



Clinical Study to Evaluate the Prevalence of TMD Before and After Delivery of Complete Denture

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Abstract:

Temporomandibular disorder (TMD) is a broad term that encompasses number of clinical problems including the temporomandibular joints, the masticatory musculature and related structures, or both. The etiology of TMD is ambiguous since the signs and symptoms which exist in patients with natural teeth may also being observed in edentulous patients. Thus, TMD is a multifactorial problem with varying symptoms combinations and rates. Relationship between removable complete dentures and tempromandibular joint disorder in different gender and age groups. A total of 30 patients (15 female and 15 male) who submitted to Prosthodontics Department, College of Dentistry, Al-Mustansiriyah University to make a new complete denture. The age of participants ranges from (40-80) years with the mean age (65.9) years. Two clinical examiners conducted the patient's examination; the first examiner takes on a questionnaire to identify the TMD symptoms signs and. Clinical examination of the patients was assessed through part I, II of research diagnostic criteria pre and post one and two months of applying the prosthesis. The clinical evaluation of prosthesis done by the second clinical examiner related to (retention, stability, fitness, occlusion and centric relation) was evaluated twice at predetermined intervals of 1 and 2 months after construction and delivery of denture.

Evaluation performed by using Dawson's bimanual technique and recorded within clinical case sheet for complete denture records. The present study shows that the highest frequency of TMD obtained in age group of 70-80 years old followed by age group of 60-69 years old at all intervals, internal derangement (ID frequency) significantly higher in females than male patients ($p=0.02$). There is significant statistical difference regarding the Myofacial pain dysfunction (MPD) frequency according to the time of using the dentures, those patients with Diabetes Mellitus (DM) formed the highest percentage (39.1%) of those whom presented with MPD followed by those with Hypertension (HT) (32%) and those with history of HT and DM represent (17.4%) only

The results also illustrated that prosthesis properties (retention, stability, fitness, occlusion and centric relation) show significant relation with TMDs improvement post one and two months. Most patients with complete denture perceived improvement in the sign and symptoms of TMDs.

Key words: complete denture, temporomandibular joint disorders, age, internal derangement, myofacial pain dysfunction.

Introduction:

The temporomandibular joint (TMJ) is one

of the stomatognathic system parts consisting of several internal and external structures, capable of carrying out complex movements. These movements serve many roles that may include swallowing, chewing, posture and phonation which their efficient work rely heavily on the function, stability, and health of the joint ^(1, 2). They are the joints, ligament and jaw muscles that make it possible to execute these complex

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functions, and control the forward, backward and side to side movements of lower mandible. The TMJ positioned on each side of the head has a disc between the ball and socket. The disc cushions the load while enabling the jaw to open widely and rotate or glide. Improperly performance of this complex system of muscles, ligaments, discs and bones may result in a TMJ disorder. Usually, the functional and structural disorders are related to the tempromandibular joint disorder (TMD) term. TMD etiology is currently known to be multifactorial, including the presence of Para functional habits, trauma and emotional stress, injury, tooth and jaw alignment, arthritis, dislocation, stress and teeth grinding, systemic, hereditary, and occlusal characteristics. Nevertheless, none of these factors has demonstrated to overcome the others. Dental examination before treatment is necessary including checking joint stiffness and difficulty in opening, tenderness of the joint area, auscultation for joint or clicking, popping and palpation of the muscle of mastication. Depending on the diagnosis, the dentist may refer the patient to a physician or another dentist⁽³⁻⁴⁾. TMD's are characterized as a group of joint and muscle disorders in the orofacial region mainly associated by facial pain, headache, muscle tenderness on palpation, and reduction of mandibular movements.

Epidemiological studies demonstrated variable result concerning the prevalence of TMD and its distribution among the people and gender. Estimated that 40% to 75% of the population has at least one TMD sign, such as abnormal sound in the TMJ, and 33% at least one symptom, facial or TMJ pain⁽⁶⁾. Recent studies showed that the prevalence of symptoms and signs of TMD are higher among women than in men^(7, 8).

