FREQUENCY OF ASSOCIATED WITH TEMPOROMANDIBULAR DYSFUNCTION DURING THE COVID-19 PANDEMIC

Bruna Caroline Tomé **Barreto**[1*], Eduardo Otero Amaral **Vargas**[1], Guido Artémio **Marañón-Vásquez**[2], Matheus Melo **Pithon**[3], Eduardo Franzotti **Sant'anna**[1]

[1]Department of pediatric dentistry and orthodontics, Dental School, Universidade Federal do Rio de Janeiro - UFRJ, Rio de Janeiro, RJ, Brazil.
[2]Department of pediatric dentistry, Faculty of Dentistry of Ribeirão Preto, Universidade de São Paulo - USP, Ribeirão Preto, SP, Brazil.
[3]Department of Health I, Dentistry Course, Universidade Estadual do Sudoeste da Bahia - UESB, Jequié, BA, Brazil.

Palavras-chave: Disfunção da Articulação Temporomandibular. COVID-19.

RESUMO

Objetivo: o objetivo deste estudo é determinar a frequência dos sintomas associados às disfunções temporomandibulares durante a pandemia de COVID-19 e investigar a relação entre o aparecimento ou agravamento dos sintomas de DTM e os sintomas de tensão após o início da pandemia. **Materiais e Métodos:** este estudo observacional transversal coletou informações por meio de questionário eletrônico na plataforma Google Forms de voluntários em todo o país, durante um período de cerca de quatro meses, sobre sintomas de DTM desde o início da pandemia. **Resultados:** foram aplicadas análises estatísticas descritivas e teste exato de Fisher aos 329 questionários coletados, que apresentavam média de idade de 38 anos (±13 anos), com 122 homens e 207 mulheres respondentes. O hábito de apertar e/ou ranger os dentes foi o sintoma mais relatado, enquanto a dificuldade de movimentar a mandíbula lateralmente foi o menos frequente. O teste exato de Fischer revelou associação estatisticamente significativa (p<0,001) entre o aparecimento ou agravamento de sintomas de DTM e o aparecimento ou agravamento de sentimentos de tensão após o início da pandemia em todos os itens comparados. **Conclusão:** o estudo constatou que menos da metade da amostra desenvolveu ou piorou o quadro de DTM durante a pandemia de COVID-19, e houve associação positiva entre os sintomas propostos.

Keywords: Temporomandibular Joint Dysfunction. COVID-19.

ABSTRACT

Objective: the purpose of this study is to determine the frequency of symptoms associated with temporomandibular disorders during the COVID-19 pandemic and to investigate the relationship between the appearance or worsening of TMD symptoms and the feelings of tension after the onset of the pandemic. **Materials and Methods:** this cross-sectional observational study collected information using an electronic questionnaire on the Google Forms platform from volunteers throughout the country over a period of around four months, regarding TMD symptoms from the beginning of the pandemic. **Results:** descriptive statistical analyses and Fisher's exact test were applied to the 329 questionnaires collected, which had a mean age of 38 years (±13 years), with 122 men and 207 women respondents. The habit of squeezing and/or grinding the teeth was the most frequently reported symptom, while difficulty moving the mandible sideways was the least frequent. Fischer's exact test revealed a statistically significant association (p<0.001) between the appearance or worsening of TMD symptoms and the onset or worsening of feelings of tension after the onset of the pandemic in all the items compared. **Conclusion:** the study found that less than half of the sample developed or worsened the TMD condition during the COVID-19 pandemic, and there was a positive association between the proposed symptoms.

Submetido: November 29, 2023
Modificado: March 20, 2024
Aceito: March 22, 2024

***Correspondence to:**
Bruna Caroline Tomé Barreto
Address: R. Prof. Rodolpho Paulo Rocco, 325 - Cidade Universitária da Universidade Federal do Rio de Janeiro, Rio de Janeiro – RJ, Zip Code: 21941-617
Telephone number: +55 (21) 3938-2017
E-mail: brunabarreto@ortodontia.ufrj.br

