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EVALUATE THE ASSOCIATION BETWEEN OTALGIA, TINNITUS AND TEMPOROMANDIBULAR JOINT DYSFUNACTION

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ABSTRACT

Background: The temporomandibular joint is closely related anatomically to the external acoustic meatus and clinical conditions of the joint may produce symptoms of pain that must be distinguished from those directly associated with the ear. Temporomandibular dysfunction (TMD) is defined as a group of conditions characterized by pain or dysfunction in the temporomandibular joint (TMJ) and masticatory muscles, restrictive, jaw movements and TMJ sound. The patients with temporomandibular disorders may also complain of aural symptoms such as otalgia, tinnitus, vertigo and impaired hearing**. Objectives:** The purpose of the study was to evaluate the Association between Otalgia, tinnitus and temporomandibular joint dysfunction. **Patients and methods:** This prospective clinical study was carried out on 50 temporomandibular dysfunction patients diagnosed in the department of otolaryngology Head and Neck surgery in Ain Shams teaching hospital., 7male and 43 female. This study conducted at 25\9 \2014 to 20\3 \2015. **Results: the most otological symptom in** temporomandibular joint dysfunction otalgia in (74%) and tinnitus (50%) .also shows significant difference among headache as regard otalgia, tinnitus, with p-value, 0.042 and 0.022, respectively and . statistically significant difference among myofacial pain as regard otalgia, tinnitus, with p-value, 0.032, 0.032; respectively using Chi-square test. **Conclusions:** The findings of this study indicate a high Prevalence of otologic symptoms in patients with TMDs. Most signs and symptom occur in females due to hormonal, psychological and physiological factors. The close embryological, anatomical and functional relationships between the temporomandibular joint and the middle ear may explain the link between aural symptoms and TMD severity.

KEYWORDS: Temporomandibular joint dysfunction, otalgia, tinnitus, myofacial pain.

INTRODUCTION

The temporomandibular joint (TMJ) is one of the most frequently used joints of the human body. It is used when speaking, chewing, yawning, swallowing and other activities during the day and even in sleep. The frequency of movement is assessed as approximately 1500–2000 times a day ***(Magee, 2002).***

The etiology of temporomandibular disorders (TMDs) is multidimensional. Biomechanical, neuromuscular, biopsychosocial and neurobiological factors may contribute to the disorder ***(Suvinen et al., 2005).***

These factors are classified as predisposing (structural, metabolic and/or psychologic conditions), initiating (e.g. trauma or repetitive adverse loading of the masticatory system) and aggravating (parafunction, hormonal, or psychosocial factors) to emphasize their role in the progression of TMD ***(Koray et al., 2009).***

Temporomandibular dysfunction (TMD) is defined as a group of conditions characterized by pain or dysfunction in the temporomandibular joint (TMJ) and masticatory muscles, restrictive, jaw movements and TMJ sound. Temporomandibular joint signs and symptoms may be correlated with patient's general health, head posture, chewing efficiency complete denture and occlusal conditions. It may by more intensive in elderly patients ***(Hotta et al., 2008).***

The patients with temporomandibular disorders may also complain of aural symptoms such as otalgia, tinnitus, vertigo and impaired hearing ***(DeFelacio, 2008).***

Different terms have since been introduced, such as "TMJ pain syndrome" by Schwartz and "myofascial pain and dysfunction syndrome" (MPD) by Laskin. In more recent reports, the terms "craniocervical-mandibular syndrome," "temporomandibular disorders" (TMD), and "craniomandibular disorders" were coined to describe this condition ***(Tuz et al., 2003).***

These terms indicate that various complaints in adjacent anatomic structures, such as the ear, mandible, face, head, and neck, can be associated with TMD. The ear is supplied by many innervations, including the trigeminal (V), facial (VII), glossopharyngeal (IX), and vagus (X) nerves, as well as the autonomic nerves. The TMJ is innervated by V and VII, and cranial nerves with communicating branches (such as chorda tympani) that pass very close to ear structures ***(Tuz et al., 2003).***

Several pathophysiological mechanisms have been proposed in the literature to explain the aural symptoms reported by TMD patients. These are spasms in the masticatory muscles associated with a dysfunction of the tensor tympani and tensor palatinus muscles, dysfunction of the auditory tube, interference in the petrotympanic fissure and tension in the anterior malleolar ligament through spheno-mandibular ligament ***(Gurel et al., 2010).***

PATIENTS AND METHODS

This prospective clinical study was carried out on 50 temporomandibular dysfunction patients diagnosed in the department of otolaryngology Head and Neck surgery in Ain Shams teaching hospital.

