 1 or 5. The sum of the item scores allows classification of individuals into one of four categories: no symptoms of TMD (0 points), mild symptoms of TMD (1 to 4 points), moderate symptoms of TMD (5 to 9 points) and severe symptoms of TMD (10 to 25 points)[12]. The participants were classified into four groups based on the results of the index and physical exam: without TMD; with mild TMD; with moderate TMD; and with severe TMD.

The tracking of headache was made according to the criteria of the International Headache Society (2004)[13].

A. At least 10 bouts of headache fulfilling the criteria B and D below. The number of days that headache is less than or equal to 180/year (less than 15/month)

B. Headache lasting 30 minutes to 7 days

C. At least two of the following pains:

1. Quality clamping / pressure (not pulsating)
2. Mild to moderate intensity (may limit, but not prevent activities)
3. Bilateral location
4. It is worsened by climbing stairs or similar routine physical activity daily.

D. Both of the following

1. No nausea or vomiting (anorexia may occur)
2. Photophobia and phonophobia are absent or only one is present

E. Not due to another disease

In the statistical analysis we used the chi-square test and Fisher's exact test, with a level of significance of 5% ($p<0.05$).

RESULTS

Eighty-one adolescents (mean age: 15.64 years; standard deviation: 1.06 years) were evaluated. Males accounted for 51.9% of the sample (n=42). The prevalence of TMD was 74.1% (n=60) in the overall sample and 87.2% among the female participants (n=34). TMD was significantly associated with the female gender ($p=0.009$), clicking sounds ($p=0.026$), headache ($p<0.001$) and the parafunctional habit of nail biting ($p=0.002$) (Table 1).

In the analysis of the degree of severity and gender, a statistically significant association was found between severe TMD and the female gender ($p=0.002$) (Table 2).

DISCUSSION

The present results demonstrate there are statistically significant associations between TMD and the female gender, clicking sounds, headache and the parafunctional habit of nail biting. With regard to the degree of severity, a significant association was found between the female gender and severe TMD.

The greater prevalence of TMD among females may be attributed to hormonal, postural, emotional, occlusal and functional factors as well as genetic predisposition[14–16]. The present findings are in agreement with previous reports on the gender difference in the adolescent population[1, 17]. It should be stressed that the use of the Helkimo Index was based on it being easy to understand by individuals in the age group studied, and the fact that this assessment tool is frequently employed for the diagnosis of TMD[10, 11].

As TMD has a multifactor etiology, individuals with this disorder may exhibit anxiety, stress, occlusal abnormalities and postural problems as well as parafunctional habits, leading to the exacerbation of signs and symptoms, with a negative impact on social activities, physiological aspects and quality of life[18, 19]. Diurnal and nocturnal bruxism (teeth clenching/grinding), biting on objects, forward thrust of the mandible, and nail biting are among the harmful oral habits called parafunctions[20, 21]. In the present sample, nail biting was found among 84.2% of the cases of TMD, followed by teeth clenching. The statistically significant association between TMD and nail biting is in agreement with findings described in a previous study[19, 22]. In contrast, other studies have found no association of these variables with TMD[23, 24]. Nonetheless, these and other parafunctional habits should be taken into consideration due to the association with emotional factors as well as the issue of placing excessive load on the stomatognathic system[25] which may be a trigger factor in the emergence of TMD.

Facial profile was not significantly associated with the presence of TMD. However, individuals with the short face pattern generally have a posteriorly inclined cervical spine, whereas those with the long face pattern have reduced curvature of the cervical spine[26]. It is important to investigate these characteristics, as orofacial abnormalities and habits have been reported to be associated with postural problems[18, 27].