INTRODUCTION

Temporomandibular disorders (TMD) correspond to a range of alterations associated with occlusion and temporomandibular joint (TMJ) that are widely discussed and relevant in contemporary Dentistry.[1] They are defined as a subgroup of craniofacial pain problems involving the TMJ, masticatory muscles, and muscle and bone structures of the head and neck.[1-3]

With a multifactorial etiology, these disorders arouse the interest of several professionals. The possible causes of the disarrangement of the TMJ can be exemplified as trauma and parafunctional habits.[4,5] In addition, there are still predisposing factors such as systemic, genetic, structural, and psychological conditions.[4,5]

It is known that chronic pain can have a negative impact on individuals' quality of life. Observations made by Reisine and Weber[6] suggest that patients with TMD experience low levels of well-being and high levels of anxiety, indicating that they may have negative psychological states. The persistence of pain further worsens their functional aspects.[7]

With the onset of the COVID-19 pandemic, a significant portion of the global population has had their daily routines and financial stability disrupted. Among the various complex symptoms, an increase in parafunctions and sleep disorders has been linked to the confinement of patients.[8] This situation may also be responsible for triggering or worsening temporomandibular disorders, as stress has previously been associated with TMDs.[9] Hence, it is critical to identify and track possible indicative symptoms of TMDs in order to raise awareness among patients and medical professionals and avoid confusion with symptoms of other diseases.

Therefore, the objective of this study was to determine how often patients experienced or had their symptoms indicative of TMD worsen during the COVID-19 pandemic. Furthermore, the study examined the relationship between the start or worsening of Temporomandibular Disorder (TMD) symptoms and the rise in stress experienced following the start of the pandemic, while also considering whether the participant took on a financial responsibility in supporting their family.

MATERIAL AND METHODS

The current study involved observational research. A calculation was performed to determine the required sample size to estimate the prevalence of TMDs, using a formula applicable to an infinite population. Several factors were taken into account, including an estimated prevalence of TMD of 31%, a confidence level of 95%, and a margin of error of 5%.[10] Based on these parameters, it was determined that a sample size of 329 subjects would be necessary.

This study was approved by the Research Ethics Committee

The study was submitted to and approved by the research ethics committee of the Hospital Universitário Clementino Fraga Filho of the Universidade Federal Rio de Janeiro. All of the study participants agreed to participate electronically after receiving a complete explanation of the research objectives. The inclusion criteria for participants in this study were lay people who were at least 18 years old. No exclusion criteria were specified, except for the participants who had insufficient information. The questionnaire was developed after consulting with an orthodontist who has experience in treating TMD (M.P). At first, the participants were asked for their age, gender, and level of education. Following this, they were presented with a series of multiple-choice questions (Table 1) pertaining to potential symptoms associated with temporomandibular disorders. The questionnaire, comprised of a total of 13 questions, inquired about TMD symptoms as well as pain and discomfort associated with it. There were four response options available, to characterize whether the symptoms were nonexistent, existed prior to the pandemic without change, existed prior to the pandemic and worsened, or began. These options are detailed in Table 1.

The questionnaire was developed by the authors, drawing on existing questionnaires. It underwent validation processes, including assessments of acceptability, construct validity, discriminative capacity, reliability, and internal consistency. A test-retest procedure was implemented. Participants were instructed to complete the questionnaire independently and without the use of internet search tools. They were assured that their responses would not be subjected to any judgment.

The questionnaire was made available for the application process through the online hosting on the Google Forms platform. The research was characterized as a model of an electronic questionnaire sent to individuals. The information was disseminated via social networks, messaging apps and email to the personal networks of the researchers involved in the research for a period of about four months. The participants responded to the questionnaire using their personal electronic devices such as computers, cell phones, and tablets, at a time that was convenient to them. There was no need to alter their schedules and appointments to answer the questions. This decision also significantly reduced the risk of confounding bias. Out of the four answers options provided, the one that best fit the participant's understanding of the question should be selected. The subjects answered the questions according to Table 1. The volunteers were asked about various scenarios including difficulty and/or pain when opening their mouth, tiredness and/or muscle pain when chewing and/or speaking, difficulty moving the mandible, rigid jaws, headache pain, pain in the ears, temples, cheeks and neck,

TMJ noises, pain in the teeth and ears, whether they needed treatment in this region and whether or not they considered themselves nervous. The questionnaire was conducted in such a way that the participants were able to indicate whether the symptom in question occurred before or after the onset of the pandemic. The forms completed by the study participants were tabulated and analyzed statistically by the same responsible operator (B.C.T.B.).

