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# ANXIETY IN THE FACE OF COVID 19 AS A DETERMINING FACTOR FOR TEMPOROMANDIBULAR DYSFUNCTION

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## ARTICLE INFO

## ABSTRACT

The objective of the research was to assess whether anxiety can be considered a predictor of temporomandibular dysfunction (TMD) in health professionals who were at the forefront of the fight against COVID-19. This is a cross-sectional quantitative study. The study included interns or health professionals aged 18 years or over, living in Brazil and working on the front lines of the fight against COVID-19. The Fonseca Anamnesis Questionnaire, considered an instrument capable of characterizing the severity of TMD symptoms. For the inferential analysis, a regression with moderation was performed considering the independent variable anxiety; the dependent variable the diagnosis suggestive of TMD; and the moderating variable the use of the N95 mask. In conclusion, we suggest that anxiety can be a triggering factor for TMD signs and symptoms in healthcare professionals, and that this relationship can be enhanced by the use of the N95 mask. Thus, it is necessary to build strategies aimed at the mental and physical health of health professionals who are working on the front lines of combating COVID-19.

## INTRODUCTION

In December 2019 a new viral pneumonia triggered by a new coronavirus (SARS-CoV-2) was identified in Wuhan, China (Huang *et al*., 2020). In a matter of weeks the virus had already spread around the world. According to Worldometer (2021), as of June 10, 2021, there had been 175,502,882 confirmed cases, 3,785,748 reported deaths and 158,964,988 recovered individuals across the world. In 2020, the World Health Organization (WHO) declared South America the new epicenter of the COVID-19 pandemic (OMS, 2020). Brazil is among the most affected countries, with 17,210,969 confirmed cases and 482,019 reported deaths of June 10, 2021. In addition, COVID-19's fatality rate in Brazil is higher than in other Latin American countries (Marinho *et al*., 2021). Thus, the COVID-19 pandemic had serious economic, social and structural consequences on the world population (Screepadmanabh, Sahu & Chande, 2020). Studies carried out in previous epidemics and pandemics showed the occurrence of psychological reactions due to

factors such as: individual vulnerability, intolerance to uncertainty, perceived vulnerability to illness and anxiety (Taylor, 2019). In addition, social isolation has also been presented as a triggering factor for feelings such as anger and loneliness, which may help in the occurrence of emotional symptoms (Zandifar & Badrfam, 2020). There is evidence that the COVID-19 pandemic has aggravated the mental health of the population, especially among health professionals (Choi, Hui & Wan, 2020; Liu *et al*., 2020). In this regard, a study carried out in 2020 in China estimated the prevalence of anxiety symptoms in 12.5% of the health professionals evaluated, and the main triggering factor was direct contact with infected patients (Liu *et al*., 2020). Temporomandibular dysfunction (TMD) it is characterized as a chronic pain condition that affects the orofacial region, masticatory muscles, temporomandibular joints and related structures (Al-Khotani *et al*., 2016). The relationship between anxiety for development and maintenance of TMD was presented (Resende *et al*., 2020). As well as the association between bruxism and psychological aspects (Przystańska *et al*., 2019; Quadri *et al*., 2015). Anxiety triggers feelings of hyperexcitation, through increased

synaptic impulse, which can trigger episodes of pain, such as chronic orofacial pain. Thus, the hypothesis of this study is that experiencing a pandemic in the midst of so many anxiety triggering factors can help to increase the prevalence of TMD in health professionals (Miglis, 2016). The objective of the research was to assess whether anxiety can be considered a predictor of TMD in health professionals who were at the forefront of the fight against COVID-19.

