Brazilian Journal of Anesthesiology 2021;71(3):228–232

Sociedade Brasileira de Anestesiologia

Brazilian Journal of ANESTHESIOLOGY

CLINICAL RESEARCH

Pain catastrophizing in daughters of women with fibromyalgia: a case-control study☆

Régis Junior Muniz[a], **Mariane Schäffer Castro**[a], **Jairo Alberto Dussán-Sarria**[b,d], **Wolnei Caumo**[b,c,d], **Andressa de Souza**[a,d,*]

[a] *Universidade La Salle, Programa de Pós-Graduação em Saúde e Desenvolvimento Humano, Canoas, RS, Brazil*
[b] *Universidade Federal do Rio Grande do Sul (UFRGS), Programa de Pós-Graduação em Ciências Médicas, Porto Alegre, RS, Brazil*
[c] *Universidade Federal do Rio Grande do Sul (UFRGS), Hospital de Clínicas de Porto Alegre (HCPA), Serviço de Tratamento de Dor e Medicina Paliativa, Porto Alegre, RS, Brazil*
[d] *Universidade Federal do Rio Grande do Sul (UFRGS), Hospital de Clínicas de Porto Alegre (HCPA), Laboratório de Dor e Neuromodulação, Porto Alegre, RS, Brazil*

Received 16 July 2019; accepted 18 October 2020
Available online 6 February 2021

KEYWORDS
Fibromyalgia;
Catastrophizing;
Anxiety;
Depression

Abstract Fibromyalgia is a syndrome characterized by chronic pain related to the musculoskeletal system. Patients feel incapable and show catastrophic thoughts (exaggeration of the sensations) related to painful events. This study aimed to compare catastrophic thoughts of pain between daughters of women with fibromyalgia and daughters of women without fibromyalgia, no daughter having the syndrome. It was a case-control study in which 76 women were included: 38 daughters of women diagnosed with fibromyalgia (case group), and 38 daughters of women without fibromyalgia (control group). The Brazilian versions of the Profile of Chronic Pain: Screen, the Pittsburgh Sleep Quality Index, the Pain Catastrophizing Scale, Resilience Scale, Beck Depression Inventory-II, and the State-Trait Anxiety Inventory were used. Data were tabulated and analyzed using SPSS 20.0. Continuous variables were compared between the groups using the Mann-Whitney *U* test or Student's *t*-test for independent samples. A significant difference was considered at $p < 0.05$. Regarding catastrophism, the case group had higher total catastrophism compared to the control group ($p = 0.025$). Daughters of patients with fibromyalgia showed higher rumination and magnification levels related to pain ($p = 0.028$ and $p = 0.007$, respectively) but did not show hopelessness. This study concludes that daughters of women with fibromyalgia are more likely to have symptoms of fibromyalgia due to their visualization of the syndrome. This indicates that emotional aspects may induce changes, and additional research on an individual basis is necessary.

☆ Study conducted at the Pain and Neuromodulation Laboratory at Hospital de Clínicas de Porto Alegre (HCPA–UFRGS), Porto Alegre, RS, Brazil.

* Corresponding author.
E-mail: andressasz@gmail.com (A. Souza).

https://doi.org/10.1016/j.bjane.2020.10.012

Introduction

Generalized pain is a sign of nervous system sensitization in patients with chronic pain.[1] Pain intensity varies from person to person, depending on the cause and psychological alterations.[2] The International Association for the Study of Pain (IASP) defined chronic pain as pain persisting over three consecutive months.[3]

Fibromyalgia presents with hyperalgesia and allodynia.[4] It is characterized by abnormal pain processing, which is caused by neurobiological alterations that deregulate the nociceptive mechanism controlling biophysical responses associated with pain.[5] The American College of Rheumatology (ACR) defined fibromyalgia as the manifestation of generalized pain for at least three consecutive months, with pain on palpating at least 11 of the 18 trigger points.[6] Drug or non-drug therapy[5] can manage chronic pain. Chronic pain affects sleep quality, resulting in fatigue and decreased performance of the activities of daily living.[7,8] Patients who were exposed to physical, emotional, environmental, or genetic presents increased pain perception in cases of not only fibromyalgia but also autoimmune diseases, infections, and inflammations.[9]