Statistical analyzes were performed using the Statistical Package for the Social Sciences program (version 22.0, SPSS Inc., USA). A significance level of 5% was adopted. After assembling the database, a descriptive analysis of the data was performed, characterizing all the variables with calculation of absolute and relative frequencies to characterize the sample, signs and symptoms. Afterward, Fisher's Exact Test was conducted with a p-value of less than 0.05 to evaluate the Spearman correlation between the development or exacerbation of TMD symptoms and the development or exacerbation of feelings of tension following the beginning of the pandemic.

RESULTS

Initially, 387 responses were obtained, but after discarding incomplete forms, 329 questionnaires were selected. The respondents had a mean age of 38 years (± 13 years), comprising 122 males and 207 females. Regarding occupation before and after the pandemic, 87.5% of the sample maintained the original scenario, with 44.4% being head of household before the pandemic while 46.5% after it. (Tables 2 and 3) The most frequent symptoms were muscle fatigue and pain when chewing, speaking or using the jaws; frequently stiff tight, or tired jaws; headaches; neck pain or torticollis and a habit of squeezing and/or grinding teeth. However, experiencing difficulty and/or pain when opening the mouth; difficulty moving the mandible sideways; pain in or around the ears, temples and cheeks; pain in the ear or joint regions; teeth pain and TMJ noises when chewing or opening the mouth were the least common symptoms, as detailed in Table 4.

Furthermore, 32 (9.7%) volunteers reported receiving treatment for an unexplained TMJ issue following the onset of the pandemic. In addition, 55 people (16.7%) noticed a recent alteration in them since the COVID-19 pandemic began. Fischer's exact test (Table 5) demonstrated a statistically significant correlation between the appearance or exacerbation of TMD symptoms and the occurrence or worsening of tension following the start of the pandemic in all items compared.

Table 1: *Questions contained in the form used.*

Email
Age
Sex
Level of education
What's your profession?
What was your occupation before the COVID-19 Pandemic?
What is your occupation during the COVID-19 Pandemic?
Were you the household head prior to the COVID-19 Pandemic? (She paid for all household expenses such as water, electricity, rent or shared expenses with someone else)
Are you the household head during the COVID-19 Pandemic? (She paid for all household expenses such as water, electricity, rent or shared expenses with someone else)
Did you notice difficulty, pain or both when opening your mouth, for example, when yawning after the start of the pandemic?
Did you notice difficulty moving your jaw sideways (it gets "stuck", "locked") after the start of the pandemic?
Have you noticed muscle fatigue/pain when chewing, talking or using your jaws after the start of the pandemic?
Are your jaws stiff, tight or tired on a regular basis after the start of the pandemic?
Do you experience headaches often after the start of the pandemic?
Do you have pain in or around your ears, temples and cheeks after the onset of the pandemic?
Do you have ear pain or joint regions after the start of the pandemic?
Do you experience neck pain or torticollis after the start of the pandemic?
Do you experience tooth pain after the start of the pandemic?
Have you noticed joint noises (ATMs) when you chew or open your mouth after the start of the pandemic?
Have you noticed any recent changes in your bite after the start of the pandemic?
Have you had recent treatment for an unexplained TMJ problem since the start of the pandemic?
Have you observed any habit of clenching and / or grinding your teeth after the start of the pandemic?
Do you feel that your teeth do not articulate well?
Do you consider yourself a tense/nervous person?

