CATASTROPHIZING, CENTRAL SENSITIZATION AND CHRONIC PAIN-RELATED TMD: HOW IS THIS ASSOCIATION?

CATASTROFIZAÇÃO, SENSIBILIZAÇÃO CENTRAL E DTM DOLOROSA CRÔNICA: QUAL A ASSOCIAÇÃO?

DOI: 10.55908/RGCV16N1-033
Recebimento do original: 16/08/2022
Aceitação para publicação: 12/09/2022

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ABSTRACT: INTRODUCTION: most of the individuals who present catastrophizing and central sensitization also present chronic pain, as temporomandibular disorders (TMD). AIM: to analyze whether there is an association between the variables of pain intensity, central sensitization, and catastrophizing in women with chronic pain-related TMD. METHODS: an observational descriptive cross-sectional study was conducted, comprising a sample of 50 women diagnosed with chronic pain-related TMD according to the DC/TMD – Brazilian Portuguese version. The following questionnaires/protocols were applied: Pain Catastrophizing Scale (PCS), Central Sensitization Inventory (CSI), pain intensity (Visual Analogue Scale, VAS). For the analysis of the PCS and CSI scores, the 75th percentile was used to determine the cutoff points, and Multiple Linear Regression Tests (p < 0.05) was applied. RESULTS: The sample showed overall higher cutoff values for catastrophization (32.3), rumination (12.4), magnification (5.7), helplessness (13.9), and central sensitization (52.2). Statistical association was found between the time of pain-related TMD (in months), number of painful points, and total catastrophizing score (F = 0.72; p = 0.004). This association was not found to central sensitization. That is, higher pain-related TMD time and/or higher number of painful points, also higher the catastrophizing. CONCLUSION: women with chronic painful TMD tend to have high levels of catastrophizing and central sensitization. There is a positive and proportional association between the duration of pain and/or the number of painful points and catastrophizing in women with chronic pain-related TMD.

KEYWORDS: Temporomandibular Joint Dysfunction Syndrome. Catastrophization. Central Nervous System Sensitization.
(12,4), magnificação (5,7), desamparo (13,9) e sensibilização central (52,2). Foi encontrada associação estatística entre o tempo de dor, o número de pontos dolorosos e o escore total da catastrofização (F = 0,72; p = 0,004). Esta associação não foi encontrada para sensibilização central (F = 0,32; p = 0,08). Quanto mais tempo de dor e/ou o número de pontos dolorosos, maior a catastrofização. CONCLUSÃO: mulheres com DTM dolorosa crônica tendem a apresentar níveis elevados de catastrofização e de sensibilização central. Há uma associação positiva e proporcional entre o tempo de dor e/ou o número de pontos dolorosos com a catastrofização na amostra estudada.

PALAVRAS-CHAVE: Síndrome da Disfunção da Articulação Temporomandibular. Catastrofização. Sensibilização do Sistema Nervoso Central.

1. INTRODUCTION

The comorbidities of TMD, especially once they become chronic, present the central sensitization as a common pathophysiological mechanism [1]. Central sensitization causes changes in peripheral impulses and a dysregulation of nociceptive pathways throughout the neuroaxis, being mainly characterized by allodynia, which is a painful sensation to normally non-painful stimuli (such as touch); by hyperalgesia, which is excessive sensitivity to a normally painful stimulus (such as pressure); and by unusually prolonged pain after removal of the stimulus (commonly being burning, throbbing, tingling, or numbness) [2,3].

Temporomandibular disorders (TMD) symptoms are directly linked to emotional issues, such as catastrophizing. Mental disorders, such as anxiety, depression, and stress are widely observed in people with TMD [4-6]. When compared to healthy individuals, people with TMD-related pain have higher levels of stress, anxiety, depression, somatization, and catastrophic thoughts [7,8].

