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Assessment of Children's Temporomandibular Joint Sounds and Ear Pain Associated with Teeth Bruxism

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Abstract **Original Research Article**

Temporomandibular joint (TMJ) sounds in children are frequent with TMJ disorder. In addition to many different findings are designed to assess the relationship between ear pain and TMJ sound with bruxism in children. ***Aim:*** This study was designed to evaluate the possible relationship between ear pain and joint sound with bruxism in children. ***Subjects and Methods:*** The sample comprised 60 schoolchildren participants between 6 to 10 years of age, of whom 30 children with bruxism as study group G1 and another 30 without bruxism as a control group G2 who were scheduled and randomly selected for this study. Examiner performed assessment who was blinded allocation of the groups. Three readings were performed on each participant. The assessment involved (manual palpation, lateral and dorsal extra-auricular auscultation of TMJ by stethoscope for detecting joint sounds, differentiating between joint sounds) Collected data were checked, entered, and statistically analyzed to test different variables by chi-square test with the level of significance ($p< 0.05$). ***Results:*** There was a statistically significant association between joint sounds regarding bruxism and age, which showed that higher prevalence rates of joint sounds were found in children aged eight to ten years in comparison to those aged six and seven years. However, there was a statistically insignificant association between joint sounds and type in relation to gender and ear pain. ***Conclusion:*** The bruxism in children may be associated with the symptoms of joint sounds with the significant association regarding age but insignificant with ear pain.

Keywords: bruxism; TMJ disorder, TMJ sound; temporomandibular joint.

INTRODUCTION

The TMJ disorder prevalence with a frequency ranging up to 68% of population [1-3]. The TMJ disorder prevalence is variated from center to center and from country to another depending on the type of evaluation and diagnosis methods of TMJ disorder that is beside another variation such as sample size selection, the age of group heterogeneity, and difference in the method of examination used in each study [1, 4, 5]. The primary and mixed dentition relationship and TMJ disorders in children aged 4 years were evaluated by [6] who observed that the signs and symptoms such as pain in TMJ area, palpatory tenderness in TMJ, headache, joint sound, limited mouth opening, deviation-deflection, masticatory muscle tenderness were increased from the primary to the mixed dentition group. Unfortunately, the differences were not significant between the two groups except for joint sounds, which were more prominent in the mixed dentition group [7] suggested that the prevalence of TMJ disorder increased by increasing the age was evident but without statistically significant results ($P<0.12$), it was 3.5% in 12 years age group and1.6% for the 9 years age group. Females were affected eight times more than the males; 4.8% to 6%. Children belonging to urban backgrounds were affected more than rural children. However, it is statically not significant [8], found that TMJ disorder prevalence in adolescents with emotional stress those who were considered nervous or tense had a higher probability to develop TMJ disorder. Moreover, the girls were significantly developing TMJ disorder than boys and the older aged had a higher probability of developing TMJ disorder [9]. In Brazil, adolescents showed a significantly higher prevalence of symptoms in girls more than boys [10]. TMJ disorder symptoms such as myofascial pain and disc displacement (10.3%) of symptoms were the myofunctional pain which appears the more prevalent symptom, followed by disc

displacement with reduction arthralgia, and myofascial pain with opening limitations and otologic symptoms but on the other side, tense or nervousness is considered the most common symptom [10, 11]. The otologic symptoms risk such as ear pain, vertigo, tinnitus, and hearing loss are considered greater in patients with TMJ and masticatory pain on palpation and cervical muscles, as well as pain during mouth opening [12, 13].

