

# Importance of stability and retention of double total prostheses: factors related to its use in the etiology of temporomandibular disorders

Prevalência de desordem temporomandibular em pacientes portadores de prótese total dupla

Letícia da Souza RENHE<sup>1</sup>, Jean Soares MIRANDA<sup>1</sup>, Natália Veloso MALTA<sup>1</sup>, Isabel Cristina Gonçalves LEITE<sup>2</sup>, Fabíola Pêsoa Pereira LEITE<sup>1</sup>

1 – School of Dentistry - Federal University of Juiz de Fora – Juiz de Fora – MG – Brazil.

2 – School of Medicine - Federal University of Juiz de Fora – Juiz de Fora – MG – Brazil.

## ABSTRACT

**Objective:** Evaluate the prevalence of temporomandibular disorder in patients with full double prosthesis. **Material and Methods:** The sample was composed of 40 volunteer patients, aged between 34 and 92 years, with upper and lower dentures, assisted at the Total Prosthodontics Clinic of the School of Dentistry at the Federal University of Juiz de Fora. Patients were evaluated by a single trained examiner and the diagnosis of TMD was established from the axis I of the RDC/TMD. **Results:** The prevalence of TMD in the sample was 42.5%, and most patients were female. Although there was no statistical significance between the time of use of the prosthesis and the presence of TMD was found, there was a correlation between time without use of prosthesis and the presence of disc displacement. **Conclusion:** According to the methodology applied and the results of this study, it can be concluded that there was a considerable prevalence of TMD in patients with double dentures, but there was no correlation between the use of full and DTM prosthesis.

## KEYWORDS

Facial pain; Temporomandibular Joint Dysfunction Syndrome; Denture, complete.

## RESUMO

**Objetivo:** Procurou-se avaliar a prevalência de Desordem Temporomandibular em pacientes portadores de prótese total dupla. **Materiais e Métodos:** a amostra foi constituída por 40 pacientes voluntários, com idade entre 34 e 92 anos, portadores de prótese total superior e inferior, atendidos na Clínica de Prótese Total da Faculdade de Odontologia da Universidade Federal de Juiz de Fora. Os pacientes foram avaliados por um único examinador, calibrado anteriormente e o diagnóstico de DTM foi estabelecido a partir do eixo I do RDC/TMD. **Resultados:** a prevalência de DTM na amostra estudada foi de 42,5%, sendo que a maioria dos pacientes era do sexo feminino. Apesar de não haver significância estatística entre o tempo de uso da prótese e a presença de DTM, foi encontrada correlação entre o tempo sem uso de prótese e a presença de deslocamento de disco. **Conclusão:** de acordo com a metodologia aplicada e os resultados deste estudo, pode-se concluir que houve uma prevalência considerável de DTM em pacientes portadores de prótese total dupla, porém não houve correlação entre o uso de prótese total e DTM.

## PALAVRAS-CHAVE

Dor facial; Síndrome da Disfunção da Articulação Temporomandibular; Prótese total e prevalência.

## INTRODUCTION

Temporomandibular disorder (TMD) is a group of clinical problems which affect the masticatory muscles, the temporomandibular joint (TMJ) and adjacent structures [1-6]. Its main signs and symptoms are: presence of pain, headache, mandibular movement limitation, joint noise or clicking and muscular sensitivity [2,3,5-8]. Settings of TMD are initiated when the intensity of the etiological factors surpasses the individual's adaptation capacity [9].

TMD is currently considered to have multifactorial etiology [1-3,6,8] and is related to the following factors: structural, neuromuscular, occlusal (missing teeth, ill-fitting dentures, inadequate restorations) and psychological (due to tension, there is an increase in muscle activity, generating spasm and fatigue). It is also related to parafunctional habits (bruxism, nail biting, resting hands on jaw) and traumatic or degenerative lesions in the TMJ [4,8].

While searching for causes of TMD in patients with complete dentures, many aspects should be considered [3,10]. The loss of all natural teeth may lead to psychological problems that increase emotional tension, which, added to iatrogenic factors introduced by the doctor of dental surgery, when making the dentures, can contribute to the development of TMD [10-12]. These factors are: increase or decrease in the vertical dimension of occlusion; inadequate maxillomandibular relations and phonetic and esthetic problems [1,3,6,12].

The lack of a thorough examination on the masticatory system and on a standard for assessing the quality of dentures, associated with the fact that facial pain and headaches are not usually reported to the Dentist, are some factors that could explain the low prevalence of TMD observed in patients with full dentures [3,10,13]. Thus, it is important to conduct studies so that we can come to a conclusion about this prevalence, contributing to early

diagnosis, avoiding future complications and complex, often unnecessary, treatments.