Catastrophizing thoughts can be defined as exaggerated, negative mental processes that occur in response to an unpleasant experience. These thoughts increase the intensity of pain, feelings of physical disability, stress, and generate an inadequate response to treatment. It has been shown that the psychological mechanism of pain catastrophizing influences the biological phenomenon of increased pain experience in cases of unpredictable stimuli [9].
Pain and suffering are closely related elements. Pain comprises a sum of mechanisms influenced by psychological, physical, and sociocultural variables. It has been observed that people constantly exposed to stressful factors show an increased masseter muscle hyperactivity [10-12].

Catastrophizing individuals who present chronic pain manifest a lack of pain control and constant automatic negative thoughts [2]. Patients may react in different ways, so the professional must establish an individualized and interdisciplinary treatment, as the etiology is multifactorial [3].

Following the problematic presented above, the aim of this paper was to analyze the association between the variables of pain, central sensitization, and catastrophizing in women with chronic painful TMD.

2. MATERIALS AND METHODS

2.1 STUDY DESIGN

An observational descriptive cross-sectional study.

2.2 DESCRIPTION OF THE SAMPLE

The sample was calculated based on the average number of individuals between 18 and 65 years old with painful TMD who are referred annually from the Department of Evaluation, Control, and Audit (DACA) of the Dentistry Regulatory Complex (CRO) of the city of Ribeirão Preto to the UNAERP (University of Ribeirão Preto) Dentistry Clinic, with data from the last 5 years. The average attendance capacity verified was 42 individuals/year. Considering a sampling error of 5% and a confidence level of 95%, the total representative sample of this patient population would be 38 individuals, with no gender distinction. Thus, half of this sample that would be representative for the female gender would be 19 research subjects (minimum sample required). The total sample obtained was 50 women, aged between 18 and 65 years. TMD diagnosis was established by the DC/TMD (Diagnostic Criteria for Temporomandibular Disorders - translated and adapted to Brazilian Portuguese).
2.3 ETHICAL ASPECTS

This project was submitted to the Research Ethics Committee (CEP) of University of Ribeirão Preto (CAAE:45451121.5.0000.5498). All the research volunteers were duly informed about the objectives, risks, and benefits of the study, and signed the Informed Consent Form.

2.4 INCLUSION AND EXCLUSION CRITERIA

The criteria for inclusion in the study were: women between the ages of 18 and 65 years, with a diagnosis of chronic painful TMD according to the Diagnostic Criteria for Temporomandibular disorders (DC/TMD). Exclusion criteria covered: women who were diagnosed with non-painful TMD by the DC/TMD [13], or who did not have enough cognitive skills to answer to the questionnaires proposed in the study. Women with a previous diagnosis of personality disorder, obsessive compulsive disorder, or bipolar disorder were also excluded.

2.5 EVALUATION PROCEDURES / APPLICATION OF QUESTIONNAIRES

The following clinical assessments/application of questionnaires were carried out:

⇒ Level of pain catastrophizing (Pain Catastrophizing Scale) (PCS)): this scale has a trifactor proposal (helplessness, magnification, and rumination), composed of 13 items with 5-point response on a Likert-type scale ranging from "never" (0) to "all the time" (4) [14]. The reference period for the responses should be the individual's general experience of pain, and the items are preceded by the expression "When I am in pain...", to analyze the catastrophizing level of patients with chronic painful TMD.

⇒ Brazilian Portuguese Central Sensitization Inventory - BP-CSI (Laboratory of Pain & Neuromodulation) Central Sensitization Questionnaire [15]. It was developed to identify patients who are at a high risk of having central sensitization, or to assess symptoms related to central sensitization. It is a self-report scale consisting of two parts on a 4-point Likert scale (0 = "never" and 4 = "always") with a maximum of 100 points.
Part A of the CSI evaluates 25 symptoms related to signs of central sensitization, with total scores ranging from 0 to 100, 40 points or more marking the presence of central sensitization indicators; and part B brings questions about the presence of previously confirmed diagnoses already correlated with central sensitization.