Many studies have shown decreasing levels of the prevalence of TMD at an earlier age comparing with the highest levels being observed among young adults and middle-aged individuals in the 20 to 45 years age range^(9, 10). Pursuing treatment was reported for only 3-7%, with the majority was observed among young adults and middle-aged individuals, particularly females, ranging from 20 to 45 years old⁽¹¹⁾.

The need to replace missing teeth is debatable and dependent on many factors

include; aesthetics function and the prevention of undesirable tooth movement. The importance of each of these factors must be considered⁽¹²⁾. The teeth provide a stable vertical and distal relation of mandible to maxilla and provide guiding planes for movement of the mandible anteriorly and laterally within mandibular movement during which the teeth are in contact. Loss of posterior teeth followed by loss of occlusal curve may tip the balance from adaptation with functional harmony towards disordered function⁽¹³⁾. The condyle of the mandible can be considered a mirror that reflect functional disturbance of the occlusion of the teeth⁽¹⁴⁾.

The impact of denture condition on TMDs is controversial. One study reported that no statistically substantial relationships between symptoms and signs of TMDs and denture stability, freeway space, retention, occlusal troubles, age of present denture or the number of sets of dentures⁽¹⁵⁾.

Materials and methods:

A total of 30 patients (15 female and 15 male) who submitted to Prosthodontic Department, College of Dentistry, Al-Mustansyria University for fabrication of new complete denture, the study lasted for the period (March 2015-August 2015). The age range of the patients was between (40-80) years with the mean age (65.9) years.

Two clinical examiners conducted patients examination, the first examiner used a questionnaire and bimanual examination to identify the signs and symptoms of TMD including earache, pain on palpation of mastication in the muscles determined by bilateral digital palpation, TMJ opened or closed lock history, displacement of the joint, measuring the pain level at maximum mouth opening by using a millimeter ruler, joint sounds were conducted with the aid of a stethoscope positioned in front of the external auditory meatus, clicking and crepitus of the TMJ were recorded either unilateral or bilateral.

Questioner selected for orofacial pain and tempromandibular joint disorders following the American Academy of Orofacial pain recommendation. Also, clinical examination of the patients was assessed through part I, II

of research diagnostic criteria pre and post one and two month of applying the prosthesis (Fig. 2). The stability, fitness, occlusion and centric relation were evaluated after one and two month delivery of complete denture.

Denture method evaluation done by using Dawson's bimanual technique⁽¹⁶⁾; stability is improper when a mandibular or maxillary denture prosthesis is dislodged with finger to a premolar region lightly; retention is inadequate when a denture is dislodged or movable when the lips are licked with approximately 15 mm mouth open. The cut off for a functional natural or artificial dentation of the bilateral contact between two opposing posterior teeth is considered as a suitable occlusion. This implies that an inadequate occlusion for less than two opposing molars pre molar bilaterally. Fit is convenient when denture are not flabby or loose on the under lying mucosa. The obtained results from patient questioner and the clinical examination were recorded within clinical record sheet (Fig.1).

This study excluded patients who had been diagnosed with habits and history of trauma. The statistical package for social science (SPSS) version 20 was applied for data entry and analysis Figures and tables presented to describe the data, and the data expressed as frequency and percentage. The validity of the data was analyzed by Chi-square test.

Results:

A total of 30 patients are included in the study, males were 15(50%) while females were 15(50%), and age range is between 45-78 years, a mean age of 65.9 years. The age group of 70-80 years represent the highest percentage (40%) followed by age group of 60-69 years (36.7%). The results summarized in Table 1 show that mandibular arch represent 56.7% while maxillary represent 43.3% of cases. With regard to medical history, the patients with diabetes mellitus represent the highest percentage (40%) followed by those with hypertension (36.7%).

Table 2 illustrates significant statistical difference regarding the MPD frequency according to the time of using the dentures, where the results revealed that the highest

frequency was reported at zero time 27 (90%) of patients and the frequency of MPD was decline with the time of using the dentures. No statistical difference was reported regarding the ID ($p=0.7$), where the frequency of ID did not change significantly with the time of using the dentures.

