TEMPOROMANDIBULAR DYSFUNCTION AND THE EMOTIONAL STATUS OF 6-14 YEARS OLD SAUDI FEMALE CHILDREN

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أن الكثير من المقالات الطبية نشرت عن أمراض المفصل الفكي الصدغي لدى الأطفال الغربيين .
إن هذا البحث يرمي إلى تحديد مدى انتشار أمراض المفصل الفكي لدى عينة عشوائية من السعوديات بين ٦ — ١٤ سنة ويهدف أيضاً إلى تحديد فيما إذا كان هناك أي علاقة بين حدوث أمراض مفصل الفك والحالة النفسية لهؤلاء الأطفال .
٦٩٦ طفلة تم فحصهم عن طريق الفحص اليدوي لمفصل الفك والعضلات المتاخمة له لوجود أي آلام فيها وتسجيل أكبر مدى لفتح الفم وأن الكثير من المقالات الطبية نشرت عن أمراض المفصل الفكي الصدغي لدى الأطفال الغربيين .
النتيجة أظهرت أن (١ ر١٧ %) من هؤلاء الأطفال لديهم على الأقل ظاهرة واحدة من الظواهر التي تدل على اختلال في مفصل الفك .
الأصوات التي تصدر عن مفصل الفك كانت هي أكثر الظواهر انتشاراً (٩ ر١٣ %) يليها محدودية فتح الفم التي وجدت لدى (٦ر ٧ %) منهم في حين انحراف الفم وألام العضلات سجلت بدرجات قليلة .
من هنا نستطيع القول أن ظاهرة أمراض مفصل الفك هي أقل انتشاراً لدي البنات السعوديات عن غيرهم من الشعوب .
كذلك أثبتت النتائج أن الأطفال العصبيين هم الأكثر عرضة لأمراض مفصل الفك عن غيرهم من الأطفال . لذا فأننا نقترح أن يتم فحص الحالة النفسية عند بداية علاج هؤلاء الأطفال .

Interest in pediatric temporomandibular dysfunction (TMD) is increasing. Many studies on TMD prevalence among children in Western countries are available. This study aimed to assess the prevalence of TMD signs among randomly selected female Saudi children aged 6 to 14 years and to evaluate the effect, if any, of their emotional states on the development of TMD. The children (n = 696) underwent an examination which consisted of palpation of temporomandibular joints and associated musculature for tenderness, determination of the maximal vertical opening and deviation of the mandible upon opening. Results showed that 17.1% of the children had at least one sign of TMD with joint sounds being the most frequent sign (13.9%). Restricted mouth opening was second in frequency (7.6%). Deviation upon opening as well as muscle tenderness to palpation were found infrequently. The prevalence of TMD is lower in the Saudi children than in some Caucasian populations. The results further revealed that children with nervous emotional states had a greater risk of developing signs of TMD than calm children. Therefore, it is suggested that emotional factors should be taken in consideration when treating these children.

Introduction

Interest in pediatric temporomandibular dysfunction (TMD) is increasing, as younger patients are being diagnosed and treated for the disorder. Many studies on TMD prevalence in children populations in Western countries are available.[1-11] These studies show that the prevalence of TMD seems to vary among different populations and ethnic groups. The etiology of TMD in children and adolescents has also been shown to be multifactorial.[12,16] Malocclusion, oral parafunctions and emotional states are the factors mostly investigated in adults.[17,19] Few studies reported higher prevalence of TMD in children with traits of nervousness and anxiety.[14,15,20] However, the importance of the emotional states in children as an etiological factor for TMD continues to be an important area of investigation.

In Saudi children, one study is available on the prevalence of TMD in children with primary dentition.[21] There is lack of information regarding prevalence of TMD in the different age groups, predisposing factors as well as age of onset of TMD. Such information is important in determining whether early childhood problems

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can predispose patients to temporomandibular growth abnormalities. The purposes of this study were to record the prevalence of TMD among Saudi female children with mixed dentition and to evaluate the relationship between emotional states and development of TMD in the examined population.

Materials and Methods

Subjects

Examinations were performed on 696 Saudi female children with mixed dentition from age 6 to 14 years. The subjects were collected from eight girls' primary schools in Jeddah City. The city was divided into four geographical areas (North, South, East and West) and two schools were randomly selected from each area. In each school, four classes were randomly selected from grades 2 to 6. All the children with mixed dentition in each class were included in the study.