Inclusion criteria

The study population consisted of (50) patients from both genders above 20 years old, referred to the department of otolaryngology, Head and Neck surgery in Buquba teaching hospital complaining from possible Temporomandibular joint dysfunction symptoms such as myofascial pain, headache and internal derangement associated with one or more aural complain such as tinnitus, otalgia,. If examination is suggestive of the condition Temporomandibular joint magnetic resonance images was taken to. evaluation of the temporomandibular joint with defining different degrees of derangement. The pretreatment data on otological complain for these 50 TMD patients was included.

- **Full ENT History:** *History of* Otalgia –Tinnitus Ototoxic agents

- **Full ENT examination:** Inspection: Inspect auricles and mastoid region: Size, shape, symmetry,- Landmarks, color, position,- Deformities or lesions -Inspect external auditory canal (with pneumatic otoscopy): - Cerumen, color, lesions, **Tuning-fork tests** Weber's test, Rinne's tes. Full TMJ history and examination.

Radiological imaging: magnetic resonance images for evaluation of the temporomandibular joint with defining different staging of disk position.

RESULTS

Table 1: Distribution of the studied group as regard general data and age.

Variables	No	%
Gender		
Male	7	14%
Females	43	86%
Age		
Mean (±SD)	31+5.6 (20-42)	

This table shows that patients in males (14%) and females (86%) of sex and this table shows age (years) there was mean (31±5.6) and ranged (20-42) of the study patients.

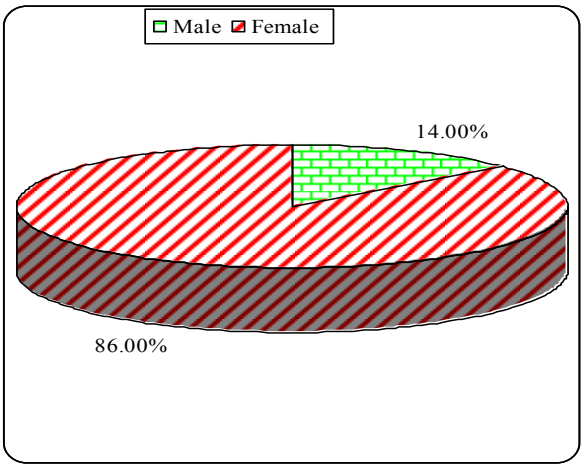

Fig. (1): Distribution of the studied group as regard general data.

Table (2): Distribution of the studied group as regard presenting symptoms.

Variables	No	%
Headache	40	80
Myofacial pain	43	85
Radiological finding (internal derangement)	22	44

This table shows that the headache (80%) and non headache (20%) of the study patients.
The myofacial pain was (85%) and non myofacial pain was (15%) of the study patients.
This table shows that the Internal derangement (44%) and Non internal derangement (56%) of the study patients.

