

# Factors predisposing 6 to 11-year old children in the first stage of orthodontic treatment to temporomandibular disorders

Patrícia Porto Loddi\*, André Luis Ribeiro de Miranda\*, Marilena Manno Vieira\*\*, Brasília Maria Chiari\*\*\*, Fernanda Cavicchioli Goldenberg\*\*\*\*, Savério Mandetta\*\*\*\*\*

## Abstract

**Introduction:** The etiology of temporomandibular disorders (TMD's) is currently considered multifactorial, involving psychological factors, oral parafunctions, morphological and functional malocclusion. **Objectives:** In keeping with this reasoning, we evaluated children who seek preventive orthodontic treatment, to better understand their grievances and to assess the prevalence of TMD signs and symptoms in these patients. **Methods:** Two examiners evaluated 65 children aged 6 to 11 years. **Results:** In our sample, bruxism featured the highest prevalence rate, whereas atypical swallowing displayed the highest rate among predisposing factors. **Conclusion:** We therefore recommend that the evaluation of possible TMD signs and symptoms in children be adopted as routine in the initial clinical examination.

**Keywords:** Temporomandibular joint disorders/diagnosis. Temporomandibular Joint Dysfunction Syndrome. Epidemiology. Children.

## INTRODUCTION

Temporomandibular disorder (TMD) is a generic term that encompasses signs and symptoms involving the masticatory muscles, temporomandibular joint and associated structures. TMD etiology is currently considered multifactorial, involving psychological factors, oral

parafunctions, morphological and functional malocclusion. There is growing evidence that temporomandibular joint (TMJ) dysfunctions may originate in early craniofacial development and that early signs and symptoms of TMJ problems are frequently associated with morphological malocclusions.<sup>10</sup>

\* PhD in Health Sciences, UNIFESP-EPM. MSc and Specialist in Orthodontics, Methodist University of São Paulo (UMESP). Professor of Preventive Orthodontics, School of Dentistry, UNESP.

\*\* Adjunct Professor, Department of Human Communication Disorders; Head of the Course on Improvement/Specialization in Speech Pathology, UNIFESP-EPM.

\*\*\* Chair Professor, Department of Speech Pathology; Head of the DCH Postgraduate Program, UNIFESP-EPM.

\*\*\*\* Professor, PhD, Head of the Department of Orthodontics, School of Preventive Dentistry and Postgraduate Program in Dentistry, Area of Concentration: Orthodontics, Methodist University of São Paulo.

\*\*\*\*\* Adjunct Professor, PhD, Postgraduate Department, School of Dentistry, Methodist University of São Paulo; Dean of the School of Dentistry, Methodist University of São Paulo.

TMJ dysfunction studies have always been more geared towards adult diagnosis and treatment, with all this adult information being extrapolated to children. Although some conditions are similar major differences exist, such as the stage of craniofacial growth and development and the extreme ability exhibited by children in adapting to changes in the masticatory system.<sup>11</sup> Some conditions such as malocclusion, bruxism, sucking habits and psychological behavior may be related to TMJ dysfunction symptoms and signs. The dysfunction is more common in tense/nervous children. Recurrent headaches may be indicative of this problem, whereas certain malocclusions and sucking habits can cause dysfunction symptoms.<sup>4</sup>

Open bite patients have been positively associated with muscle tension, and patients with crossbite, negative or excessively positive overjet are related to joint noises. These occlusal characteristics have a statistically significant correlation with TMD signs and symptoms, and this correlation is greater in young adults.<sup>13</sup>

Professionals are strongly advised to perform an anamnesis with all patients who come to the office, regardless of their apparent need or lack of need for treatment, in order to identify subclinical TMD signs and symptoms.

Children evaluations performed by means of a clinical examination and patient history have revealed a 16% to 27% prevalence<sup>1,2,12</sup> of temporomandibular disorders and the presence of symptoms such as headache, earache and/or tinnitus, and ear clicks in most children,<sup>2,5,14</sup> as well as a high prevalence of parafunctional habits, especially mouth breathing and bruxism.<sup>3,15</sup> Therefore, any factor capable of interfering with the optimal functioning of the stomatognathic system can cause the emergence of one or more signs or symptoms.<sup>2,3</sup>