# METHODS

This is a cross-sectional quantitative study. The research was voluntary and participants had to fill out an informed consent form. The present study followed the ethical principles of the Declaration of Helsinki and was approved by the Committee of Ethics in Research of the Faculty of Applied Social Sciences (CAAE: 39861020.7 .0000.5175). The study included interns or health professionals aged 18 years or over, living in Brazil and working on the front lines of the fight against COVID-19. The sample consisted of accessibility. Exclusion criteria were individuals who underwent some type of spinal and/or orofacial surgery, traumatic injuries of the mandible and cervical region, who already have a history of TMD or orofacial pain before the pandemic, as well as those who did not complete the instrument data collection process satisfactorily. A questionnaire containing questions related to sociodemographic and professional characterization. The Fonseca Anamnesis Questionnaire, considered an instrument capable of characterizing the severity of TMD symptoms according to the following scores: no TMD (0 to 15 points), mild TMD (20 to 45 points), moderate TMD (50 to 65) and severe TMD (70 to 100 points) (Fonseca, 1994). A questionnaire for the initial screening of potential patients with orofacial pain proposed by the American Academy of Orofacial Pain (Okeson, 2000). Beck Anxiety Inventory: presents 21 items regarding how the individual has been feeling during the last two weeks, including the current day, in order to provide descriptive information on anxiety symptoms. Each item has 4 options, among which one can be chosen by the participant (ranging from 0 to 3 the score of each option). The total score is calculated by adding the individual response for each item, with a maximum score of 63 points (Bartholomeu *et al.*, 2010). The research was carried out through the application of an online form built in the Google Forms tool. The form was sent to participants via email, Instagram and WhatsApp for proper completion. Data collection was carried out between January and May 2021. Descriptive analyzes were performed for the participants' socioeconomic and clinical variables. Confidence Interval (95%) and p<0.05 were considered. Analysis of the correlation between the anxiety scale variable and the variable diagnosis suggestive of TMD was performed. For the inferential analysis, a regression with moderation was performed considering the independent variable anxiety; the dependent variable the diagnosis suggestive of TMD; and the moderating variable the use of the N95 mask.

# RESULTS

Altogether, 101 health professionals participated in the survey. Table 1 shows the socioeconomic and demographic characterization of the study participants. Most participants were female (n=78, 77.2%), brown (n=53, 52.5%), without a partner (n=64, 63.4%), from the Northeast region (n = 97.96%), with higher education (n=53, 52.5%), working in the field of Nursing (n=36, 35.6%) and with training time between 1 and 10 years (n=57, 56.4%). Age ranged between 18 and 42 years old, with the most prevalent age group being 24 to 29 years old. In Table 2, it is possible to verify variables related to the relationship of the participants with regard to the service in which they work. Most have been in the position for less than 5 years (n=58, 57.4%), have a daily workload of less than 12 hours a day (n=52, 51.5%) and weekly between 31 and 49 hours (n=50, 49.5%). Most respondents have their work divided into two shifts (n=50, 49.5%), with at least one or even two breaks between them (n=88, 87.1%). With regard to the use of PPE, most use N95 mask and cap; mask, glasses and cap; or mask/coat/cap/glasses and faceshield face shield (n=25, 24.8% each).

**Table 1. Socioeconomic and demographic characterization of research participants, 2021**

| VARIABLE | N | % | CI (95%) |
|---|---|---|---|
| Age | | | |
| 18-23 years | 17 | 16,8 | (1,11-2,07) |
| 24-29 years | 34 | 33,7 | (1,01-1,70) |
| 30-35 years | 26 | 25,7 | (0,76-1,54) |
| 36-41 years | 13 | 12,9 | (0,80-1,97) |
| 42 years or more | 11 | 10,9 | (1,09-2,73) |
| Gender | | | |
| Female | 78 | 77,2 | (1,31-1,77) |
| Male | 23 | 22,8 | (0,60-1,31) |
| Breed | | | |
| White | 41 | 40,6 | (0,94-1,60) |
| Brown | 53 | 52,5 | (1,25-1,80) |
| Black | 7 | 7,0 | (0,59-1,98) |
| Marital status | | | |
| With partner | 37 | 36,6 | (1,09-1,78) |
| No partner | 64 | 63,4 | (1,14-1,64) |
| Scholarity | | | |
| Graduated | 53 | 52,5 | (1,00-1,53) |
| Incomplete higher | 24 | 23,8 | (1,23-2,02) |
| Postgraduate studies | 15 | 14,9 | (0,72-1,95) |
| Technical education | 9 | 8,9 | (0,85-2,70) |
| Occupation | | | |
| Physiotherapy | 24 | 23,8 | (1,03-1,97) |
| Dentistry | 9 | 8,9 | (0,67-2,00) |
| Nursing | 36 | 35,6 | (0,87-1,52) |
| Medicine | 7 | 6,9 | (0,84-2,30) |
| Technical | 20 | 19,8 | (1,06-2,04) |
| Pharmaceutics | 5 | 5,0 | (0,18-3,42) |
| graduation time | | | |
| < 1year | 24 | 23,8 | (1,17-1,99) |
| Between 1 and 10 years | 57 | 56,4 | (0,98-1,51) |
| > 10 years | 20 | 19,8 | (1,16-2,14) |
| TOTAL | 101 | 100 | |

Source: Own authorship, 2021.