The results in Table 3 show that the frequency of MPD was higher in males than females patients before denture construction time but this difference not significant statistically ($p=0.06$) while ID frequency significantly higher in females than males patients ($p=0.02$). After one month of using the dentures the male patients reported higher frequency of MPD than females ($p=0.01$), but no significance difference reported with ID frequency. After two month of using the dentures, the frequency of ID was higher in females than males patients and this difference statistically significant ($p=0.02$), while males patients reported higher frequency of MPD but no significant difference was reported ($p=0.1$).

Table 4 shows that the highest frequency of MPD was obtained in age group of 70-80 years old followed by age group of 60-69 years old at zero time of using the dentures with significant difference in comparisons to others age groups ($p=0.001$). With regard to the frequency of ID, the highest frequency was reported in the age group of 70-80 years old followed by age group of 60-69 years old at zero time, no significance difference was reported ($p=0.3$). After one month of using the dentures the results shows that the highest frequency of MPD and ID was in the age group of 70-80 years old followed by the age group of 60-69 years old, no significant difference was reported for both ($p\geq 0.05$). The finding after two month of using the dentures shows that the highest frequency of MPD and ID also in the age group of 70-80 years old patients and no significant difference was reported for both complaint ($p\geq 0.05$).

Table 5 shows that the frequency of MPD was mostly reported with mandibular arch type (94.1%) for 16 cases at zero time. After one month of using the dentures, 61.5% of cases whom presented with MPD were maxillary arch wearers. Same frequency of MPD was reported after two months of using the dentures with both types of

dentures and no significant difference was reported ($p=0.4$). For ID, equal frequency was reported at zero time and after two month of using the dentures regarding the type of arch while mandibular arch wearer formed higher frequency than maxillary one after one month of using the denture, no significant difference was found regarding the time of using the dentures ($p\geq 0.05$).

The presence of MPD was checked at different time of using the dentures (before denture construction, one month and two months) for each patient and the results in Table 6 show that those patients with DM formed the highest percentage (39.1%) of those whom presented with MPD followed by those with HT (32%) and those with history of HT and DM represent (17.4%) only. No significant difference was noted with regard to medical history ($p\geq 0.05$). The finding shows that the frequency of ID mostly reported in cases with history of HT (45.1%) (23 cases) followed by those with history of DM (23.5%) (12 cases), patients with others medical history showed less frequency than those with HT and DM and this difference statistically significant ($p=0.03$).

Table 7 shows the frequency of MPD after one month and two months of using the dentures revealed that the patients with stable dentures reported presence of MPD in 17.9% (7) of cases only on two time of examination and that 82.1% (32) of cases reported no MPD and the patients with non-stable dentures reported high frequency of MPD (57.1%) (12) Of cases on two examination and this association was statistically significant ($p=0.003$). For ID the patients with stable dentures reported positive ID (18, 46.2%), negative (21, 3.8%) on two examination at different time, and those with non-stable dentures reported positive ID (61.9%) (13), negative ID (38.1%) (8) And this association statistically not-significant ($p=0.1$), i.e. the stable dentures having less frequency of ID.

Table 8 shows the results shows that the patients with retention reported less frequency of MPD on examination at two different time (yes =7(18.4%), no =31(81.6%) and those without retention reported higher frequency (yes =54.5%) (12), (no = 45.5 %), (10), and this association

statistically significant ($p= 0.005$). The dentures with retention reported less frequency of ID (44.7%) (17) and those without retention reported higher frequency of ID (63.6%) (14) on two successive examination at different time but this difference statistically not-significant ($p= 0.1$).

The results in Table 9 reveals significant association between frequency of occlusion character and MPD ($p=0.001$), where those with right occlusion having less frequency for MPD (yes=19.6%) (9), no=37(80%) on examination at different time (one month and two month) with significant difference ($p=0.001$). For ID the dentures wearers with right occlusion shows high frequency (yes=52.2%) (24), no=47.8 % (22) and this association not significant statistically ($p=0.5$).

Discussion:

TMD is a multi-factorial problem accompanied with signs and symptoms that eventually can limit or even disable the individual physiological activity^(17, 18).

The present study shows that the highest frequency of TMD obtained in age group of 70-80 years old followed by age group of 60-69 years old at all intervals; this indicates that TMD do increase in the elderly population. Plesh et al. supported this observation, as they get a correlation between increasing age and the evolution of TMD signs and symptoms⁽¹⁹⁾. Serman et al. reported that sign and symptoms of TMJ disorders showed inconsistent data with age and may vary over time⁽²⁰⁾.