Catastrophizing is a cognitive process defined as ''exaggerated negative thinking brought to bear during an actual or anticipated painful experience''.[10,11] Catastrophizing related to pain can change pain perception. The fear provoked by catastrophizing influence the perception of stimuli and pain intensity.[12,13] Studies suggest that higher levels of catastrophizing thoughts are associated with higher functional incapabilities.[14] Emotions may influence the pain threshold through psychiatric or somatoform disorders in addition to catastrophizing.[15] Several studies revealed the presence of pain catastrophizing in patients with fibromyalgia. A domain of catastrophizing is magnification, which may increase the patient's attention to painful symptoms.[16,17]

Therefore, the aim of this study was to compare the levels of pain catastrophizing between daughters of women with fibromyalgia and daughters of healthy women. The study hypothesis was that catastrophizing is higher in daughters of women with fibromyalgia than in daughters of healthy women.

Methods

This article has addressed the checklist of items in the STROBE Statement for case-control observational studies. The study protocol was approved by the Ethics and Research Committee of Hospital de Clínicas de Porto Alegre/RS (registration nº 140635). The use of protocols followed the conditions established in the resolution nº 466/12 of the National Health Council. This case-control study was conducted at the Pain and Neuromodulation Laboratory of Hospital de Clínicas de Porto Alegre (HCPA).

Population and study design

This is a case-control observational study in which daughters of women with fibromyalgia and daughters of women without fibromyalgia aged above 18 years were included. Women with fibromyalgia treated at the Pain Treatment and Palliative Medicine Ambulatory of HCPA were contacted to recruit their daughters, while daughters of women without fibromyalgia were recruited using the snowball technique, in which each recruited daughter of a woman with fibromyalgia indicates another person who is the daughter of a woman without fibromyalgia. Written informed consent for participation in the study was obtained from all participants.

Inclusion and exclusion criteria

The inclusion criteria were age over 18 years, no diagnosis of fibromyalgia, and a mother with (case group) or without (control group) fibromyalgia. Participants received the informed consent form, understood the study objective and protocol, and signed the form. The exclusion criteria were a diagnosis of fibromyalgia or of a serious psychiatric or cognitive disorder that could interfere with the understanding of scales used in the study, such as a neurologic disorder, a systemic disease-causing decompensation, or an associated inflammatory disease, including lupus and rheumatoid arthritis.

Instruments and evaluations

Participants were evaluated in a single appointment at the Pain Treatment and Palliative Medicine Ambulatory of HCPA by the research team using: Sociodemographic Questionnaire for epidemiologic analysis; the Brazilian version of the Profile of Chronic Pain: Screen (B-PCP:S)[18] for characteristics of chronic pain; the Brazilian version of the Pittsburgh Sleep Quality Index[19] for sleep quality; the Brazilian version of the Pain Catastrophizing Scale (B-PCS)[20] for catastrophizing; the Resilience Scale (RS)[21] for the capacity to deal with adversities; the Beck Depression Inventory-II (BDI-II)[22] for depression; State-Trait Anxiety Inventory (STAI)[23] for anxiety.

Volunteers were asked to remember a nociceptive painful experience for B-PCP:S and B-PCS. Data regarding other medical conditions and previous diagnosis of depression or anxiety were not collected.

Sample size calculation

The sample size was calculated based on a study performed by Montoya et al. in 2005.[24] The estimated effect size was 0.68 (Cohen's *d*). With the independent samples *t*-test for a difference between mean values up to 0.68, a two-tailed alpha error of 0.05, power of 80%, and same sample size, a total of 70 women were required: 35 for the control group and 35 for the case group. Considering that approximately 10% of participants could not complete all tests, 76 patients were recruited to compensate for possible losses. The sample size was calculated using the G*Power program.