**Table 2. Characterization of the relationship of research participants regarding the service they work, 2021**

| Variable | N | % | CI (95%) |
|---|---|---|---|
| Time in servisse | | | |
| < 10 years | 82 | 81,2 | (1,14-1,59) |
| 10 years or more | 19 | 18,8 | (1,12-2,04) |
| Time in office | | | |
| < 5 years | 58 | 57,4 | (1,11-1,65) |
| 5 years or more | 43 | 42,6 | (1,14-1,74) |
| Daily hourly load | | | |
| < 12 h | 52 | 51,5 | (1,13-1,72) |
| 12 - 24h | 34 | 33,7 | (1,02-1,68) |
| >24h | 15 | 14,9 | (0,92-2,02) |
| Weekly workload | | | |
| Until 30h | 32 | 31,7 | (1,25-2,00) |
| 31-49h | 50 | 49,5 | (1,08-1,68) |
| 50h or more | 19 | 18,8 | (0,75-1,46) |
| Work shifts | | | |
| 1 | 24 | 23,8 | (1,14-2,03) |
| 2 | 50 | 49,5 | (1,18-1,74) |
| 3 | 27 | 26,7 | (0,76-1,54) |
| Breaks during shifts | | | |
| 1 or 2 days | 88 | 87,1 | (1,16-1,59) |
| > 2 days | 13 | 12,9 | (0,98-2,25) |
| PPE | | | |
| Mask | 6 | 5,9 | (0,13-2,20) |
| mask/cap | 25 | 24,8 | (0,94-1,54) |
| mask/faceshield/cap | 20 | 19,8 | (1,35-2,25) |
| Mask/glasses/cap | 25 | 24,8 | (1,03-2,01) |
| Mask/coat/cap/glasses/faceshield | 25 | 24,8 | (0,77-1,63) |
| Number of hours you use PPE per day | | | |
| 12h | 77 | 76,2 | (1,15-1,60) |
| >12h | 24 | 23,8 | (1,07-1,93) |
| Daily PPE changes | | | |
| 1-3 times | 79 | 78,2 | (1,23-1,66) |
| > 3 times | 22 | 21,8 | (0,78-1,77) |
| N95 post-mandemic | | | |
| Yes | 82 | 81,2 | (1,18-1,65) |
| No | 19 | 18,8 | (1,04-1,70) |
| Total | 101 | 100 | |

Source: Own authorship, 2021

The use of PPE takes up to 12 hours a day (n=77, 76.2%) and it is changed between one and three times a day (n=79, 78.2%).Table 3 shows the characterization of research participants regarding possible predictive factors for TMD.

participants had a diagnosis suggestive of mild TMD (n=38, 77.6%) and minimal anxiety (n=54, 53.5%). Regarding the influence of working hours and use of PPE, the cross-reference table showed that the type of PPE used (p=0.01), as well as the beginning of the use of

**Table 3. Characterization of participants regarding previous history, predictive factors, signs of TMD and anxiety**

| VARIABLE | N | % | CI (95%) |
|---|---|---|---|
| Previous TMD Diagnosis | | | |
| No | 85 | 84,2 | (1,00-1,40) |
| Yes | 16 | 15,8 | (2,16-2,84) |
| Use of orthodontic appliance currently | | | |
| No | 43 | 42,6 | (0,97-1,54) |
| Yes | 58 | 57,4 | (1,24-1,79) |
| Use of orthodontic appliance during life | | | |
| No | 40 | 39,6 | (1,01-1,64) |
| Yes | 61 | 60,4 | (1,20-1,72) |
| Mandibular Trauma History | | | |
| No | 95 | 94,1 | (1,14-1,54) |
| Yes | 6 | 5,9 | (1,62-3,38) |
| Pain in the TMJ | | | |
| No | 62 | 61,4 | (0,72-1,12) |
| Yes | 39 | 38,6 | (1,91-2,45) |
| Considers the N95 responsible for the TMD | | | |
| No | 73 | 72,3 | (1,01-1,45) |
| Yes | 28 | 27,7 | (1,14-2,25) |
| TMD Signs and Symptoms Scale | | | |
| Without TMD | 20 | 19,8 | (0,08-0,62) |
| Light TMD | 38 | 37,6 | (0,25-0,75) |
| Moderate TMD | 25 | 24,8 | (0,67-1,73) |
| Severe TMD | 18 | 17,8 | (1,10-2,13) |
| Anxiety scale | | | |
| Minimal anxiety | 54 | 53,5 | (0,85-1,33) |
| Mild anxiety | 19 | 18,8 | (0,74-1,68) |
| Moderate anxiety | 18 | 17,8 | (1,53-2,58) |
| Severe anxiety | 10 | 9,9 | (1,95-2,65) |
| TOTAL | 101 | 100 | |