Examination

The examination and recording were made by three experienced faculty members. Prior to the study, the examiners were trained in temporomandibular examination criteria of previous studies[9-22-23] and calibrated to acceptable levels of reliability for assessing the variables covered by the examination. All the subjects were examined at the schools using two chairs. Examination was done while the child was seated upright during the examination. The clinical examination included the following aspects:

1. Joint sounds were recorded by digital palpation of the joint using middle and index fingers while the child was opening and closing her mouth. Joint sounds were recorded as clicking or crepitus. A stethoscope was not used due to the high incidence of false positive responses recorded by the stethoscope.[2] When different sounds were detected in each joint, the more progressive sign (crepitus) was assigned to that subject.
2. Temporomandibular Joint (TMJ) tenderness during opening and closing of mouth.
3. Muscle tenderness. Muscles (temporalis, masseter, and sternocleidomastoid) were palpated bilaterally with two fingers. Pain responses were recorded as present or absent. To avoid uncomfortable procedures, intraoral muscle palpation was excluded.
4. Maximum extent of vertical opening was measured, using Boley gauge, from maxillary to mandibular central incisor edges adjacent to the dental midline. The child was asked to open her mouth as wide as possible and the movement was repeated twice for confirmation and the highest value was recorded. The overbite value (mm) was added to the maximum incisal distance to obtain the maximum opening distance; while in cases of openbite, the inter-incisal distance value was subtracted from the measurement. The lower limit for normal opening in this age group was considered 40 mm.[20]
5. Deviation of mandible more than 2 mm from the midline plane during opening was recorded at approximately the midpoint as the subject opened to the maximum distance.

Questionnaire

After the examination, a questionnaire was sent to the parents to collect information regarding psychological qualities of the children. The parents were asked to classify the children into the following categories: calm, nervous or not applicable.

The Chi-Square Test was used for analysis of correlations and differences between groups for the recorded variables. Fisher Exact Test was used for comparison whenever the comparable groups have a sample size smaller than five. P value of < 0.05 was regarded as significant.

Results

Table 1 shows the distribution of different signs of TMD in the examined children. To make a more meaningful comparison, the children were divided into three groups: 6-8, 9-11 and 12 to 14 years of age. The prevalence of dysfunction as determined by the presence of one or more of the five cardinal signs was 17.1% in the entire population. The prevalence increased slightly from the youngest age group (16.6%) to the oldest age group (18.9%). This difference was not statistically significant.

(2.4%) as was muscle tenderness to palpation (1.0%). It was not possible to measure the maximal opening for some children who had no anterior teeth due to normal exfoliation process and they were excluded from this part of the study. The maximal opening values found ranged from 31 mm to 54 mm with a mean value (±SD) of 49.1 mm ± 5.2. The means of maximal opening gradually increased with age as shown in Fig. 1. After excluding the children with missing anterior teeth (n = 144), restricted opening was recorded in 7.6% of the remaining sample.

Table 1. Distribution of signs of TMD by age.

Age group (years)	n	At Least One Sign		Joint Sounds		TMJ Tenderness		Muscle Tenderness		Opening Deviation		Restricted Opening	
		n	%	n	%	n	%	n	%	n	%	n	%
6-8	313	**52**	16.6	**41**	13.1	**7**	**2.2**	**4**	**1.3**	**9**	**2.9**	23/178*	12.9
9-11	330	**57**	17.3	**48**	14.5	**17**	**5.2**	**3**	**0.9**	**7**	**2.1**	16/321*	**4.9**
12-14	53	**10**	18.9	**8**	15.1	**4**	**7.5**	**0**	**0**	**1**	**1.9**	3/53*	5.7*
Total	**696**	**119**	**17.1**	**97**	**13.9**	**28**	**4.0**	**7**	**1.0**	**17**	**2.4**	**42/552***	**7.6**

•0.01 < P<0.05
*n and Percentage after excluding children with missing anterior teeth