In this study, ID frequency significantly higher in females than male patients ($p=0.02$). This observation is well supported with the view that the joint disk in the woman is more susceptible than that in the man which could be attributed to the inherent sex differences in articular cartilage^(21, 22). Other studies show that prevalence of ID in males and females is not clearly defined, but occurs most often in females⁽²³⁾.

Several epidemiological studies have reported that temporomandibular disorder is more prevalent in women, suggesting the involvement of sex hormones, such as

estrogen, in the pathogenesis of this disease. This is evidenced in a research note that TMJ damage consistent with fluctuating levels of estrogen in the bloodstream. This means that the lower levels of estrogen in the blood then the possibility of damage to the TMJ will increase. Osteoporosis is a systemic disease that is closely related to the levels of estrogen in the body. Lack of estrogen will trigger osteoporosis, damage will occur in the bone including TMJ this may explain the result of this study. The incidence of osteoporosis is higher in women than in men, especially in women post menopause⁽²⁴⁾.

Table (2) illustrates significant statistical difference regarding the MPD frequency according to the time of using the dentures, where the results, patients and the frequency of MPD was decline with the time of using the dentures. No statistical difference was reported regarding the ID ($p=0.7$), where the frequency of ID did not change significantly with the time of using the dentures. These results show that loss of all teeth may play a role in the cause of TMJ disease which agrees with the work presented by Gberg et al.⁽²⁵⁾.

Previous studies reported that the position of condyles in the mandibular fossae possibly changes as a result of a shift in the vertical and horizontal mandibular positions. This shift found to be promoted by the absence of complete dentures for long periods. Furthermore, the decrease of occlusion vertical dimension is also suggested to be one of the predisposing factors that cause a change of the rest position. The treatment of denture wearers associated with symptoms of TMD was particularly effective by applying a proper vertical dimension⁽²⁶⁾. It was also indicated that the improvement in the occlusion for complete denture wearers has enhanced the disappearance of mandibular dysfunction symptoms^(27, 28).

The present study results in table (6) shows that those patients with DM formed the highest percentage (39.1%) of those whom presented with MPD followed by those with HT (32%) this may be due to gradual changes occur in TMJ and muscular system symptoms than those with natural dentition⁽³⁹⁾. The psychological and emotional factors accompanied with aging and loss of natural

with consequences for patient health as well as emotional stress this result similar to other studies stated that increased TMD's in edentulous patients might be due to emotional and psychological factors particularly those related to age growth and loss of natural dentition⁽²⁹⁾.

Anxiety and stressful conditions can cause clenching of the jaws and thereby over contraction and fatigue of the masticatory muscles. This is the probable explanation for temporomandibular Joint dysfunction signs in unhealthy patient. The development of TMD may be contributed to psychological problems such as the increase in emotional stress caused by the loss of natural teeth^(28, 30).

To the best of our knowledge, there are scarce researches relating the use of complete dentures in edentulous patients to the TMDs. It has been suggested that patients may also be predisposed to TMD symptoms due to the complete denture wear complication⁽³¹⁾. Some studies have proposed that denture wearers have a greater predominance of TMD symptoms compared to the normal who still have natural teeth population^(18,32); and that the occurrence and intensity of TMDs are advanced in subjects with greater tooth loss in the supporting zones^(33,34).

Several studies have reported that the presence or severity of symptoms of TMD is not correlated significantly to the dentures characteristics^(35, 36). However, Tervonen and Knuutila found that more signs and symptoms of TMD for complete denture wearers than those with natural dentition⁽³⁷⁾. Longitudinal studies have showed that TMD alters over time and no strong conclusion has yet been achieved on its natural development. There are numerous ideas on the incidence of symptoms and signs in the dentate population, as well as the connection between the changes in TMJ and the number of teeth in occlusion⁽³⁸⁾.

Some studies proposed that TMD appears to be almost as prevalent in patients with complete dentures as in dentate people. Other investigators suggested that complete denture wearers have higher prevalence of

dentition might lead to increase TMD's in edentulous patients^(40, 41).