Around 90% of the population have bruxism which is a very common condition [14] Bruxism is defined as: (a repetitive jaw muscle activity characterized by clenching or grinding of the teeth and/or by bracing or thrusting of the mandible) [15]. The International Classification of Sleep Disorders (ICSD) defined sleep bruxism within the category of parasomnias or disorders that (intrude on sleep but are not associated with complaints of insomnia or sleepiness as a stereotyped movement disorder characterized by grinding or clenching of the teeth during sleep) [16]. In 2005, ICSD, categorized sleep bruxism as a sleep-related movement disorder and defined it as an (oral parafunctional activity characterized by tooth grinding or jaw clenching during sleep, usually associated with sleep arousals) [17]. ICSD recently updated the definition of general bruxism as: (A repetitive jaw-muscle activity characterized by clenching or grinding of the teeth and/or by bracing or thrusting of the mandible) [18]. Bruxism is a parafunctional activity with harmful effects on the teeth temporomandibular joint, masticatory muscles periodontium, and teeth which is commonly found in adolescents who have psychological effects [19, 20]. The bruxism consequences have a direct relation to the masticatory muscles changes which are often associated with joint pain and discomfort, along with chewing difficulty, sometimes joint luxation, uncoordinated jaw movement with joint degenerative alterations associated with joint sounds [21, 22]. Bruxism is a rhythmic contraction of the jaw-closing muscles which produces tooth movement without any awareness of the patient, this movement has two types of different etiopathogenesis which are asleep and awake [14, 24, 25]. Repetitive sleep bruxism movement disorder is primarily characterized by rhythmic masticatory muscle activity with occasional tooth grinding and is associated with brief cardiac and brain reactivation [26] but awake bruxism is predisposed with psychosocial factors which is characterized by only clenching type activity [27]. Sounds classification of TMJ joint are proposed which takes into account the sounds nature of as a single, explosive noise (click or pop) or a continuous noise (crepitus), the quality of sound (hard or soft), their positions in relation to the mandibular movement (near, middle or wide) and whether the sounds occur on opening or closing of the jaws. There is the consensus of clicks are generally the result of the impact between the condyle of the mandible and the TMJ temporal component after its rapid passage through the posterior band of the joint disc [28] but Crepitus is often found in most of the advanced stages of TMJ disorder associated with a degenerative condition[29].

However, many studies have explained sounds in the TMJ are frequent in children with TMJ disorder [30, 31]. Moreover, divergent findings are reported to demonstrate the relationship between bruxism, ear pain, and TMJ disorder in children [32]. Considering the consequences of these aspects to the TMJ, the present study was conducted to investigate the possible relationship between bruxism, joint sounds, and ear pain in children.

SUBJECTS AND METHODS

According to World Medical Association, [33], the study population was designed and ethical local institutional approval for the study sample comprised 60 participants aged from six to ten years, scheduled for treatment at (Outpatient Clinics, Zagazig University Hospital, Egypt). Patients with debilitating diseases or neurological disorders, with any type of malocclusion, undergoing orthodontic treatment of orofacial asymmetry, or who were audiological examined for possible ear infections were excluded from the study. All participants have Angle Class I occlusal relationship as inclusion criteria. According to the criteria of the American Academy of Sleep Medicine [18], the first group (G1) was composed of 30 children with some sign of bruxism. Another group (G2) consisted of 30 children with no signs or symptoms of bruxism randomly selected. All parents or legal guardians received adequate information and written consent to participate in the study.

Joint sounds analysis

1-Unfortunately, joint sounds were analyzed by the occurrence of a joint sound (click/pop and crepitus) through lateral and dorsal extra-auricular exams. Digital palpation of both TMJs was performed along with auscultation by stethoscope with diaphragm-endpiece. Digital palpation is valuable in the irregular TMJ movement's detection due to displacement of the disc [34, 35] and it is a valuable complement to auscultation but is not recording the same variable. 2- To detect the presence or absence of joint sounds and classify joint sounds and their type, the participants were asked several times to open and close their mouth. Each child performed the different movements at least three times. 3- When one or more signs were detected by auscultation, the child was classified as positive for joint sounds. The assessment involved (manual palpation, lateral and dorsal extra-auricular auscultation of TMJ by stethoscope for detecting joint sounds, differentiating between joint sounds as a click/pop or crepitation) Three readings were performed on each participant. The results were collected, tabulated, entered, and analyzed by using SPSS (version 22) and presented as a quantitative variable. Chi-Square test used for detecting distribution that is expected between

different variables (bruxism, age, ear pain and sex) to presence and type of TMJ sounds and ear pain.