More recently, it was found that in any given group of children the habit of nail biting (onychophagy) can be found in 47.5% of

the children, the habit of gritting or grinding teeth (bruxism), in 35%, followed by headache (22.5%), TMJ noises (18.7%) and earaches or pain in the TMJ region (13.7%). The most frequently found malocclusions were anterior open bite (56.2%) and posterior crossbite (38.7%).<sup>15</sup>

Although the factors underlying these conditions, such as occlusal problems, parafunctions and emotional state are well known, we cannot as yet determine to what extent each of these, alone or in combination, may indicate that the patient will develop temporomandibular disorder. Be it as it may, the examination of children and adults for signs and symptoms of TMJ dysfunction should be adopted as a routine procedure in the initial clinical examination.<sup>14,15,16</sup>

Therefore, our goal is to contribute to the existing knowledge on TMD in children by monitoring its development in order to better understand its origins and predispositions.

## MATERIAL AND METHODS

Our sample consisted of 65 male and female patients whose ages ranged from 6 to 11 years, selected from among the patients applying for orthodontic treatment in the Children's Clinic of the School of Dentistry, UMESP.

To allow us to gather data on the presence of TMD signs, all patients were identified and evaluated by means of a standardized clinical examination. Evaluations were performed by 2 examiners. All examinations were performed at the Clinic of the School of Dentistry, UMESP.

All participants in this study underwent an evaluation that consisted of the following:

- 1) Anamnesis (patient history).
- 2) Clinical Examination.

### Anamnesis

Anamnesis or patient history is an interview conducted with the purpose of learning about the patient's symptoms. Since it is a subjective

analysis, which depends on the patient's cognition and his or her age group, the assessment was performed using a literature-based questionnaire<sup>12</sup> administered to the subjects' parents or legal guardians (Table 1).

Methodist University of São Paulo Children's Clinic (2004) Patient history form for TMD diagnosis	
Name: _____ age _____	
Address: _____	
Telephone No.: _____	
1) Do you have difficulty opening the mouth?	( ) Yes ( ) No
2) Do you find it difficult to move your mandible sideways?	( ) Yes ( ) No
3) Do you feel any discomfort or muscle pain when chewing?	( ) Yes ( ) No
4) Do you have frequent headaches?	( ) Yes ( ) No
5) Do you feel pain in the neck and/or shoulders?	( ) Yes ( ) No
6) Do you feel earaches or pain near the ear?	( ) Yes ( ) No
7) Have you noticed any noises in the TMJ?	( ) Yes ( ) No
8) Do you consider your bite "normal"?	( ) Yes ( ) No
9) When chewing food, do you use only one side of your mouth?	( ) Yes ( ) No
10) Do you feel pain in your face when you wake up in the morning?	( ) Yes ( ) No
11) Have you ever felt your jaw "lock up" or "dislocate"?	( ) Yes ( ) No
12) Have you ever been treated for unexplained facial pain or any TMJ problem?	( ) Yes ( ) No
13) Do you grind your teeth? (bruxism)	( ) Yes ( ) No

TABLE 1 - Patient history form.

## Clinical examination

The physical examination consisted in evaluating the malocclusion features, palpating the masticatory muscles and the TMJ, TMJ auscultation, measuring the degree of mouth opening and observing any midline shifts (Table 2).

### Inspection

The clinical examination revealed the morphofunctional characteristics of the occlusion, such as malocclusion classification according to Angle, crossbite, open bite, early tooth loss, tooth crowding, oral habits such as sucking, swallowing and phonation.

### Palpation

#### I) Muscle palpation

The following regions were palpated in a systematic manner: Deep masseter, superficial masseter, anterior and posterior portions of the temporal muscle. Palpation was performed by applying digital pressure, using the middle fingers of the left and right hands and palpating the muscles on both sides simultaneously. Muscle pain on palpation was recorded only if palpation produced a sharp reaction in the patient, or if the patient reported that the palpated area felt distinctly more sensitive than the corresponding structures on the opposite side.

#### II) TMJ palpation

The temporomandibular joints were palpated laterally, at first with the patient's mouth closed and shortly thereafter, while the patient was opening and closing the mouth. Palpation was performed using the middle fingers of both hands on the lateral portions of the two joints simultaneously. Only the sharp reactions of patients to palpation were recorded.