Joint sounds were the most prevalent sign among the children. Clicking was overwhelmingly the most common joint sound produced by 88 (12.6%) children. Crepitus was detected in 9 (1.3%) children. Although not statistically significant, joint sounds were observed at a higher frequency in the oldest age group compared to the youngest age group; and no crepitus was observed in the youngest age group. Restricted mouth opening was second in frequency (7.6%). The prevalence of this sign showed statistically significant difference between the youngest (12.9%) and the oldest (5.7%) age groups. (X^2= 1.78, df - 2, P=0.03). Joint tenderness was third in frequency. It occurred more frequently in the oldest age group than in the youngest group. This difference was marginally significant (P < 0.06). Deviation upon opening was found infrequently

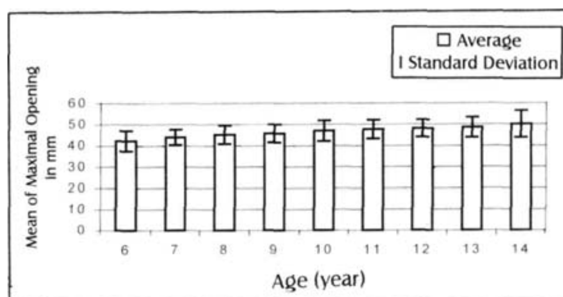

Fig. 1. Distribution of maximal vertical opening according to age.

Out of 696 parents who received the questionnaires; only 404 (58%) responded. On the basis of the responses, the children were divided into two groups: (1) subjects rated as calm (N = 190), and (2) subjects rated as tense or nervous (N = 208). Responses from six parents whose answers didnt fall in these two categories were excluded from the analysis.

Table 2. Prevalence of signs of TMD in the different emotional groups.

Signs of **TMD**	**Calm** n = 190		**Nervous** n = 208		**P Value**	**Total** n = 398	
	n	%	**n**	%		**n**	%
At least one sign	28	14.7	28	13.5	NS	56	14.1
Joint sounds	21	11.1	19	9.1	NS	40	10.1
TMJ tenderness	1	0.6	11	5.3	•	12	3.0
Muscle tenderness	0	0	3	1.4	**NS**	3	0.7
Restricted opening	12/150*	8	7/146*	4.8	**NS**	19/296*	6.4
Opening deviation	5	2.6	4	1.9	**NS**	9	2.3

*n and Percentage after excluding children with missing anterior teeth

P Value NS = non-significant, * 0.01 < P < 0.01

Table 2 reveals the distribution of the different signs of TMD among the two emotional status groups. Using Fisher Exact Test, the differences in the prevalence of TMJ between the two groups was statistically significant (P = .007). TMJ tenderness occurs more frequently in the nervous than in the calm group. Statistically significant differences between the two groups were not found with respect to other signs of TMD.

Discussion

The sample of the present study consisted of randomly selected Saudi female children aged 6-14 years old in the mixed dentition period. While strong differences in the prevalence of TMD were noted between races,[11] most of the studies reported no significant differences in TMD between the sexes.[5,6-11,24] Therefore, although the results are from female subjects only, they can be compared to these previous studies. One or more signs of TMD were observed in 17.1% of the total sample which is much lower than the findings of some earlier studies.[5,6,8,10] The prevalence of at least one sign increased slightly with age, in agreement with many of the studies done on different age groups.[4,5] Alamoudi et al[21] found a prevalence of 16.5% for TMD in Saudi children with primary dentition. The author's results of 17.1% therefore suggest an increase in prevalence from primary to mixed dentition. Morphological changes of the TMJ and jaw development as well as occlusal changes may be responsible for these observations. TMJ sound were the most frequently observed sign with significantly more cases in clicking than crepitus. These results are in accordance with data published by earlier authors.[6,7,10] Sounds occurred in 13.1% of the younger group and in 15.1% of the older ones. These results are consistent with that of Williamson[1] and Ogura[7] (Table 3), are slightly higher than the figures by Nilner[2] and Brandt[3] but much lower than Gazit,[6] Grosfeld[4] and Kritsineli[10] who used a stethoscope to detect joint sound. Dworkin et al[25] used digital palpation and a stethoscope to detect joint sound and reported that detecting specific joint sound using a stethoscope resulted in unacceptable reliability. Okeson and O'Donnell[26] in their temporomandibular evaluation workshop considered the use of stethoscope to be of questionable value since it may magnify insignificant joint sounds.