RESULT

All data extracted from patients were collected, tabulated, entered and analyzed by using SPSS (version 21) and presented as a quantitative variable. Chi-Square test used for detecting distribution that is expected between different variables (bruxism, age, ear pain and sex) to presence and type of TMJ sounds $p<0.05$. However, a significant relation was found regarding age because that a greater percentage of children at eight to ten years of age had joint sounds and a lesser percentage at six to seven years of age ($P<0.05$).

Table-1: Distribution of joint sounds according to sex

			Present Joint sounds	Absent Joint sounds	Total	p-value
Sex	Male	n	9	17	26	0.3326
		%	34.62%	65.38%	43.33%	
	Female	n	16	18	34	
		%	47.06%	52.94%	56.67%	
Total		n	25	35	60	
		%	41.67%	58.33%	100%	

$X2^x$ test = 0.9386

Statistically insignificant ($p>0.05$)

Table 2: Distribution of joint sounds according to age

			Present of Joint sounds	Absent of Joint sounds	Total	p-value
Age	6 years	n	4	18	22	0.007015*
		%	18.18%	81.82%	36.66%	
	7 years	n	1	6	7	
		%	14.29%	85.71%	11.67%	
	8 years	n	7	4	11	
		%	63.64%	36.36%	18.33%	
	9 years	n	9	4	13	
		%	69.23%	30.77%	21.67%	
	10 years	n	4	3	7	
		%	57.14%	42.86%	11.67%	
Total		n	25	35	60	
		%	41.67%	58.33%	100%	

$X2^x$ test = 14.0893

*statistically significant ($p<0.05$)

Table-3: Distribution of bruxism and joint sounds

Bruxism		Presence of Joint sounds	Absent of Joint sounds	Total	p-value
G1) with Bruxism	n	17	13	30	0.0184*
	%	56.67%	43.33%	50%	
(G2) without Bruxism	n	8	22	30	
	%	26.67%	73.33%	50%	
Total	n	25	35	60	
	%	41.67%	58.33%	100%	

X^2 test = 5.5543

Statistically significant ($p<0.05$)

Table-4: Distribution of joint sound's type according to sex

			Type of joint sound		Total	p-value
			Click/ pop	Crepitus		
Sex	Male	n	7	2	9	0.3326
		%	31.82%	66.67%	36%	
	Female	n	15	1	16	
		%	68.18%	33.33%	64%	
Total		n	22	3	25	
		%	88%	12%	100%	

$X2^x$ test = 1.3915

Statistically insignificant ($p>0.05$)

(Table 3,4): shows that 45% (n=25) of children had joint sounds and 55% (n=35) of them exhibited no sounds during any clinical examination. There was association between the joint sounds and bruxism which showed statically significant p<0.05. However, those who had joint sound was 88% (n=22) exhibited a click/pop and 12% (n=3) exhibited crepitus with statically insignificant correlation with gender (P>0.05).

Table-5: Distribution of bruxism and ear pain

Bruxism		Presence of ear pain	Absent of ear pain	Total	p-value
G1) with Bruxism	n	3	27	30	0. 3006*
	%	10%	90%	50%	
(G2) without Bruxism	n	1	29	30	
	%	3.33%	66.67%	50%	
Total	n	4	56	60	
	%	6.67%	93.33%	100%	

$X^{2}x$ test = 1.0714

Statistically insignificant (p>0.05)

(Table 5): shows that 10% (n=3) of children with bruxism had ear pain and 90% (n=27) of them exhibited no ear pain during any clinical examination but no one of patients without bruxism have ear pain except one patient. Results revealed a statically insignificant correlation between the presence of bruxism and ear pain (P>0.05).