### TMJ auscultation

Joint noises were evaluated without the aid of a stethoscope during the opening and closing

Patient ID _____				
Age _____				
Gender _____				
Address : _____				
Phone No.: _____				
<b>1 - Muscle palpation:</b>				
a - Deep masseter	(0) ___	(1) ___	(2) ___	(3) ___
b - Superficial masseter	(0) ___	(1) ___	(2) ___	(3) ___
c - Anterior temporal muscle	(0) ___	(1) ___	(2) ___	(3) ___
d - Midtemporal muscle	(0) ___	(1) ___	(2) ___	(3) ___
e - Posterior temporal muscle	(0) ___	(1) ___	(2) ___	(3) ___
f - Medial pterygoid	(0) ___	(1) ___	(2) ___	(3) ___
g - Upper lateral pterygoid	(0) ___	(1) ___	(2) ___	(3) ___
h - Lower lateral pterygoid	(0) ___	(1) ___	(2) ___	(3) ___
i - TMJ	(0) ___	(1) ___	(2) ___	(3) ___
<b>2 - TMJ auscultation</b>				
normal ( )				
click ( )	opening ( )	right laterality ( )	left laterality ( )	protrusive ( )
crepitation ( )	opening ( )	right laterality ( )	left laterality ( )	protrusive ( )
<b>3 - Maximum Opening</b>				
	>40 mm _____	<40 mm _____		
	pain:	Yes ( )	No ( )	
<b>4 - Mandibular opening path</b>				
• No shift ( )				
• Shift centralized at maximum opening ( )		Right ( )	Left ( )	
• Shift accentuated at maximum opening ( )		Right ( )	Left ( )	

TABLE 2 - TMD physical examination form.

movements of the mouth, as well as the right and left lateral movements and mandible protrusion.

**Recording the movement of mouth opening**

We used a millimeter ruler (Desetec™) to record the linear measurements of maximum mouth opening, measured from maximum habitual intercuspation (MHI). Maximum mouth opening was measured by instructing patients to open their mouth to the fullest, and by measuring the distance between the incisal edges of the opposite upper and lower incisors.

Patients were inquired whether they felt any pain during these movements, but we only recorded the presence of pain when it was clearly identified by the patient.

During this phase we also noted their mandible opening and closing pattern and only recorded midline shifts greater than or equal to 2 mm.

**RESULTS AND DISCUSSION**

Data were tabulated and distributed in graphs (Figs 1, 2, 3 and 4) and data prevalence was evaluated using a percentage rate.

The study was conducted with children who applied for orthodontic treatment at the School of Dentistry, UMESP. Sixty-five patients were selected, consisting of 38 female (58.46%) and 27 male (41.54%) subjects.

Among the symptoms reported, headache was the most frequently found (55.38%), corroborating other authors,<sup>2,3,5</sup> with 38.46% of females

reporting this condition, compared with 16.94% of males. The second most frequent complaint was earache (23.07%). These data are difficult to compare because the concept of headache and earache may be related to other pathologies. This study did not investigate the source of such pain, which can result from a series of problems other than TMJ dysfunction.

The prevalence of tenderness to palpation of masticatory muscles was 52.30%, which is high compared to the findings of Almeida et al.<sup>2</sup> Twenty percent of the sample exhibited sensitivity in the masseter and 4.61% in the temporal muscle.

Upon lateral palpation, 20% of the patients reported TMJ pain, a finding that was similar to that of Almeida et al.<sup>2</sup> (21.7%), lower than Guedes and Bonfante<sup>5</sup> (30%) and higher than Cyrano et al.<sup>3</sup> (5.55%).

Joint noises, typical of TMJ dysfunction, affected 16.9% of the sample, i.e., 6 female (9.23%) and 5 male (7.6%) patients.

Bruxism was reported by 38.46% of the sample (21.53% female and 16.9% male subjects). These data are similar to the findings of Cyrano et al.,<sup>3</sup> but slightly higher than other studies that found rates ranging between 7% and 20%. Prevalence of this habit was foremost among girls. This finding has been justified by several authors as

being due to the faster development and heightened tension experienced by the female gender.

Similar to other findings, the least frequently reported signs were difficulty in opening the mouth (1.54%) and moving the mandible (3.07%). It is highly likely that the absence of these signs is due to the adaptability of the child at a stage of primary and mixed dentition, when the stomatognathic system is undergoing development and major changes impact on the oral cavity.

Two cases (3%) of mandibular locking were reported. A similar number was found by Almeida et al.<sup>2</sup> (4%). However, Egermark-Erikson et al.<sup>4</sup> found luxation or locking in only 1% of 402 children tested.