TMJ tenderness in the present sample is lower than the reports of the studies, which included samples of older age groups.[1-4-6] Limited mouth opening was recorded in 7.6% of the present sample in which 40 mm was considered

the lower limit of maximal opening for children with mixed dentition as suggested by Okeson and O'Donnell.[26] The prevalence of restricted opening in the present study is relatively high in comparison to the studies that considered 35 mm as the lower limit.[2,4,10] The average measurement of the amplitude of opening (49.1 mm) is relatively lower than the average data of the same age group published by Grosfeld[4] (51. 8mm) and Vanderas[15] (54.8 mm). Restricted opening was significantly more apparent among the younger age group than the older one which could be due to inability of children younger than 8 years old to open as wide as the older ones. Therefore, for this age group (6-8 years) the lower limit of physiologic function could be placed at 35 mm.

The recording of deviation on opening was recorded at approximately the midpoint of maximal opening since some children open with their mandible following S-shaped trajectories and yet reach the maximal opening in an undeviated position.[22] In the present investigation, this sign of dysfunction occurred less than what other studies reported earlier. (Table 3)

Table 3. Cross-study comparison of TMD sign prevalence in children.

Study (Year)	Sample Size	Age (Years)	TMJ Sounds	TMJ Tenderness	Muscle Tenderness	Restricted Opening	Opening Deviation
Williamson (1997)[1]	304	6-16	16	**32**	31	NR	NR
Nilneretal(1981)[2]	440	7-14	8	39	64	1	14
Brandt (1985)[3]	1342	6-17	9	**7**	18	7	21.4
Gazitetal(1984)[6]	369	10-18	35.8+	30.4	20.3	1.6	6
Grosfeld(1985)[4]	400	15-18	31.7+	**27**	16.3	None	6
Oqura(1985)[7]	2198	6-18	10	**9**	**2**	NR	NR
Kritsineli (1992)[10]	40	Mixed dentition	65+	**5**	**7.5**	None	12.5
Present Study	696	(6-14) mixed dentition	13.9	**4**	**1**	7.6	2.4

NR Parameter not reported
f Stethoscope used to detect joint sounds

Several authors reported that psychological stressors cause increased muscle activity and that TMD patients respond to stressors with increased and prolonged masticatory muscle tension.[27,29] This study showed statistically significant differences in the prevalence of TMJ tenderness between the calm and nervous children. The present findings agree closely with that reported by Vanderas.[15] The fact that no statistically significant differences related to TMJ sounds or dysfunction in the mandibular movement were found between the two groups might be explained by the mechanisms through which the emotional factors act on the masticatory system. It is suggested that pain and dysfunction arise from increased muscle tension caused by emotional factors.[30,31] The tenderness among the nervous group in this study might not be severe enough to cause deflection of the mandible or restriction of the mandibular movements. Furthermore, high adaptability of the masticatory system of the young children could mask the development of other signs of dysfunction among the nervous group.

Conclusion

The results of this study showed that the prevalence of TMD among female Saudi children is relatively lower than in Western children with joint sound being the most frequent sign. The present findings also suggest that children in emotional states run a greater risk of developing TMD signs.