⇒ DC/TMD - Axis I (Symptom Questionnaire and Exam Form) [13]. The DC/TMD symptom questionnaire was developed by Schiffman et al. (2014). It is a self-report scale that presents 1 initial item to assess the presence of pain in the temple region, ear region, temporomandibular joint, and jaw muscle; 1 item to assess headache with focus on the temple region; 1 item to assess joint noises; 1 item to assess jaw locking closed; and finally, 1 item to assess jaw locking open, with answers ranging from "yes/no", "years and months" (when pain appeared for the first time), "no pain", "the pain comes and goes", "the pain is always present" (regarding the description of pain in the last 30 days), "R" "L" and "doesn't know" (if the patient presents pain, noises, or locking on the right side, left side, or doesn't know, respectively). The clinical assessment form (part of the DC/TMD) aims to measure the patient's TMD with clinical examinations, focusing on muscle and TMJ palpation (right and left sides), and measurements in millimeters of overjet (horizontal incision and vertical incision), midline shift, opening movements, lateral and protrusive movements. And finally, it presents the topic on diagnoses, aiming at "pain disorders", "right TMJ disorders", and "left TMJ disorders".

2.6 STATISTICAL ANALYSIS

First the Shapiro-Wilk Normality Test was applied, and it verified that the data had a normal distribution (parametric, i.e., p > 0.05). The 75th percentile was then used for the PCS, corresponding to a cutoff score equal to 30 in the total score, 11 in Rumination, 5 in Magnification, and 13 in Helplessness. For the analysis of dependence/association among the variables, the Multiple Linear Regression was applied, adopting 5% as the level of significance (alpha error).
3. RESULTS

Fifty women with an average age of 43.7 years participated in the study. According to the DC/TMD questionnaire, through the application of Axis I (Symptom Questionnaire and Clinical Assessment Form), patients had an average of 10.6 years of pain, 75% defined pain as "come and go", an average of 12.6 painful points on palpation was found and, in what concerns mandibular movements, the sample presented values considered within the normal range, with no limitation. As regards catastrophizing, the level was measured by the Pain Catastrophizing Scale (PCS). According to the averages, the sample presented figures above the cutoff values for catastrophizing (32.2), rumination (12.4), magnification (5.7), and helplessness (13.9).

As for central sensitization, the level was measured following the Central Sensitization Questionnaire (BP-CSI); according to the averages, the sample was above the cutoff value for central sensitization (52.2), and only 5 patients had no comorbidity. For the analysis of the PCS and CSI scores, the 75th percentile was used to determine the cutoff points, and the Shapiro-Wilk Normality and Multiple Linear Regression Tests were applied (p<0.05). Statistical association was found between the time of pain, the number of painful points, and the total catastrophizing score (F= 0.72; p= 0.004).

Table 1 shows the average, mean, minimum, maximum, and standard deviation according to the application of the DC/TMD, PCS, and BP-CSI. It was possible to analyze that the patients with an average age of 43.7 years, with an average time of pain of 10.6 years, presented scores above the average for catastrophizing (32.3), which is divided between magnification (5.7), rumination (12.4), and helplessness (13.9), and central sensitization (52.2). As for the clinical evaluation, there were 12.6 painful points, on average, during palpation. The mandibular movements had the average values within normal standards, being mouth opening (47.5), right laterality (8.3), left laterality (6.5), and protrusion (5.5).
Table 1. Data on age, catastrophizing, magnification, rumination, helplessness, central sensitization, time of pain, number of pain points on palpation, opening, right laterality, left laterality, protrusion, and pain characteristic, according to the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD), Pain Catastrophizing Scale (PCS), Brazilian Portuguese Central Sensitization Inventory (BP-CSI), regarding the study participants.