The mean maximum extent of mouth opening among the children was 45.4 mm, a finding similar to that of Almeida et al.<sup>2</sup> (43 mm).

As regards the opening movement, 21 patients (32.30%) displayed midline shifts. Seventeen of them (26.15%) centered their upper and lower midlines at maximum opening while 6.15% did not.

Among the risk factors we found a high prevalence of parafunctional habits (57.57%), contradicting reports from other studies. The habit of atypical swallowing was the most common, affecting 38.46% of patients, followed by

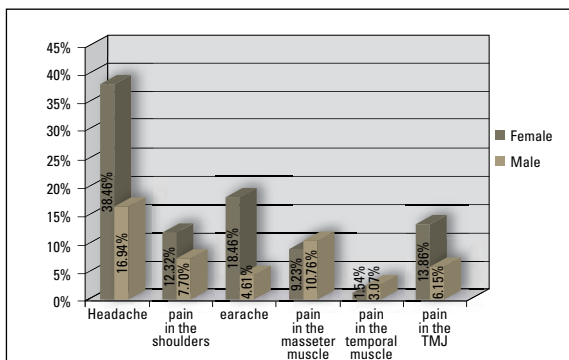


FIGURE 1 - Graphical representation of TMD symptoms.

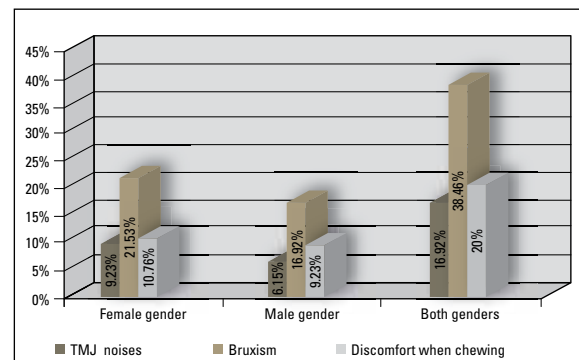


FIGURE 2 - Graphical representation of TMD signs.

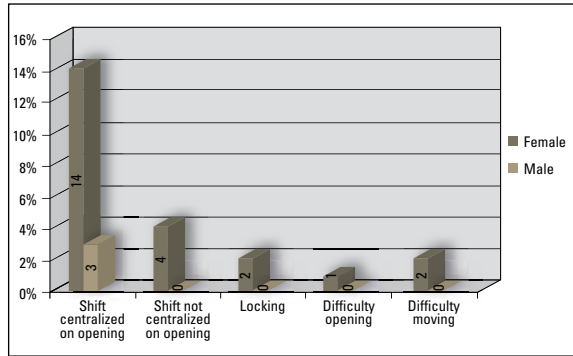


FIGURE 3 - Number of female and male patients with mandibular alterations.

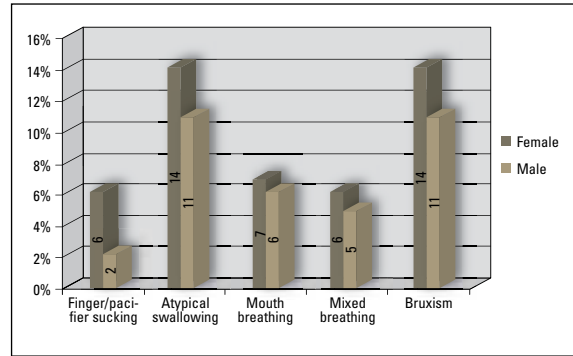


FIGURE 4 - Number of females and males patients with TMD predisposing factors.

mouth breathing (36.9%) and sucking habits (12%). Although usually not included in TMD studies, these factors deserve special attention because they are linked to the development of malocclusion, which can be correlated with TMD signs and symptoms.

The surveyed data include only TMD predisposing signs and symptoms. The findings of this study should raise dental surgeons' awareness of the need for a detailed patient history (anamnesis) and a thorough review of the stomatognathic system in children—in view of the likelihood of TMD—as well as the need to monitor patients with evidence of any TMJ alterations, thereby preventing the development of severe dysfunction or major sequelae in future.

## CONCLUSIONS

Based on the results of this study we have concluded that because some TMD signs and/or symptoms exhibited high prevalence, it is of paramount importance to evaluate the data with caution to rule out any association with other diseases. Professionals are also advised not to make their final diagnosis based on one single factor since we now know that TMD has a multifactorial etiology.

Bruxism displayed the highest prevalence rate of all signs and atypical swallowing the highest rate among predisposing factors.