References

1. Williamson EH. Temporomandibular dysfunction in pre-treatment adolescent patients. Am J Ortho 1977;72:429-433.

2. Nilner M and Lassing SA. Prevalence of functional disturbances and diseases of the stomatognathic system in 7-14 year olds. Swed Dent J 1981;5:173-87.
3. Brandt J. Temporomandibular disorders and their association with morphologic malocclusion in children in developmental aspects of TMJ disorders, Carlson DS et al. Eds, monograph 16, Craniofacial Growth Series, Ann Arbor; University of Michigan, 1985,279-88.
4. Grosfeld O, Jackowska M and Czarnecka B. Results of epidemiological examinations of the temporomandibular joint in adolescents and young adults. J Oral Rehab 1985;12:95-105.
5. Egermark-Eriksson I, Carlsson GE and Ingervall B. Prevalence of mandibular dysfunction and orofacial parafunction in 7-, 11-and 15-year old Swedish children. Eur J of Orthod 1981; 3:163-72
6. Gazit E, Lieberman M, Eini R and Hirsch N et al. Prevalence of mandibular dysfunction in 10 to 18-year-old Israeli schoolchildren. J Oral Rehabil 1984; 11:307-17.
7. Ogura T, Morinushi T, Ohno H and Sumi K et al. An epidemiological study of TMJ dysfunction syndrome in adolescents. J Pedod 1985;10:22-35.
8. Bernal M and Tsamtsouris A. Signs and symptoms of TMJ dysfunction in 3 to 5-year -old children. J Pedod 1986;10:127-40.
9. Goho C and Jones HL. Association between primary dentition wear and clinical temporomandibular dysfunction signs. Pediatr Dent 1991;13:263-66.
10. Kritsineli M and Shim YS. Malocclusion, body posture and temporomandibular disorder in children with primary and mixed dentition. J Clin Ped Dent 1992;16:86-93.
11. Widmalam SE, Christiansen RL, Gunn SM and Hawley LM. Prevalence of signs and symptoms of craniomandibular disorders and orofacial parafunction in 4-6 year old African, American and Caucasian children. J Oral Rehabil 1995; 22:87-93
12. Egermark-Eriksson I, Ingervall B and Carlsson GE. The dependence of mandibular dysfunction in children on functional and morphologic malocclusion. Am J Orthod 1983; 83:187-94.
13. Egermark-Eriksson I, Carlsson GE and Magnusson T. A longitudinal study on malocclusion in relation to signs and symptoms of craniomandibular disorders in children and adolescents. Eur J Orthod 1990;12:399-407.
14. Vanderas AP. An epidemiologic approach to the etiologic factors of craniomandibular dysfunction in children and adolescents. The host agent model. J Craniomand Pract 1988;6:172-178.
15. Vanderas AP. Prevalence of craniomandibular dysfunction in white children with different emotional states. Part Mi. A comparative study. J Dent Child 1992;59:23-27.
16. Vanderas AP. Relationship between craniomandibular dysfunction in children and adolescents: A review. Pediatr Dent 1993; 15:317-22.
17. Perry HT, Lammie GA and Main J. Occlusion in a stress situation. J Am Dent Assoc 1960; 60:626-633.
18. Mohlin B, Ingervall B and Thilander B. Relation between malocclusion and mandibular dysfunction in Swedish men. Eur J Orthod 1980;2:229-38.
19. Parker MW. A dynamic model of etiology in temporomandibular disorders. JADA 1990; 120:283-90.
20. Egermark-Eriksson I. Mandibular dysfunction in children and individuals with dual bite. Swed Dent J 1982; Supp 10.
21. Alamoudi N, Farsi N, Salako N and Feteih R. Temporomandibular disorders among school children in Jeddah, Saudi Arabia. Accepted for publication in J Clinical Ped Dent.
22. Gross A and Gale EN. Prevalence study of the clinical signs associated with mandibular dysfunction. J Am Dent Assoc 1983; 107: 932-36.
23. Adair SM and Hecht C. Association of generalized joint hypermobility with history, signs and symptoms of temporomandibular joint dysfunction in children. Pediatr Dent 1993;15:323-26.
24. Nilner M. Relationships between oral parafunctions and functional disturbances and diseases of the stomatognathic system among children aged 7-14 years. Acta Odontol Scand 1983;41:167-172.
25. Dworkin SF, Kimberly HH, Le Resche L and Vonkroff M et al. Epidemiology of signs and symptoms in temporomandibular disorders. Clinical signs in cases and control JADA 1990;120:273-81.
26. Okeson JP and O'DonnellJ. Temporomandibular disorders in children. Pediatr Dent 1989;11:325-29.
27. Haber JD, Moss RA, Kuczmierczyk AR and Garrett JC. Assessment and treatment of stress in myofascial pain-dysfunction syndrome: a model for analysis. J Oral Rehabil 1983;10:187-96.
28. Yemm R. A neurophysiological approach to the pathology and etiology of temporomandibular dysfunction. J Oral Rehabil 1985;12:343-53.
29. Dahlstrom L. Electromyographic studies of craniomandibular disorders: a review of the literature. J Oral Rehabil 1989;16:1-20.
30. Yemm R. Neurophysiologic studies of temporomandibular joint dysfunction. Oral Sci Rev 1976;1:31-53.
31. Rugh JD and Soldberg WK. Phsychological implications in temporomandibular pain and dysfunction. Oral Sci Rev 1976;1:3-20.