Table 2: *Characterization of the sample.*

	Education						
Sex	Did not finish elementary school ary school	Finished elementary school	Did not finish high school	Did not finish college education	Did not finish college education	Finished college education	Total
Women	1	0	0	18	43	145	207
Men	2	1	0	10	20	89	122
Total	3	1	0	28	63	234	329

Table 3: *Distribution of the sample regarding occupation and family headship.*

	Same occupation before and after the Pandemic		***Head of household before the Pandemic***		***Head of household after the Pandemic***	
	Frequency	%	Frequency	%	Frequency	%
Yes	288	87.5%	146	44.4%	153	46.5%
No	41	12.5%	183	55.6%	176	53.5%

Table 4: *Frequency of symptoms associated with temporomandibular disorders.*

Questions	**No**	**I already felt it before the pandemic and it's the same**	**Yes, after the start of the pandemic**	**I already felt it before the Pandemic and it got worse**
Did you notice difficulty, pain or both when opening your mouth, for example, when yawning after the start of the pandemic?	268 (81.5%)	33 (10%)	10 (3%)	18 (5.5%)
Did you notice difficulty moving your jaw sideways (it gets "stuck", "locked") after the start of the pandemic?	282 (85.8%)	28 (8.5%)	12 (3.6%)	7 (2.1%)
Have you noticed muscle fatigue/pain when chewing, talking or using your jaws after the start of the pandemic?	230 (69.9%)	37 (11.2%)	39 (11.9%)	23 (7%)
Are your jaws stiff, tight or tired on a regular basis after the start of the pandemic?	213 (64.7%)	44 (13.4%)	44 (13.4%)	28 (8.5%)
Do you experience headaches often after the start of the pandemic?	199 (60.5%)	59 (17.9%)	40 (12.2%)	31 (9.4%)

Table 5: *Association between the Appearance/worsening of TMD symptoms and the appearance/worsening of the feeling of tension after the start of the pandemic. Fisher's exact test.*

		Appearance/worsening of the feeling of tension after the start of the pandemic		
Appearance/worsening of the feeling of tension after the start of the pandemic		No	Yes	*P* value
Pain/difficulty opening	No	222 (95.3)	79 (82.3)	**<.001**
	Yes	11 (4.7)	17 (17.7)	
Pain/difficulty in laterality	No	228 (97.9)	82 (85.4)	**<.001**
	Yes	5 (2.1)	14 (14.6)	
Muscle soreness on function	No	206 (88.4)	61 (63.5)	**<.001**
	Yes	27 (11.6)	35 (36.5)	
Stiff, tight, or tired jaws	No	206 (88.4)	51 (53.1)	**<.001**
	Yes	27 (11.6)	45 (46.9)	
Headache	No	204 (87.6)	54 (56.3)	**<.001**
	Yes	29 (12.4)	42 (43.8)	
Pain in the ears	No	212 (91.0)	76 (79.2)	**.003**
	Yes	21 (9.0)	20 (20.8)	
Earache	No	226 (97.0)	80 (83.3)	**<.001**
	Yes	7 (3.0)	16 (16.7)	
Neck pain	No	206 (88.4)	56 (58.3)	**<.001**
	Yes	27 (11.6)	40 (41.7)	
Toothache	No	218 (93.6)	75 (78.1)	**<.001**
	Yes	15 (6.4)	21 (21.9)	
Noises	No	215 (92.3)	79 (82.3)	**.008**
	Yes	18 (7.7)	17 (17.7)	
Bite change	No	206 (88.4)	68 (70.8)	**<.001**
	Yes	27 (11.6)	28 (29.2)	

DISCUSSION

Since the establishment of the World Health Organization (WHO), the most severe public health crisis that the world encountered is the COVID-19 pandemic.[11] Initially, the only thing the population was certain of was the severity of the disease. Uncertainties included the progression of the pandemic and the government's measures for controlling it. In this context, several reactions and psychological disturbances appeared in the public[12] and among these, there was an increase in reports suggestive of temporomandibular disorders (TMD) among patients. Therefore, the objective of this study was to ascertain the occurrence of symptoms linked with temporomandibular disorders during the COVID-19 outbreak. Although the frequency was low, there was a significant association between the symptoms. Considering the objective of this study, the literature.[13] reports that psychological factors related to the COVID-19 pandemic increase the chances of developing or worsening TMD.[14]

Everyday life and literature indicate that the COVID-19 pandemic was unquestionably a difficult time, with people extremely scared and afraid of what could happen both in terms of their health and their finances. A survey conducted in 2020 revealed that number of individuals who self-diagnosed with stress (60%), anxiety (57.5%) and panic (14%) were abnormally high.[15] Many entrepreneurs declared bankruptcy or faced a decrease in profits due to the economic crisis caused by the pandemic. This has resulted in increased unemployment and informality.[16] Therefore, emotional problems may have caused or worsened symptoms indicating TMD. In addition, the precautionary measure of social distancing during the pandemic has limited the

accessibility of medical assistance, which could be considered as a contributing factor to the exacerbation of disorders.[17]

Therefore, this research aims to investigate the prevalence of TMD symptomatology and its impact on the primary financial provider of the household, who is believed to be the most affected emotionally. As TMD is a multifactorial disease, the presence of symptoms was asked to suggest a possible scenario rather than to establish a cause-and-effect relationship.