Several factors can motivate and generate TMD, namely, the reduction the vertical dimension of occlusion because of tooth loss, Para functional habits, the habit of not wearing the prosthesis throughout the day, old and poor dentures, plucking out the prosthesis to sleep, absence of stability and retention of prostheses, not to mention psychological factors. Although TMD has been considered as multiple etiologies, faulty vertical dimension is a prevalent source of muscular pain among complete denture wearers. Generally it is found that edentulous patient do not have many TMD symptoms comparing with dentate people which is possibly attributed to the fact that no more proprioceptive feedback from teeth to stimulate the symptom complex of TMD⁽⁴²⁾. The constant muscular contraction produced to stabilize the poor prosthesis, adaptation can cause pain and muscle dysfunction. Ribeiro et al. proposed that both complete dentures wearers and natural dentate had similar TMD symptoms. However, other studies reported that patients with bimaxillary complete dentures showed more TMD signs and symptoms^(38, 19, 43, and 44).

Previous studies stated that establishment of proper vertical dimension throughout denture fabrication is definitely effective in the treatment of TMD symptoms associated

with denture wearers. Furthermore, reduction in the vertical dimension due to complete dentures generally does not yield clear TMJ problems. It is well known that the fatigue resistance, endurance time, bite force of the masseter muscles and electromyographic activity are considerably reduced in edentulous subjected with TMD syndrome. These observations was clarified by Monteith et al., hypothesis. They proposed that amount of the contractile power of the medial pterygoid and masseter muscles is well related to the free-way space presented in an individual^(35, 45, 46). This result agrees with the findings of previous studies, which reported that most patients with a modified denture perceived improvement^(47, 48).

Conclusions:

The present study showed that the prevalence of TMDs in patients wearing complete denture manifest appositive relation between the time of using complete dentures and the presence of TMDs, as a result most of the patient perceived good enhancement. Moreover, it can be argued that the characteristics of complete denture can affect the TMDs in edentulous patient.

Table 1: Distribution of patients according to age groups, gender, arch type and medical history.

		No.	%
Age(years)	40-49	2	6.7%
	50-59	5	16.7%
	60-69	11	36.7%
	70-80	12	40.0%
Gender	Females	15	50.0%
	Males	15	50.0%
Arch type	Maxillary arch	13	43.3%
	Mandibular	17	56.7%
Medical history	Hypertension	11	36.7%
	Normal	2	6.7%
	Diabetes mellitus	12	40.0%
	Hypertension and diabetes mellitus	4	13.3%
	Diabetes mellitus and breast cancer	1	3.3%

Table 2: The frequency of MPD and ID according to the time of using the dentures.

		MPD				p-value	I.D.				p-value
		Yes		No			Yes		No		
		Count	N %	Count	N %		Count	N %	Count	N %	
Time of using the denture	Before denture construction time	27	90.0%	3	10.0%	0.001	20	66.7%	10	33.3%	0.7
	After one month	17	56.7%	13	43.3%		19	63.3%	11	36.7%	
	After two month	2	6.7%	28	93.3%		12	40.0%	18	60.0%	

ID= Internal Derangement.

MPD= Myofacial Pain Dysfunction

Table 3: Frequency of MPD and ID according to gender and time of using the dentures.

			MPD				p-value	ID				p-value	
			Yes		No			Yes		No			
			Count	N %	Count	N %		Count	N %	Count	N %		
Time of using the denture	Before denture construction time	Gender	Females	12	80.0%	3	20.0%	0.06	13	86.7%	2	13.3%	0.02
			Males	15	100.0%	0	0.0%		7	46.7%	8	53.3%	
	After one month		Females	5	33.3%	10	66.7%	0.01	12	80.0%	3	20.0%	0.06
			Males	12	80.0%	3	20.0%		7	46.7%	8	53.3%	
	After two month		Females	0	0.0%	15	100.0%	0.1	9	60.0%	6	40.0%	0.02
			Males	2	13.3%	13	86.7%		3	20.0%	12	80.0%	

Table 4: Frequency of MPD and ID according to age group and at fixed intervals.