Considering the elements above, this study aimed at verifying the prevalence of TMD in patients with full dentures and the correlation between the use of dentures and TMD.

## MATERIALS AND METHODS

This study's research design was approved by the Ethics Committee of the Federal University of Juiz de Fora (Protocol 12562713.0.0000.5147). The sample consisted of 40 volunteers who attended the Total Prosthodontics Clinic of the School of Dentistry at the Federal University of Juiz de Fora, with the following inclusion criteria: wearing complete dentures for at least one year. After the explanation of the research objectives and the volunteers' participation agreement, an Informed Consent Form was signed.

Patients were identified according to sex, age, and subjected to clinical examination by a single, previously calibrated examiner. Tests were performed using personal protective equipment and following the biosafety standards. To set the diagnosis of TMD, RDC/TMD14 Axis I was used, and its severity was determined according to the temporomandibular Index – TMI15. TMI is composed of three sub-indices: the Functional Index (FI), the Muscular Index (MI) and the Articular Index (AI). FI includes twelve items related to the jaw range of motion (ROM). These items characterize pain or limitation related to jaw ROM and mandibular deviation during the opening movement. MI measures the pain associated with bilateral digital palpation of selected masticatory intra and extra-oral muscles in 20 different spots. AI measures the pain caused by digital palpation on 2 sites for each temporomandibular joint (TMJ) and the incidence of noise in each TMJ [15].

Dentures were evaluated regarding their time of use, habit of sleeping with them and time in which patients remained toothless

until the making and use of the artificial teeth. Clinical evaluation of full dentures consisted of analyzing their retention and stability, as well as classifying them according to the Woelfel Index [16], in four groups, concerning retention condition and presented stability. Thus, values from 1 to 4 were assigned, varying from bad retention condition and stability to excellent retention and stability [16].

After questionnaire completion, data were tabulated and submitted to descriptive statistical analysis. To compare categorical variables the Chi-square Test was used and for comparison of ordinal variables the Spearman correlation test was performed, applied by SPSS (Statistical Package Social Science) version 15.0 for Windows. Variables age, time of use and time without use were dichotomized, referring to these times mean. The stability and retention characteristics were grouped into good (excellent and good) and bad (regular and bad). The accepted significance level in the analyses was 5%.

## RESULTS

The sample consisted of 40 patients aged between 34 and 92 years old, mean of 67 years old (SD = 12.255). Out of these, 31 individuals (77.5%) were female.

Dentures' time of use ranged from 1 to 50 years, and 45% of patients wore dentures for over 20 years and 65% of patients slept wearing them.

Seventeen (17) patients (42.5%) were classified with at least one TMD diagnosis, according to DRC/TMD axis I. Among these diagnoses, muscular disorders were the most prevalent ones (25%), as shown in Table 1.

**Table 1** - Distribution of patients according to diagnostic groups of the DRC. Each patient may have more than one diagnosis

Diagnosis	(%)
Muscular disorder	25%
Disc Displacement	20%
Other joint conditions	20%

Table 2 shows data on the association between average age, average time of use and average time without use accompanied by TMD, and each of the diagnostic groups. There was statistical significance only between the average time without use and disc displacement.

Among the sub-indices of the TMI, the Functional Index showed the highest mean, indicating greater severity, as seen in Table 3.

The Woelfel Index results are shown in Table 4, in which we can observe that no lower dentures were considered excellent for retention or stability, that is, value 4. On the other hand, most of the upper dentures showed retention and stability considered good or excellent, values 3 and 4, respectively.

**Table 2** - Association between research variables and TMD

	TMD	Muscular disorder	Disc Displacement	Other joint conditions
Middle Ages	0.491	0.626	0.314	0.408
Average usagetime	0.676	0.417	0.645	0.193
Average usagetime without	0.574	0.274	0.007	0.607

**Table 3** - Characterization of patients according to TMI and its sub-indices

	N	Minimum	Maximum	Mean	Standard Deviation
TMI	17	0	1	0.35	0.178
FI	17	0	1	0.44	0.173
MI	17	0	1	0.26	0.293
AI	17	0	1	0.36	0.182

**Table 4** - Distribution of patients according Woelfel Index

	1	2	3	4
	N (%)	N (%)	N (%)	N (%)
Retention of theupper dentures	6 (15)	5 (12.5)	26 (65)	3 (7.5)
The upperdenturestability	5 (12.5)	8 (20)	22 (55)	5 (12.5)
Retention oflowerdenture	17 (42.5)	14 (35)	9 (22)	0 (0)
The lowerdenturestability	12 (30)	17 (42.5)	11 (27.5)	0 (0)

Table 5 presents data on the association between retention and stability of dentures accompanied by TMD and each of the diagnostic groups. There was statistical significance only between lower stability and the group “other joint conditions.” However,  $\rho$  value is tangential, indicating that further studies are needed with larger samples, to confirm the existence of this association and to establish its plausibility.