Among the symptoms, positive associations with TMD were found for headache and clicking sounds. Gonçalves et

Table 1. Characteristics of adolescents according to presence of TMD

		without TMD n (%)	with TMD n (%)	Total n (%)	
Gender	Male	16 (38.1%)	26 (61.9%)	42 (100%)	*
	Female	5 (12.8%)	34 (87.2%)	39 (100%)	
Age [a]	14	6 (66.7%)	3 (33.3%)	9 (100%)	
	15	6 (18.2%)	27 (81.8%)	33 (100%)	
	16	5 (22.7%)	17 (77.3%)	22 (100%)	
	17	3 (25.0%)	9 (75.0%)	12 (100%)	
	18	1 (20.0%)	4 (80.0%)	5 (100%)	
Angle Classification[a]	Class I	11 (28.2%)	28 (71.8%)	39 (100%)	
	Class II	1 (11.1%)	8 (89.9%)	9 (100%)	
	Class III	7 (36.8%)	12 (63.2%)	19 (100%)	
	Mixed	2 (14.3%)	12 (85.7%)	14 (100%)	
Type of bite	Normal	16 (28.1%)	21 (71.9)	57 (100%)	
	Open bite	3 (33.3%)	6 (66.7%)	9 (100%)	
	Crossbite	2 (13.3%)	13 (86.7%)	15 (100%)	
Clicking sounds	Absent	12 (40%)	18 (60%)	30 (100%)	*
	Present	9 (17.6%)	42 (82.4%)	51 (100%)	
Headache[a]	Absent	20 (40.8%)	29 (59.2%)	49 (100%)	*
	Present	1 (3.1%)	31 (96.9%)	32 (100%)	
Facial pattern[a]	Dolichocephalic	20 (25.6%)	58 (74.4%)	78 (100%)	
	Mesocephalic	1 (33.3%)	2 (66.7%)	3 (100%)	
Breathing pattern	Nasal	15 (23.4%)	49 (76.6%)	64 (100%)	
	Oral	6 (35.3%)	11 (64.7%)	17 (100%)	
Parafunctional habits[a]	Absent	15 (26.8%)	41 (73.2%)	56 (100%)	*
	Nail biting	3 (15.8%)	16 (84.2%)	19 (100%)	
	Teeth clenching	1 (50%)	1 (50%)	2 (100%)	

[a] Fisher's exact test, * Statistically significant, $p<0.05$
NS: not significant

Table 2. Distribution of patients based on degree of TMD according to gender

			TMD				Total
			Absent	Mild	Moderate	Severe	
Gender	Male	n	16	23	3	0	42
		%	38.1%	54.8%	7.1%	0%	100.0%
	Female	n	5	18	14	2	39
		%	12.8%	46.2%	35.9%	5.1%	100.0%
Total		n	21	41	17	2	81
		%	25.9%	50.6%	21.0%	2.5%	100.0%

Fisher's exact test p=0.002*

al. found an association between different subtypes and severities of TMD and primary headache, suggesting that the central facilitation of nociceptive inputs and the involvement of TMD with muscle pain may be important in such cases[28].

Clicking sounds may be present due to different factors, such as trauma, genetic malformation of bone and cartilage surfaces, syndromes and parafunctions. Clicking sounds upon opening the mouth may occur due to the anterior dislocation of the disc with or without reduction and consequent friction between the anterior region of the head of the condyle and the posterior band of the disc during the translation of the condyle, causing the joint to "click". Crackling may occur due to degenerative disc problems, with the leakage of synovial fluid between the supra and infra disc compartments[16, 26]. In the present study, joints noises were presented by clicking in 82.4% of the participants with TMD, which is in agreement with studies reporting this to be a frequent sign of this disorder[7, 29].

Premature occlusal contact constitutes a possible cause of headache, facial pain and TMD, affecting chewing function and causing asymmetry of the stomatognathic system.

These disorders may be secondary consequences of the change in occlusal position due to joint and muscle pain, leading to deviation of the mandible and excessive pressure on the joint and bilamellar region. In the growth phase, occlusal interferences may exacerbate symptoms due to the functional deviation of the mandible as well as periodontal alterations due to pain. These functional alterations between the dental arches may have negative neuromuscular consequences for the structures of the head and neck, triggering the development of TMD, with a negative impact on quality of life[30, 31].

Based on the present findings, TMD is more prevalent among females and headache is one of the most closely related symptoms. Clicking sounds (represented by clicking) are found in the majority of cases. Therefore, the sum of two or more factors may be necessary for the onset and perpetuation of TMD.

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