Statistical analysis

Continuous and categorical variables were resumed with conventional descriptive statistics. Normality was verified with the Shapiro-Wilk test. Continuous variables were com-

Table 1 Epidemiological and clinical characteristics.

Variable	Control (n = 38) Median (25^{th}–75^{th})	Case (n = 38) Median (25^{th}–75^{th})	*p*-value[a]
Age	27.50 (19.0–34.0)	30.00 (23.75–35.0)	0.160
Body mass index	23.00 (20.99– 24.85)	24.1 (22.26–27.97)	0.132
Formal Education (years of study)	14.00 (13.00–16.00)	13.00 (12.00–16.00)	0.139

Values are described as median and interquartile ranges (interquartile 25–75) (n = 76).
[a] Mann Whitney test.

Table 2 Catastrophizing, resilience, depression, and anxiety behavior profile of the sample.

Variable	Control (n = 38) Median (25^{th}–75^{th})	Case (n = 38) Median (25^{th}–75^{th})	*p*-value	Effect size
Total B-PCS	12.50 (2.00–24.50)	21.50 (11.00–31.75)	0.025[a,b]	0.50
B-PCS – Hopelessness	5.00 (2.00–10.00)	7.00 (3.75–12.0)	0.135[b]	–
B-PCS – Magnification	3.00 (0.00–5.25)	5.00 (2.00–7.25)	0.028[a,b]	0.48
B-PCS – Rumination	6.00 (0.00–9.25)	9.00 (5.00–11.00)	0.007[a,b]	0.68
Resilience Scale	136.50 (132.00–145.25)	134.50 (126.75–140.25)	0.137[b]	–
BDI-II	6.00 (3.75–9.00)	10.00 (5.00–15.25)	0.005[a,b]	0.78
STAI – State	29.00 (27.75–32.25)	28.00 (25.00–31.00)	0.011[a,c]	0.60
STAI – Trait	24.00 (22.00–27.00)	24.00 (22.75–27.25)	0.628[b]	–

Values described as median and interquartile ranges (interquartile 25–75) (n = 76).
[a] Significant difference from control group.
[b] Mann Whitney test.
[c] *t*-test for independent samples.

pared between the groups using the Mann-Whitney *U* test or Student's *t*-test for independent samples. The difference was considered significant if $p < 0.05$ (error tax of type I). Data were analyzed using SPSS 20.0 (SPSS, Chicago, IL, USA). There were no missing data to be addressed.

Results

This study presents the results of the analyses of 76 women, including 38 daughters of women with fibromyalgia (case group) and 38 daughters of women without fibromyalgia (control group). Age, years of study and BMI were considered as non-parametric variables (Shapiro Wilk Test; $p = 0.002$, $p < 0.001$ and $p < 0.001$, respectively). Both groups had the same baseline profile (Table 1), with no significant differences between the groups ($p > 0.05$) in the presented characteristics.

Pain catastrophizing thought scale and its domains (hopelessness, magnification, and rumination) were considered as non-parametric variables (Shapiro Wilk Test; $p = 0.009$, $p = 0.005$, $p < 0.001$ and $p = 0.003$, respectively). Resilience Scale, BDI and STAI-Trait were also considered non-parametric (Shapiro Wilk Test; $p = 0.012$, $p < 0.001$ and $p = 0.025$, respectively). Only STAI-State was considered as a parametric variable (Shapiro Wilk Test; $p = 0.149$). The case group has a higher total pain catastrophizing level compared to the control group (Table 2); $p = 0.025$. In its domains, magnification and rumination were significantly higher in the case group compared to the control group ($p = 0.028$ and $p = 0.007$, respectively). However, hopelessness was not significantly different between the groups ($p = 0.135$). In addition, the RS score did not significantly differ between the two groups ($p = 0.137$). The BDI-II score was significantly higher ($p = 0.005$) in the case group compared to the control group. The STAI-trait score did not differ significantly between the groups ($p = 0.628$), while STAI-state had a significant difference between groups ($p = 0.011$).