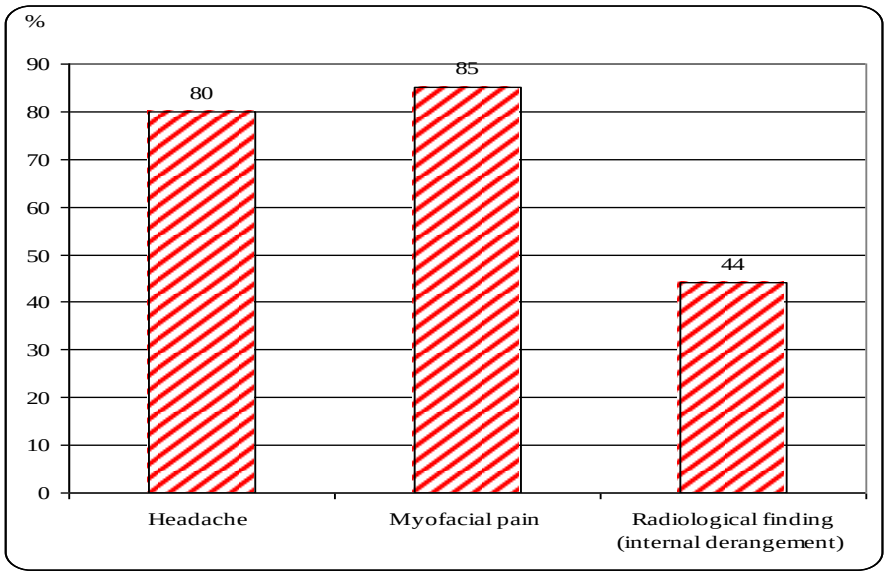

Fig. (2): Distribution of the studied group as regard presenting symptoms.

Table (3): Distribution of the studied group as regarding radiological finding in the MRI of TMJ.

Variables	No	%
N	28	56
I	4	8
II	5	10
III	5	10
IV	8	16
V	0	0

This table shows that the normal disk position occur in (56%) of radiological examination and (44%) presented with internal derangement of TMJ mostly occur in stage IV.

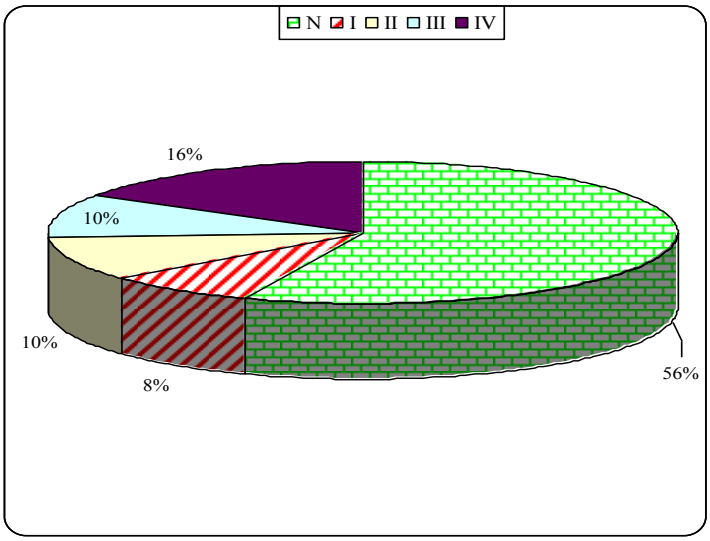

Fig. (3): Distribution of the studied group as regarding radiological finding in the MRI of TMJ.

Table (4): Distribution of the studied group as regard aural symptoms.

Variables	No	%
Otalgia	37	74.0
Tinnitus	25	50.0

This table shows that the aural symptoms otalgia (74%) and tinnitus (50%)

Table (5): Relation between normal disk position and internal deraignment on the TMJ versus aural symptoms.

Variables		Normal (n=28)		Internal derangement (n=22)		Chi-square test	
		No.	%	No.	%	x^2	p-value
Otalgia	No	13	46.4	0	0.0	11.49	<0.001 (HS)
	Yes	15	53.6	22	100.0		
Tinnitus	No	20	71.4	5	22.7	9.82	<0.001 (HS)
	Yes	8	28.6	17	77.3		

This table shows highly statistically significant difference among normal and internal derangement according to otalgia and tinnitus p-value (<0.001)

Table (6): Relation between difference stage of internal derangement in the right side of TMJ and aural symptoms.

	TMJ			
	I	II	III	IV
Otalgia				
No	0	0	0	0
Yes	4(100%)	5(100%)	5(100%)	8(100%)
Tinnitus				
No	2(50%)	0	3(60%)	0
Yes	2(50%)	5(100%)	2(40%)	8 (100%)

This table shows the otalgia must occur in all stages, tinnitus and occur mostly in the stage IV and stage II,

Table (7): Relation between aural symptoms versus headache.

Variables	Headache				Chi-square test	
	No (n=10)		Yes (n=40)		x^2	p
	No.	%	No.	%		
Otalgia						
No	4	40	9	22.5	2.829	**0.042 (Sig.)**
Yes	6	60	31	77.5		
Tinnitus						
No	9	90	16	40	5.212	**0.022 (Sig.)**
Yes	1	10	24	60		

This table shows statistically significant difference among headache as regard otalgia, tinnitus, with p-value, 0.042 and 0.022, respectively using Chi-square test.