It is recommended that the evaluation of possible signs and symptoms of TMD in children be adopted as routine during the initial clinical examination.

## REFERENCES

1. Alamoudi N, Farsi N, Salako NO, Feteih R. Temporomandibular disorders among school children. *J Clin Pediatr Dent*. 1998 Summer;22(4):323-8.
2. Almeida IC, Silva RHHR, Cardoso AC. Disfunção do sistema estomatognático, dor e disfunção miofacial em escolares na faixa etária de 7 a 12 anos. *RGO*. 1989 jul-ago;37(4):251-4.
3. Cirano GR, Rodrigues CRMD, Oliveira MDM, Lopes LF. Disfunção de ATM em crianças de 4 a 7 anos: prevalência de sintomas e correlação destes com fatores predisponentes. *RPG*. 2000 jan-mar; 7(1):14-21.
4. Egermark-Erikson I, Carlsson GE, Ingervall B. Prevalence of mandibular dysfunction and orofacial parafunction in 7-11 and 15 years-old Swedish children. *Eur J Orthod*. 1981;3(3):163-72.
5. Guedes FA Jr., Bonfante G. Desordens temporomandibulares em crianças. *J Bras Oclusão ATM, Dor Orofac*. 2001 jan-mar;1(1): 39-43.
6. Keeling SD, McGorray S, Wheeler TT, King GJ. Risk factors associated with temporomandibular joint sounds in children 6 to 12 years of age. *Am J Orthod Dentofacial Orthop* 1994;105: 279-87.
7. Lemos JBD, Amorim MG, Correia FAZ, Procópio ASF. Incidência de sinais e sintomas de disfunção da articulação temporomandibular em pacientes que procuram tratamento ortodôntico. *RPG*. 1997 out-dez; 4(4):306.
8. Mintz SS. Craniomandibular dysfunction in children and adolescents: a review. *Cranio*. 1993 Jul;11(3):224-31.
9. Motegi E, Miyazaki H, Ogura I, Konishi H, Sebata M. An orthodontic study of temporomandibular joint disorders. Part 1: Epidemiological research in Japanese 6-18 years old. *Angle Orthod*. 1992 Winter;62(4):249-56.
10. Moyers RE. Análise da musculatura mandibular e bucofacial. In: Moyers RE, editor. *Ortodontia*. 4ª ed. Rio de Janeiro: Guanabara Koogan; 1991. p. 183.
11. Okeson JP. Temporomandibular disorders in children. *Pediatr Dent*. 1989 Dec; 11(4):325-33.
12. Okeson JP. Tratamento das desordens temporomandibulares e oclusão. 4ª ed. São Paulo: Artes Médicas; 2000.
13. Oliveira RSMF. Prevalência de sinais e sintomas e grau de severidade clínica de distúrbios temporomandibulares em crianças e adolescentes, antes do tratamento ortodôntico, e sua relação com a classificação de Angle e algumas características das máis oclusões. [dissertação]. São Bernardo do Campo: Universidade Metodista de São Paulo; 2000.
14. Riolo ML, Brandt D, TenHave TR. Associations between occlusal characteristics and signs and symptoms of TMJ dysfunction in children and young adults. *Am J Orthod Dentofacial Orthop*. 1987 Dec;92(6):467-77.
15. Santos ECA, Mendonça MR, Cuoghi OA, Pignatta LMB, Magalhães MVP, Bertoz AP. Disfunção temporomandibular em crianças: etiologia, diagnóstico e abordagens terapêuticas. *Rev Assoc Paul*. 2003 jul-set;1(3):15-20.
16. Santos ECA, Bertoz FA, Pignatta LMB, Arantes FA. Avaliação clínica de sinais e sintomas da disfunção temporomandibular em crianças. *Rev Dental Press Ortodod Ortop Facial*. 2006 jan-abr;11(2):29-34.
17. Soviero VM, Gama FVA, Castro LA, Bastos EPS, Souza IPR. Disfunção da articulação temporomandibular em crianças: revisão de literatura. *JBO*. 1997 maio-jun;2(9):49-52.

Submitted: September 2006

Revised and accepted: September 2008

**Contact address**

Patrícia Porto Loddi

Rua Conselheiro Lafayete, 760 Barcelona

CEP: 09.550-000 – São Caetano do Sul/SP, Brazil

E-mail: patricialoddi@hotmail.com