			MPD				p-value	ID				p-value	
			Yes		No			Yes		No			
			Count	N %	Count	N %		Count	N %	Count	N %		
Time of using the denture	Before denture construction time	Age years	40-49	0	0.0%	2	100.0%	0.001	2	100.0%	0	0.0%	0.3
			50-59	5	100.0%	0	0.0%		2	40.0%	3	60.0%	
			60-69	10	90.9%	1	9.1%		7	63.6%	4	36.4%	
			70-80	12	100.0%	0	0.0%		9	75.0%	3	25.0%	
	After one month		40-49	0	0.0%	2	100.0%	0.2	2	100.0%	0	0.0%	0.3
			50-59	4	80.0%	1	20.0%		2	40.0%	3	60.0%	
			60-69	6	54.5%	5	45.5%		6	54.5%	5	45.5%	
			70-80	7	58.3%	5	41.7%		9	75.0%	3	25.0%	
	After two month		40-49	0	0.0%	2	100.0%	0.3	2	100.0%	0	0.0%	0.1
			50-59	0	0.0%	5	100.0%		2	40.0%	3	60.0%	
			60-69	0	0.0%	11	100.0%		2	18.2%	9	81.8%	
			70-80	2	16.7%	10	83.3%		6	50.0%	6	50.0%	

Table 5: The frequency of MPD and ID based on arch in concern at fixed intervals.

				MPD				p-value	I.D.				p-value
				Yes		No			Yes		No		
				Count	N %	Count	N %		Count	N %	Count	N %	
Time of using the denture	Before denture construction time	Arch type	Maxillary	11	84.6 %	2	15.4 %	0.3	10	76.9 %	3	23.1 %	0.2
			Mandibular	16	94.1 %	1	5.9 %		10	58.8 %	7	41.2 %	
	After one month		Maxillary	8	61.5 %	5	38.5 %	0.6	9	69.2 %	4	30.8 %	0.5
			Mandibular	9	52.9 %	8	47.1 %		10	58.8 %	7	41.2 %	
	After two month		Maxillary	1	7.7 %	12	92.3 %	0.4	6	46.2 %	7	53.8 %	0.5
			Mandibular	1	5.9 %	16	94.1 %		6	35.3 %	11	64.7 %	

Table 6: Frequency of MPD and ID according to medical history of the patients.

		MPD				p-value	I.D.				p-value
		Yes		No			Yes		No		
		Count	Valid N %	Count	Valid N %		Count	Valid N %	Count	Valid N %	
Medical history	HT	15	32.6 %	18	40.9 %	0.5	23	45.1 %	10	25.6 %	0.03
	Normal	3	6.5 %	6	13.6 %		6	11.8 %	3	7.7 %	
	DM	18	39.1 %	15	34.1 %		12	23.5 %	21	53.8 %	
	HT and DM	8	17.4 %	4	9.1 %		7	13.7 %	5	12.8 %	
	DM and Breast cancer	2	4.3 %	1	2.3 %		3	5.9 %	0	0.0 %	

HT = hypertension , DM = diabetes mellitus

Table 7: Relationship between stability, MPD and ID

			MPD		p-value	ID		p-value
			Yes	No		Yes	No	
Stability	Yes	Count	7	32	0.003	18	21	0.1
		% within Stability	17.9 %	82.1 %		46.2 %	53.8 %	
	No	Count	12	9		13	8	
		% within Stability	57.1 %	42.9 %		61.9 %	38.1 %	

Table 8: Association between retention for MPD and ID.

			MPD		P-value	ID		p-value
			Yes	No		Yes	No	
Retention	Yes	Count	7	31	0.005	17	21	0.1
		% within Retention	18.4 %	81.6 %		44.7 %	55.3 %	
	No	Count	12	10		14	8	
		% within Retention	54.5 %	45.5 %		63.6 %	36.4 %	

Table 9: Association between occlusion, MPD and ID

			MPD		p-value	ID		p-value
			Yes	No		Yes	No	
Occlusion	Yes	Count	9	37	0.001	24	22	0.5
		% within Occlusion	19.6%	80.4%		52.2%	47.8%	
	No	Count	10	4		7	7	
		% within Occlusion	71.4%	28.6%		50.0%	50.0%	

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