|                      | Average | Mean | Minimum | Maximum | Standard deviation |
|----------------------|---------|------|---------|---------|--------------------|
| Age                  | 43,7    | 47   | 22      | 64      | 14,7               |
| Catastrophizing      | 32,3    | 33   | 20      | 44      | 6,2                |
| Magnification        | 5,7     | 5,5  | 0       | 12      | 3,1                |
| Rumination           | 12,4    | 14   | 1       | 17      | 3,9                |
| Helplessness         | 13,9    | 14   | 1       | 21      | 4,5                |
| CSI                  | 52,2    | 54   | 28      | 76      | 12,1               |
| Pain time            | 10,6    | 8    | 2       | 40      | 9,6                |
| Nº of pain points on palpation | 12,6    | 13   | 7       | 16      | 2,9                |
| Opening              | 45,7    | 45   | 27      | 60      | 9,6                |
| Right laterality     | 8,3     | 5    | 2       | 30      | 8,1                |
| Left laterality      | 6,5     | 7    | 1,9     | 12      | 3,6                |
| Protrusion           | 5,5     | 5    | 1,5     | 12      | 2,5                |

Source: Own elaboration.

Table 2 presents the number of patients for each comorbidity according to the CSI questionnaire, where no patient had restless legs syndrome, 4 had chronic fatigue syndrome, 11 fibromyalgia, 50 temporomandibular joint dysfunction, 21 migraine or tension headache, 6 irritable bowel syndrome, 28 chemical hypersensitivity, 2 neck injury, 24 anxiety or panic attacks, and 21 for depression. Overall, only 5 patients had no comorbidity.

Table 2. Number of patients for each comorbidity according to the Brazilian Portuguese Central Sensitization Inventory (BP-CSI), regarding the study participants.

| Comorbidities                        | Number of patients |
|--------------------------------------|--------------------|
| Restless leg syndrome                | 0                  |
| Chronic fatigue syndrome             | 4                  |
| Fibromyalgia                         | 11                 |
| Temporomandibular joint dysfunction  | 50                 |
| Migraine or tension headache         | 21                 |
| Irritable bowel syndrome             | 6                  |
| Chemical hypersensitivity             | 28                 |
| Cervical injury                      | 2                  |
| Anxiety or panic attacks             | 24                 |
| Depression                           | 21                 |

Source: Own elaboration.

The graph contained in Figure 1 presents the comparison between the average and cutoff value from the PCS and CSI questionnaires regarding catastrophizing, magnification,
rumination, helplessness, and central sensitization. The results indicate that the average values are above the cutoff values for catastrophizing (32.32 out of 30), magnification (5.74 out of 5), rumination (12.42 out of 11), helplessness (13.88 out of 13), and central sensitization (52.22 out of 40).

4. DISCUSSION

Pain is a multidimensional expression that involves emotional, quantitative, and sensory aspects. During the painful event, both the physical and chemical components, as well as the subjective and psychological ones, must be considered. However, chronic painful TMD is also associated with other factors, which are pathophysiological, psychological, emotional, social, and cultural [10]. This study aimed to analyze the association between pain variables, central sensitization, and catastrophizing among women with chronic painful TMD, to provide more information about the relationship between emotional factors and chronic painful TMD.

Pain in general, whether acute or chronic, generates manifestations in the individual, such as irritability, energy change, decreased concentration, and restriction in daily activities; but, when the pain becomes chronic, there is a persistence of pain, which ends up exacerbating these symptoms [5,7,16]. Chronic pain is defined as a condition of present and constant pain that lasts for a period of 3 or more months. In this experience of pain, psychological and social factors must be considered relevant, because the biopsychosocial model understands this pain because of internal and external factors, chronic pain being thus considered a multifactorial phenomenon derived from interactions between biological, psychological, and social factors [2].