This study's results indicate significant correlation between TMI and its sub-indices with the presence of a diagnosis of TMD, according to the RDC, in which the Articular Index was the most strongly correlated one ( $\rho = 0.785$ ).

## DISCUSSION

The results obtained during the research contribute to clarifying the relationship between Temporomandibular Disorder and use of double dentures, so that more accurate diagnoses and appropriate treatment can be established. The scientific literature does not have a consensus on the subject yet and more research is needed, as there are differences in diagnostic criteria as well as in the investigated populations. In addition, the great difficulty lies in the standardization of criteria for evaluation of the the artificial teeth, which are still very subjective.

In this study, it was observed a higher prevalence of TMD in women, this is in agreement with the literature [1,3,5-7,17]. These results can be explained by psychological and hormonal differences between the sexes, as well as by the fact that women have greater concern for their health and seek treatment [16].

The prevalence of TMD (42.5%) found among wearers of complete denture was low, compared with some of literature findings

[2,13,18]. However, it was higher than the prevalence found by Shibayama et al [6], Shibayama et al. [5] and Souza et al. [10]. This is due to the use of different indices to diagnose TMD and the distinction between the samples studied.

Regarding dentures' time of use, there was no statistical significance between this factor and the presence of TMD, which corroborates the findings of Bontempo and Zavanelli [1], Coronatto et al. [3], Serman et al. [18]. found a positive association between the use of dentures and TMD, but this statement was made based on the individuals who continuously wore the same artificial teeth, while other studies considered only the time of use, regardless of whether the patient switched dentures. Souza et al. [10] concluded that only the time of tooth loss and the time of use of a pair of dentures had relationship with the signs and symptoms of TMD.

The association between the average time without use and the presence of disc displacement can be explained by the loss of vertical dimension of occlusion in patients who remained a longer time without using dentures. According to Hongchen et al. [19], this alteration of the vertical dimension also generates an alteration of the freeway space, with significant changes in the relationship between the condyle and the glenoid fossa, and may predispose people to the development of signs and symptoms of TMD.

In the edentulous patient that replaces the old prosthesis, there is usually demand for the restoration of mandibular relations [10]. The condyle acquires a new position, considering that the vertical dimension will be increased, which may cause muscle and articulate discomfort, especially in the stage adaptation of prostheses

**Table 5** - Association between Woelfel and DTM Index

	TMD	Muscular disorder	Disc Displacement	Other joint conditions
Retention of the upper dentures	0.454	0.557	0.196	0.381
The upper denture stability	0.594	0.733	0.800	0.590
Retention of lower denture	0.454	0.645	0.823	0.619
The lower denture stability	0.504	0.796	0.203	0.057

[20], but this was not analyzed in this study, which may have led to some different results from the literature reviewed.

There was no statistically significant difference between the prevalence of TMD and habit of sleeping or not with complete dentures in accordance with Bontempo and Zavanelli[1].

The fact that the upper dentures have shown better retention and stability quality, compared to the lower ones, is in accordance with the literature [1], since the lower lip can have a higher degree of resorption, hindering thereby the fit of the artificial teeth.

Thus, the DDS should always perform a comprehensive interview and complete physical examination so that they can identify the presence of signs and symptoms of TMD in patients, in addition to highlight the importance of periodic checks for dentures maintenance.

## CONCLUSION

According to the methodology applied and the results of this study, it can be concluded that there was a considerable prevalence of TMD in patients with double dentures, but there was no correlation between the use of complete dentures and TMD.