Table (8): Relation between aural symptoms versus myofacial pain.

Variables	Myofacial pain				Chi-square test	
	No (n=7)		Yes (n=43)		x^2	p
	No.	%	No.	%		
Otalgia						
No	3	42.86	10	23.26	4.130	**0.032 (Sig.)**
Yes	4	57.14	33	76.74		
Tinnitus						
No	5	71.43	20	46.51	4.573	**0.029 (Sig.)**
Yes	2	28.57	23	53.49		

This table shows statistically significant difference among myofacial pain as regard otalgia, tinnitus, with p-value, 0. 032, 0.032; respectively using Chi-square test

DISCUSSION

According to The American Academy of Orofacial Pain criteria of TMDs is divided into two groups according to the anatomical etiology, respectively: Articular disorder, including the articular surface, the intra-articular disc or the articular bone; and Muscular disorder, involving the masticatory muscles surrounding the TMJ; or mixed disorder when there are signals of articular and muscular TMD **(Tatiane et al., 2013).**

Signs and symptoms of temporomandibular disorders (TMDs) may include pain, impaired jaw function, malocclusion, deviation or deflection, limited range of motion, joint noise, and locking. Headache, otalgia,

vertigo, tinnitus, fullness, visual changes, and other neurologic complaints may also accompany TMDs. Because of many etiologic factors, the diagnosis and treatment of patients with TMDs is complex ***(Fletcher et al., 2004).***

In this study, (86%) of the TMD patients were females and 14% of patients were males with age range20-42 years. and this prevalence is very close to the values reported in the literature, since many studies have shown that TMD signs and symptoms are more common in women aged between 20 to 42 years old ***(Silveira et al., 2007).***

Also, ***Velly et al. (2003)*** reported that females had approximately three times the risk of myofascial pain than males in a series 83 patients, similar results were reported by different authors that show 80% of patients treated for TMD are females ***(Magnusson et al., 2000; Macfarlane et al., 2001; Tuz et al., 2003; Azak, 2004).***

The dominance of TMD in females that was explained by many authors as hormonal changes, physiological and psychological factors. ***Schmid-Schwap et al. (2013)*** show highest prevalence of TMDs during the reproductive years, beginning with puberty and decreasing after menopause. ***Le et al. (2003)*** show course of pain severity, peaked during perimenstrual and periovulational period.

In our study the incidence of aural symptoms in TMDs patient was (74%) with Otalgia, (50%) with tinnitus this agree with ***David et al. (2001)*** found otalgia, tinnitus, (67%, 64.1%) had TMD, respectively. Subjects with aural symptoms were significantly more likely to be females).

Tuz et al. (2003) reviewed 200 patients, the incidence of aural symptoms was found. Otalgia, tinnitus, were reported by 63.6%, 59.1%, respectively.

In another study found 42% of patients with TMD reported tinnitus, 35% reported otalgia, ***(Luis et al., 2011)*** this disagree with our study due to Studies that have evaluated the prevalence of aural symptoms in TMD patients vary, both in symptoms reported and in the method of evaluation.

Several researchers have investigated the basis for the putative connection between aural symptoms and TMD symptoms. As early as 1934, aural symptoms, such as otalgia, stuffiness, tinnitus, vertigo, and hearing impairment, were included among the symptoms. Costen claimed that hearing impairment was secondary to Eustachian tube compression resulting from mandibular overclosure ***(David et al., 2001).***

Silvinelli et al. (2003) suggest that poor positioning of the mandibular condyle could cause symptoms of otalgia and tinnitus. The tinnitus in TMD patients can be due to a neural signal induced by auricular temporal nerve or reduction of sensory signals ***(Nakashima et al., 2007).***

Zipfel et al. (2000) noted that the most common mechanical origin of objective tinnitus is palatal myoclonus and middle ear myoclonus (rhythmic movement of the tympanic membrane secondary to repetitive contraction of the tensor tympani and stapedial muscles

Ramirez et al. (2005) show the biomechanical connection between the middle ear and the mandibule This connection is made by the discomalleolar and the anterior malleolar ligaments that attach to the malleus of the ossicular chain and the sensory innervation of the ear and periauricular region is derived from cranial nerves V, VII, IX, X, C2, and C3 these anatomical neuromuscular interrelationship between the TMJ and the middle ear. Expressed in aural symptom so irritation of this nerves lead to otalgia and tinnitus.