Source: Own authorship, 2021

**Table 4. Cross-reference table between the use of PPE and the diagnosis suggestive of TMD, 2021**

| | Without TMD | Light TMD | Moderate TMD | Severe TMD | p |
|---|---|---|---|---|---|
| Variable | N | N | N | N | |
| Daily hourly load | | | | | |
| < 12 h | 11 | 19 | 11 | 11 | 0,759 |
| 12 - 24h | 6 | 15 | 8 | 5 | |
| > 24h | 3 | 4 | 6 | 2 | |
| Weekly workload | | | | | |
| Until 30h | 4 | 13 | 6 | 9 | 0,207 |
| 31-49h | 12 | 16 | 13 | 9 | |
| 50h or more | 4 | 9 | 6 | 0 | |
| Work shifts | | | | | |
| 1 | 3 | 11 | 3 | 7 | 0,257 |
| 2 | 9 | 17 | 16 | 8 | |
| 3 | 8 | 10 | 6 | 3 | |
| Breaks during shifts | | | | | |
| 1 or 2 days | 19 | 31 | 24 | 14 | 0,151 |
| > 2 days | 1 | 7 | 1 | 4 | |
| PPE | | | | | |
| Mask | 1 | 4 | 0 | 1 | *0,01** |
| mask/cap | 2 | 17 | 4 | 2 | |
| mask/faceshield/cap | 2 | 5 | 8 | 5 | |
| Mask/glasses/cap | 7 | 5 | 6 | 7 | |
| Mask/coat/cap/glasses/faceshield | 8 | 7 | 7 | 3 | |
| Number of hours you use PPE per day | | | | | |
| 12h | 16 | 29 | 19 | 13 | 0,957 |
| >12h | 4 | 9 | 6 | 5 | |
| N95 post-mandemic | | | | | |
| Yes | 24 | 22 | 16 | 20 | *0,003* |
| No | 14 | 3 | 2 | 0 | * |

*Chi-square test ($x^2$)(p<0.05)* Source: Author, 2021.

It can be observed that those without a previous diagnosis of TMD were more prevalent (n=85, 84.2%), who used (n=58, 57.4%) or had a history of using orthodontic appliances (n=61, 60.4%), with no history of mandibular trauma (n=95, 94.1%), no TMJ pain (n=62, 61.4%) and who did not believe that N95 could be an etiological factor for TMD ( n=73, 72.3%). It should be noted that most

the type N95 mask in the Covid pandemic -19 (p<0.001) influenced the diagnosis suggestive of TMD (Table 4). In Table 5, it is possible to verify the cross-reference between possible predictive factors and the suggestive diagnosis of TMD. It is evident that severe TMD diagnoses were more prevalent in people with a previous diagnosis of TMD (p<0.001), with a history of mandibular trauma (p=0.013) and with a moderate degree of anxiety (p<0.001).

**Table 5. Cross-reference table between possible predictive factors and suggestive diagnosis of TMD, 2021**

|  | Without TMD | Light TMD | Moderate TMD | Severe TMD | P |
|---|---|---|---|---|---|
| Variável | N | N | N | N |  |
| Previous TMD Diagnosis |  |  |  |  |  |
| No | 20 | 37 | 19 | 9 | *0,001\** |
| Yes | 0 | 1 | 6 | 9 |  |
| Use of orthodontic appliance currently |  |  |  |  |  |
| No | 8 | 22 | 7 | 6 | 0,087 |
| Yes | 12 | 16 | 18 | 12 |  |
| Use of orthodontic appliance during life |  |  |  |  |  |
| No | 8 | 18 | 7 | 7 | 0,490 |
| Yes | 12 | 20 | 18 | 11 |  |
| Mandibular Trauma History |  |  |  |  |  |
| No | 20 | 37 | 24 | 14 | *0,013\** |
| Yes | 0 | 1 | 1 | 4 |  |
| Anxiety scale |  |  |  |  |  |
| Minimal anxiety | 14 | 25 | 11 | 4 |  |
| Mild anxiety | 5 | 7 | 5 | 2 | *0,001\** |
| Moderate anxiety | 1 | 6 | 2 | 9 |  |
| Severe anxiety | 0 | 0 | 7 | 3 |  |