DISCUSSION

The lack of relation between TMJ dysfunction and clicking does not mean that variable is not important, the main methods used in recording TMJ sound are palpation and auscultation with or without a stethoscope [36, 37]. During palpation, the low-frequency vibrations of high amplitude may be possibly felt and heard. However, the human ear is most sensitive for vibrations in the range 1000-3000 Hz that most probably cannot be felt by palpation. TMJ sound frequencies involved in that range and higher [38, 39] and without auscultation pass unnoticed at palpation. Therefore, palpation cannot replace auscultation in the recording of TMJ sound. TMJ sounds can sometimes be heard with the naked ear. In the present study, it could not be heard without the help of a stethoscope. The stethoscope does not amplify the sound but passes it to be possible for the examiner to hear the sound about as well as if he listens with the naked ear touching the skin over the TMJ area. Avoiding touching the patient was actually the original rationale for using a stethoscope. Moreover, not all stethoscopes are the same and it is important to select one of high quality for all examinations if comparisons between recordings are done [40, 41]. Joint pain, occasional headaches and sound produced by bruxism that explained by overloading the temporomandibular joint [42-48], and more precisely by shear stresses in the articular disc, which constitute the source of the damage induced to chondrocytes [49]. Earache complaints may have a variety of causes which can be musculoskeletal disorders involving the cervical spine, TMJ, and its related muscles and ear. The results of the previous study have shown that 40.9% of elderly patients with earache complaints have TMJD which can explain than ear pain is not prominent in younger age due to it associated with a degenerative condition that appears more progressive in elder age [28, 32] Joint sounds are related to functional and/or structural changes in the TMJ biomechanics which may be indicative of degeneration of the joint [28, 32, 50]. Many studies suggest a strong relationship between bruxism and TMJ disorder [51]. TMD often results in pain, joint sounds and limited condyle movements when opening and closing the mouth [52]. In epidemiological investigations, TMJ sound is a frequently reported symptom and a clinically proven sign [3]. However, divergent findings are reported regarding joint sounds in individuals with bruxism. In our study, parafunctional activity can be explained a significant which was found between both conditions, which is common in children and alters the TMJ movements and its functions that totally agreed with [52]. Multiple clinical exams confirmed that many children were aware of sounds in the TMJ [46]. Other authors reported that the more severity degree of bruxism the more increase in the frequency of joint sounds [53] and that joint sounds are a significant predictor sign of TMJ disorder [54]. Sleep bruxism may be one of the factors of TMJ disorder [55, 56] found a correlation between sounds in the TMJ and bruxism. In the present study, joint sounds were associated with an increase in age, especially over eight years. These sounds stem from changes in the shape of the TMJ that begin to occur at approximately six years of age [32]. The clicking sound occurs due to changes in the joint disc location in the temporal bone fossa, indicating that the disc was in a forward position and returned to its correct position during the vertical jaw movement [28] but until now, it is unknown whether joint sounds subsequently develop TMJ disorder as pathological symptoms [32]. The prevalence of bruxism increases significantly with increasing age [57]. The present study confirmed that TMJ sounds prevalence increases with increasing age which occur with high prevalence after 6 years. Other studies, suggested that TMJ sounds occur with high prevalence already in children with 4 years old to 6

years old [58, 59] and that are significantly associated with other signs of TMJ dysfunction and pain [60] who reported that very few children with 5 years old have joint sounds without palpation tenderness. The crepitus sounds with a low prevalence of this joint noise in children explained by it often occurs in cases of osteoarthrosis of the TMJ that is very rare in children [28, 53, 61]. It is difficult to make sensitive and accurate comparisons due to variations between studies in recording methods, demographic characteristics, and definition of variables that are significantly associated with a high number of other signs of TMJ dysfunction and related pain.

CONCLUSION

The rates of joint sounds were found in children elder aged more than younger aged. The main value of this study is that demonstrates a possible association between bruxism, ear pain, and joint sounds in children which our clinical relevance finding suggests this direct relation between bruxism in children and the severity and progression of joint sound symptoms. On the opposite side, there is no correlation between bruxism and ear pain symptoms, especially in children as the degenerative condition appears more progressive in elder age.

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