Patients who have TMD pain see it pose a negative impact on their daily life, such as at work/school, during sleep, when eating, due to difficulty in chewing, and end up feeling greater irritability, frustration, and difficulty in tolerating pain [11,12]. The study was carried out only with patients with chronic painful TMD, and it was possible to analyze that most of them presented negative impacts on their daily routine, and it was found that the central nervous system of most patients was sensitized due to a pathophysiological mechanism.
Central sensitization is a common denominator among TMD disorders, fibromyalgia, chronic fatigue syndrome, irritable bowel syndrome, and tension headache/migraine, and these conditions are linked to emotional factors such as depression and anxiety [17,18,19]. These comorbidities were cited in the CSI questionnaires, with only 5 patients not presenting any of them. The sample showed an average score of 52.2 for central sensitization, evidencing a directly proportional relationship between this and chronic TMD pain, but was not associated with pain variables, such as intensity, number of painful sites and pain time. Thus, such painful variables do not seem to play a preponderant role in the mechanisms of central sensitization, which occurs through different clinical manifestations.

Pain catastrophizing is a negative and exaggerated thinking related to actual or anticipated pain, comprising rumination, magnification, and helplessness. The individual focuses exacerbated on pain sensations, which may be real or not, because they are unable to define pain mitigation. In other words, the more catastrophizing the individual is, the higher the pain interference [20]. Catastrophizing contributes to increased pain intensity and disability in patients with TMD. The higher the levels of catastrophizing, the higher the chances of having clinically significant pain development [12,17,18,20]. The results of the research regarding catastrophizing scores were above average (32.3) according to the PCS questionnaire, showing that the sample indicates a directly proportional relationship between catastrophizing and chronic painful TMD.

Mental rumination is the act of repeating thoughts or memories with an excessive fixation on worries, emotions, past events, expectations, losses, ideas, or decisions, and the situations that may cause it are numerous. Anxiety is closely linked to negative and repetitive thoughts, as anxious people tend to anticipate suffering. The repetitions of pathological thoughts in the form of ruminations can be related to the physical brain, and the construction of thoughts influenced by the ego, personality, and behavior [21]. With the use of the PCS questionnaire, scores above the average (12.4) were observed for rumination, showing that a large part of catastrophizing patients present this as a condition, being the second most found in the patients of the sample out of the three ramifications of catastrophizing, which ends up directly interfering with the sensation of pain in chronic TMD.
Helplessness is characterized by the fact that the individual feels "helpless" by pain, feeling "blocked" by it [2,20]. In the study conducted, the patients in the sample presented scores above the average (13.9) for helplessness, being the most common branch of catastrophizing in patients, showing that thoughts of helplessness, by which patients feel overwhelmed by their pain, are very present and directly interfere with the pain of chronic TMD.

Magnification is a fundamental dimension of catastrophizing, that is characterized by the act of the individual increasing and exaggerating the intensity of the pain being experienced [2,20,22]. The research done pointed out that magnification was the branch of catastrophizing less apparent in the patients, but still with scores above the average (5.7), thus showing that exaggerated and magnified thoughts are present in the sample patients and are directly proportional to chronic painful TMD. The 3 ramifications of catastrophizing (rumination, helplessness, and magnification) were present in the sample, with scores above the average and showing the association between catastrophizing and chronic painful TMD.

A proportional relationship between central sensitization and pain variables was also expected, however this hypothesis was not confirmed. Perhaps this is explained by the fact that the pathophysiological mechanisms of central sensitization are influenced by different clinical manifestations, many of them found in the sample studied, which justifies the high scores recorded in CSI.

5. CONCLUSION

Based on the methodology used and the results obtained, this study demonstrated that women with chronic pain-related TMD tend to have high levels of catastrophizing and central sensitization. There is a positive and proportional association between the time of pain and/or the number of painful points and catastrophizing in the studied sample, but not with central sensitization. These results point to the need for a clinical evaluation of the aspects related to catastrophizing and central sensitization in women with chronic painful TMD, as these may impact the perception of the pain experience and the clinical management of TMD.
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