*\*Chi-square test ($x^2$)(p<0.05)*
Source: Author, 2021.
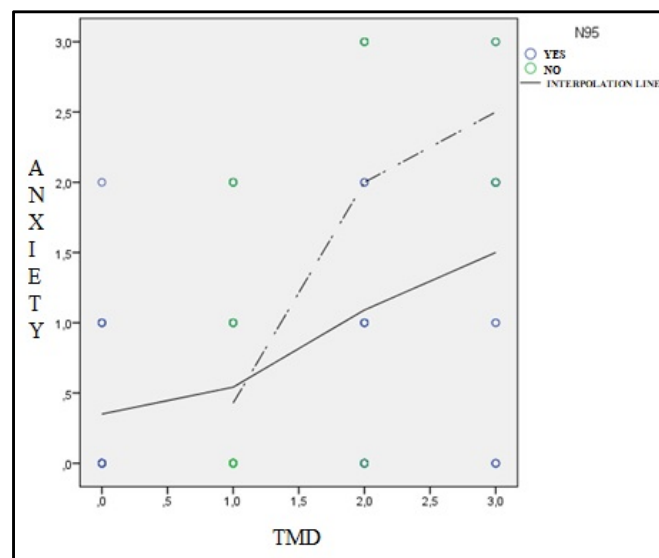


No – people who were already using N95 (not started in the pandemic) (effect 0.4005).
Yes – people who started using N95 in the pandemic (effect 1, 1563).
Source: Own Authorship, 2021.

**Graph 1. Analysis of the beginning of the use of N95 in the pandemic as a moderator of the relationship between anxiety and diagnosis suggestive of TMD**

The bivariate correlation test performed between the anxiety scale and the diagnosis suggestive of TMD showed a statistically relevant positive relationship (r=0.444, p<0.001). The moderated regression test showed that 23.81% (p<0.001) of the relationship between anxiety and a diagnosis suggestive of TMD was moderated by the beginning of the N95 mask during the pandemic (Graph 1). The interpolation line in a non-horizontal position shows that even in participants who were already using N95 before the pandemic, it was already partially responsible for the relationship between anxiety and TMD. However, when the use of N95 starts only at the time of a pandemic (dotted line), the effect is considerably increased.

## DISCUSSION

The objective of the research was to assess whether anxiety can be considered a predictor of TMD in health professionals who were at the forefront of the fight against COVID-19. Our results showed that anxiety was an important factor in triggering TMD and this relationship was more pronounced with the presence of the N95 mask. Previous studies have shown a relationship between anxiety and the onset or worsening of TMD (Humphris *et al*., 2002; Medeiros *et al*., 2020; Sójka *et al*., 2019). Studies have reported a correlation between hypothalamic-pituitary-adrenal (HPA) axis dysregulation and TMD (Lambert *et al*., 2013; Leeuw *et al*., 2005). There is evidence that the HPA axis and the sympathetic-adrenal axis are both activated by anticipatory anxiety (Mason, 1975). In the context of chronic anxiety, the HPA axis is activated in the long term, which can lead to the desensitization of 5-HT receptors in the hippocampus, resulting in damage to this brain área (Graeff *et al*., 1996).

It is believed that the COVID-19 pandemic increased anxiety, especially among health professionals (Choi, Hui & Wan, 2020; Liu *et al*., 2020), and that this may have contributed to the prevalence of TMD among health professionals. participants in our survey. Regarding the worsening of symptoms related to the use of the N95 mask, we hypothesized that it may reflect an additional aspect of anxiety, as it is considered a symbol of protection for the COVID-19 pandemic. However, further studies need to be carried out in order to understand the perception of participants in relation to N95. This research has some limitations. As it was performed as a self-report through the internet, possible response biases may have been presented. However, considering the social distance, we believe it was an initial tool to elucidate some hypotheses and propose future studies. In addition, we do not work with the clinical diagnosis of TMD, but with signs and symptoms related to temporomandibular pain.

Thus, longitudinal studies can be carried out in order to better elucidate this relationship, considering the monitoring of people over time and the clinical diagnosis, in order to provide data related to the incidence of TMD and its risk factors. We also suggest studies that assess the relationship between anxiety and TMD, considering possible biological markers, as it may help in early diagnosis and coping strategies. In conclusion, we suggest that anxiety can be a triggering factor for TMD signs and symptoms in healthcare professionals, and that this relationship can be enhanced by the use of the N95 mask. Thus, it is necessary to build strategies aimed at the mental and physical health of health professionals who are working on the front lines of combating COVID-19.

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