Okeson et al. (2003) show that the TMJ internal derangement (TMJ ID) is the most frequent type of TMD and is characterized by several stages of dysfunction involving the condyle-disk relationship. TMJ ID is considered to be a basic mechanism in the pathogenesis of TMJ dysfunction.

Regarding the type of disc displacement observed in the present study, (44%) of adult symptomatic patients with TMD have different stages of disk displacement These agreement with the findings of another study. ***Mahrokh et al. (2014)*** show normal disk position were reported in (51.9%) of cases whereas disk displacement with or without reduction was found in 42.3% patients.

El-Essaw et al. (2008) had reported an approximately similar percentage of the disk displacement (45%) had disk displacement in MRI**.** ***Dias et al. (2012)*** study show (58.42%) of TMJ with signs and symptoms of temporomandibular disorder had disk displacement in MRI.

But disagreement with the findings of another study Almost (80%) of adult symptomatic patients with TMD have some form of ID. ***Byun et al. (2005)*** where (82.5%) of cases had disc displacement. ***Whyte et al. (2006) and Gesch et al. (2004)*** show (70%) of symptomatic patients demonstrated abnormalities in the temporomandibular region on MRI examinations.. this difference in findings my be due to variation in numbers of pationt and parameter used in these studies.

In our knowledge this subject was not discussed in other studies however our initial experience revealed highly statistically significant of otalgia and tinnitus in internal deraignment of disc position than the normal disc position

Our results also indicated that the all patients with different stages of internal derangement of disc position had otalgia and tinnitus most of them with stage IV.

In our study (85%) reported pain in the temporal region followed by headache (80%). Similar results were mostly reported pain in the temporal region (92%), followed by headache (87%) ***(Bora et al., 2012).***

Cooper et al. examined the presence of symptoms and signs of TMD in 4528 patients and reported that 96.1% of the patients complained of TMJ pain, followed by headache (79.3%) ***(Cooper and Kleinberg, 2007).***

Trejo and Michael found that (73%) TMD patients reported headache ***(Cooper and Kleinberg, 2007 & Machado et al., 2010).***

Headache has been reported to be more common in adult patients with TMDs than in those without ***(Ciancaglini et al., 2001).***

Also we found significant correlations between headache and aural symptom also significant correlations between myo facial pain and otalgia tinnitus .This agree with Hazell reported 39% of patients suffering from tinnitus with frequent tension headaches with fatigue and muscle soreness in the facial and masticatory muscles.

Explanation of pain in the temporal region was reported by different authors. ***Kathleen et al. (2006)*** found the Inflammation of the capsular ligament may manifest with swelling and continuous pain localized to the joint. The joint movements that stretch the capsular ligament cause pain and limitation of joint movement. Significant inflammation may increase joint fluid volume, inflammation due to trauma or abnormal function may affect the retrodiscal tissue. Oedema in this area may cause anterior displacement of the condyle and an acute malocclusion with painful limitation of mandibular movements.

Kaneyama et al. (2004) show the highly innervated and vascularized synovial membrane digests debris and pain mediators released from cartilage degradation. Inflammatory mediators and waste products may play a role in disk derangement.

Kathleen et al., (2006) found inflammatory states cause changes in the viscosity of synovial fluid, which changes its ability to nourish the articular cartilage, thus changing cartilage metabolism. MRI studies have suggested headaches due to ID of the TMJ appear to be primarily inflammatory in origin due to stretching of the collateral diskal ligaments with subsequent anterior disk displacement ***(Andre et al., 2008).***

Beth (2012) explain the highly association between otalgia and myofacial paine and headache. The innervations of the ear is supplied by four cranial nerves (CN), V, VII, IX and X, as well as two superior cervical plexus nerves, C2 and C3. Each of these nerves is shared by other anatomical areas, and referred pain in the ear can be traced to the areas that share these nerves.

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