## REFERENCES

- Bontempo KV, Zavanelli RA. Fatores etiológicos correlacionados à desordem temporomandibular em pacientes portadores de próteses totais bimaxilares: uma análise comparativa. RGO. 2009; 57(1):67-75.
- Bontempo KV, Zavanelli RA. Desordem temporomandibular: prevalência e necessidade de tratamento em pacientes portadores de próteses totais duplas. RGO. 2011;59(1):87-94.
- Coronato EAS, Zuccolotto MCC, Bataglion C, Bitondi MBM. Association between temporomandibular disorder and anxiety: epidemiological study in edentulous patients. Int J Dent. 2009 Jan-Mar;8(1):6-10.
- Donnarumma MDC, Muzilli CA, Ferreira C, Nemr K. Disfunções temporomandibulares: sinais, sintomas e abordagem multidisciplinar. Rev CEFAC. 2010;12(5):788-94.
- Shibayama R, Garcia AR, Zuim PRJ. Prevalência de desordem temporomandibular (DTM) em pacientes portadores de próteses totais duplas, prótese parciais removíveis e universitários. Rev Fac Odontol Aracatuba. 2004;25(2):18-21.
- Shibayama R, Contreiras E, Shibayama B, Sella M, Boer PR, Nakui MT. Prevalência de disfunção temporomandibular em pacientes portadores de próteses totais duplas. Rev Fac Odontol Aracatuba. 2008;29(2):46-51.
- Almeida LHM, Farias ABL, Soares MSM, Cruz JSA, Cruz RES, Lima MG. Disfunção temporomandibular em idosos. RFO UPF. 2008;13(1):35-8.
- Figueiredo VMG, Cavalcanti AL, Farias ABL, Nascimento SR. Prevalência de sinais, sintomas e fatores associados em portadores de disfunção temporomandibular. Acta Sci Health Sci. 2009;31(2):159-63.
- Santos-Daroz CB, Senna PM, Nuñez JMC, Lucena SC, Barbosa CMR. Relação entre o envelhecimento, problemas articulares e disfunção temporomandibular. Rev Bras Pesq Saúde. 2009;11(1):46-51.
- Souza SA, Cavalcanti NP, Oliveira LV, Meyer GA. Prevalência de desordens temporomandibulares em indivíduos desdentados reabilitados com próteses totais convencionais. Rev Odontol UNESP. 2014;43(2):105-10.
- Jorge JH, Silva GS Jr, Urban VM, Neppelenbroek KH, Bombarda NHC. Desordens temporomandibulares em usuários de prótese parcial removível: prevalência de acordo com a classificação de Kennedy. Rev Odontol UNESP. 2013;42(2):72-7.
- Meyerowitz WZ. Myofascial pain in edentulous patient. J Dent Assoc S Afr. 1975;30(1):75-7.
- Ribeiro RA, Mollo FA Jr, Pinelli LAP, Arioli JN Jr, Ricci WA. Prevalência de disfunção craniomandibular em pacientes portadores de próteses totais duplas e pacientes dentados naturais. Ciênc Odontol Bras. 2002; 5(3):84-9.
- Pereira Júnior FJ, Vieira AR, Prado R, Miasato JF. Visão geral das desordens temporomandibulares. Rev Gaucha Odontol. 2004;52(2):117-21.
- Pehling J, Schiffman E, Look J, Shaefer J, Lenton P, Friction J. Interexaminer reliability and clinical validity of the temporomandibular index: a new outcome measure for temporomandibular disorders. J Orofac Pain. 2002;16(4):296-304.
- Woelfel JB, Paffenbarger GC, Sweeney WT. Clinical evaluation of complete dentures made of 11 different types of denture base materials. J Am Dent Assoc. 1965;70:1170-88.
- Silva JAMG, Dibai Filho AV, Machado AA, Oliveira LEM, Navega MT. Correlação entre autoestima e grau de severidade da disfunção temporomandibular em sujeitos controle e afetados. Rev Odontol UNESP. 2012;41(6):377-83.
- Serman RJ, Conti PCR, Conti JV, Salvador MCG. Prevalência de disfunção temporomandibular em pacientes portadores de prótese total dupla. J Bras Oclusão, ATM Dor Orofacial e dor orofacial. 2003;3(10):141-4.
- Hongchen L, Jilin Z, Ning L. Edentulous position of the temporomandibular joint. J Prosthet Dent. 1992;67(3):401-4.
- Porto VC, Salvador MCG, Conti PCR. Avaliação da posição condilar em desdentados totais, através de planigrafias da ATM. Rev Fac Odontol Bauru. 2002;10(2):81-7.

### Jean Soares Miranda (Corresponding address)

Rua Batista de Oliveira, 1096/504  
Granbery, Juiz de Fora/MG  
Cep: 36010-532  
E-mail: jeansoares@msn.com

Date submitted: 2015 Jun 29

Accept submission: 2016 Feb 15