In this research, 73.5% of the participants carried out regular occupational activity before the COVID-19 Pandemic, from which 91.7% continued to exercise those occupations. 44.4% of the sample was the head of household with financial responsibilities prior to the Pandemic and approximately 5% of them left this responsibility. 55.6% of the participants were not initially the head of household, but 7.6% of them had to assume this obligation. Work-related factors such as occupation[18] and working hours[19], were related to TMD. Professions like computer office worker and dentist[16] showed an increased risk of developing TMD. In a previous study, the risk of TMD was higher among women who work more than 60 hours a week than among those who work less than 40 hours a week[19].

The study has certain limitations, including potential selection bias due to the use of convenience sampling. Additionally, data collection through an online self-report questionnaire may have introduced reporting bias in the responses. Additionally, the volunteers were unable to clarify any possible doubts. Another bias that could have been included is information bias, which occurs when the information obtained may distort the study's results. In this case, it would be represented by the potential memory bias of the interviewees when completing the questionnaire. Additionally, since the study was conducted on a limited sample size of the population, it is impossible to eliminate random errors.

In addition, there is no study prior to the pandemic so that a correlation could be established. On the other hand, the fact that the family's financial provider developed psychological and family relationship problems after the start of the pandemic is notorious. Another limitation that must be taken into account is that more than half of the volunteers presented themselves as retirees, students, public servants and even liberal professions. This lack of an employee-employer relationship may have introduced a confounding bias when analyzing occupations both before and during the Pandemic.

Despite the identified biases, with the analysis of the data, it is possible to better measure the psychological and emotional situation of patients in the post-pandemic context that still affects everyone. This may be one of the most common reasons why patients seek orthodontic treatment, although it may not necessarily provide a complete solution, it could improve their complaints. Therefore, new studies with a randomly selected sample and a larger number of volunteers are necessary to ensure greater representation.

CONCLUSION

During the COVID-19 pandemic, less than half of the sample either developed or experience a worsening of temporomandibular disorders. Additionally, a correlation was discovered between the appearance/worsening of TMD symptoms and the onset/worsening of feelings of tension following the start of the pandemic in all of compared items.

REFERENCES

1. Scrivani SJ, Keith DA, Kaban LB. Temporoman-dibular disorders. N Engl J Med. 2008;359(25):2693–705. doi: 10.1056/NEJMra0802472.

2. Greene CS. Diagnosis and treatment of temporo-mandibular disorders: emergence of a new care guidelines statement. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2010;110(2):137–9. doi: 10.1016/j.tripleo.2010.04.032.

3. Scrivani SJ, Khawaja SN, Bavia PF. Nonsurgical Management of Pediatric Temporomandibular Joint Dysfunction Oral Maxillofacial Surg Clin N Am 30. 2018; 35–45. doi: 10.1016/j.coms.2017.08.001

4. Venkateswaran S, Saravanakuma, Annamalai, Divya, Yamini. Diagnosis & Management of Temporomandibular Joint Disorders- What the Medical and Dental practitioners should know? Chettinad Health City Medical Journal. 2013;2(2):52-59.

5. Motghare V, Kumar J, Kamate S, Kushwaha S, Anand R, Gupta N, et. al. Association Between Harmful Oral Habits and Sign and Symptoms of Temporomandibular Joint Disorders Among Adolescents. J Clin Diagn Res. 2015;9(8):ZC45-8. doi: 10.7860/JCDR/2015/12133.6338. Epub 2015 Aug 1.

6. Reisine ST, Weber J. The effects of temporomandibular joint disorders on patients' quality of life. Comm Dent Health. 1989; 6:257–270.

7. Kempen GI, Ormel J, Brilman EI, Relyveld J. Adaptive responses among Dutch elderly: the impact of eight chronic medical conditions on health-related quality of life. Am J Public Health. 1997;87:34–44. doi: 10.2105/AJPH.87.1.38.

8. Di Giacomo P, Serritella E, Imondi F, Di Paolo C. Psychological impact of COVID-19 pandemic on TMD subjects. Eur Rev Med Pharmacol Sci. 2021;25(13):4616-4626. doi: 10.26355/eurrev_202107_26254.

9. Augusto VG, Perina KCB, Penha DSG, Dos Santos DCA, Oliveira VAS. Temporomandibular dysfunction, stress and common mental disorder in university students. Acta ortop. bras. 2016;24(6). Doi: 10.1590/1413-78522016240616287

10. Valesan LF, Da-Cas CD, Réus JC, Denardin ACS, Garanhani RR, Bonotto D, et. al. Prevalence of temporomandibular joint disorders: a systematic review and meta-analysis. Clin Oral Investig. 2021;25(2):441-453. doi: 10.1007/s00784-020-03710-w. Epub 2021 Jan 6. PMID: 33409693.

11. Zhang N, Bai B, Zhu J. Stress mindset, proactive coping behavior, and posttraumatic growth among health care professionals during the COVID-19 pandemic. Psychol Trauma. 2023;15(3):515-523. doi: 10.1037/tra0001377. Epub 2022 Oct 10. PMID: 36222661.
12. Pan W, Wang RJ, Dai WQ, Huang G, Hu C, Pan WL, et. al. China Public Psychology Analysis About COVID-19 Under Considering Sina Weibo Data. Front Psychol. 2021;8;12:713597. doi: 10.3389/fpsyg.2021.713597. PMID: 34566790; PMCID: PMC8456024.
13. Almeida-Leite CM, Stuginski-Barbosa J, Conti PCR. How psychosocial and economic impacts of COVID-19 pandemic can interfere on bruxism and temporomandibular disorders? J Appl Oral Sci. 2020;28:e20200263. doi: 10.1590/1678-7757-2020-0263. Epub 2020 May 11. PMID: 32401942; PMCID: PMC7213779.
14. Canales GT, Guarda-Nardini L, Rizzatti-Barbosa CM, Conti PCR, Manfredini D. Distribution of depression, somatization and pain-related impairment in patients with chronic temporomandibular disorders. J Appl Oral Sci. 2019;7;27:e20180210. doi: 10.1590/1678-7757-2018-0210. PMID: 30624469; PMCID: PMC6322638.
15. Lipp MEN, Lipp MEN. Stress e transtornos mentais durante a pandemia da COVID-19 no Brasil. Bol. - Acad. Paul. Psicol. 2020; 40(99):180-191.
16. Louredo FM, Pereira PHF, de Souza Júnior PD, dos Santos RAB. Pandemia e desemprego no brasil: impactos e consequências para os jovens no mercado de trabalho. Rev. Eletro. Instituto de Humanidades. 2021;26(52):93-117.
17. Clauw DJ, Häuser W, Cohen SP, Fitzcharles MA. Considering the potential for an increase in chronic pain after the COVID-19 pandemic. Pain. 2020;161(8):1694-1697. doi: 10.1097/j.pain.0000000000001950. PMID: 32701829; PMCID: PMC7302093.
18. Emodi Perelman A, Eli I, Rubin PF, Greenbaum T, Heiliczer S, Winocur E. Occupation as a potential contributing factor for temporomandibular disorders, bruxism, and cervical muscle pain: a controlled comparative study. Eur J Oral Sci. 2015;123(5):356-361. doi: 10.1111/eos.12210. Epub 2015 Sep 1. PMID: 26333137.
19. Han W, Kwon SC, Lee YJ, Park C, Jang EC. The associations between work-related factors and temporomandibular disorders among female full-time employees: findings from the Fourth Korea National Health and Nutrition Examination Survey IV (2007-2009). Ann Occup Environ Med. 2018;20;30:42. doi: 10.1186/s40557-018-0253-9. PMID: 29977568; PMCID: PMC6011415.