B-PCP:S was used to characterize pain in both groups. Pain frequency was considered a parametric variable (Shapiro Wilk Test; $p = 0.311$), while interference in activities and emotions were considered non-parametric variables (Shapiro Wilk Test; $p = 0.001$ and $p < 0.001$, respectively) The total B-PCP:S scores of its domains were significantly higher in daughters of women with fibromyalgia: pain frequency ($p < 0.001$), pain interference in activities ($p < 0.001$), and pain interference in emotions ($p < 0.001$) (Table 3).

Discussion

In both groups, participants had no medical diagnosis of fibromyalgia, but pain catastrophizing levels were significantly different between them in terms of rumination and magnification of thoughts related to pain. This allow to hypothesize that patients who have contact with their mothers' condition may be more susceptible to higher levels of catastrophizing. However, this study has not investigated the relationship between mothers and daughters, and therefore it cannot conclude that their relationship is the cause of higher results.

Environmental and psychosocial factors can trigger physiological alterations and directly affect the mental health of women with fibromyalgia.[25] Fitzcharles et al. (2014)[26] evaluated 120 individuals with fibromyalgia and verified significant differences in catastrophizing, evidencing that

Table 3 Pain characteristics profile according to each group.

Variable	Control (n = 38) Mean ± SD	Case (n = 38) Mean ± SD	*p*-value[a]	Effect size
B-PCP:S	22.18 ± 15.75	40.05 ± 17.46	< 0.001	0.71
Pain frequency	12.05 ± 7.50	18.52 ± 6.32	< 0.001	0.93
Pain interference in activities	5.36 ± 4.98	12.60 ± 9.32	< 0.001	0.97
Pain interference in emotions	4.76 ± 4.64	8.92 ± 4.78	< 0.001	0.88

Profile of Chronic Pain scale (B-PCP:S), values are described as mean ± standard deviation (n = 76).
[a] *t*-tests for independent samples, significant difference in control group.

environmental factors, such as familial or work atmosphere, exposure to stressors, physical or emotional, and psychosocial factors resulting from socioeconomic and educational levels can influence mental health. In the present study, we concluded that daughters of women with fibromyalgia have higher levels of catastrophizing. According to previous study, environmental factors, such as seeing their mothers' condition affect psychosocial characteristics, may influence mental health.

RS score showed no significant difference, which is attributable to the fact that women of neither group suffered from fibromyalgia. As for the possibility that resilience is associated with fibromyalgia, therefore this study's participants did not present resilience, McAllister et al. (2015)[27] reported few negative effects with fewer symptoms. Emotional aspects related to daily activities and interpersonal relationships can influence emotional well-being and mediate this relation to pain.[28]

Responses from case group showed that preoccupation with the possibility of developing fibromyalgia can provoke alterations in the emotional state, causing depressive and anxious thoughts and feelings, since daughters witnessed the emotional and physical discomfort provoked by pain in their mothers. This generates a negative notion regarding fibromyalgia, possibly leading to a psychosomatic effect in its homeostasis.[28] Regarding environmental and psychosocial factors that could cause higher levels of stress,[25] Fitzcharles et al. (2014)[28] found a significant correlation between anxiety and depression. According to previous study, the environmental factor, such as seeing their mothers' condition affecting psychosocial characteristics, influence in their mental health, such as pain catastrophizing.[25]

In contrast to depression, trait-anxiety did not differ between the groups. Fibromyalgia seems to be related to an anguish that could develop from painful symptoms: pain intensity, daytime drowsiness, fatigue, cognitive disturbs, anxiety, and depression.[29,30] It has been evidenced that anxiety is a symptom of fibromyalgia. Since patients who were evaluated did not have fibromyalgia, they also did not have anxiety.

Daughters of women with fibromyalgia showed emotional and behavior alterations, which warrants medical attention because some characteristics shown by women with fibromyalgia are seen in their daughters, although in smaller levels. Possibilities of pain catastrophizing, depression, and anxiety may be associated with mothers' condition and the daughters' somatization, or could have a genetic trace, and daughters of mothers with fibromyalgia in the study could develop symptoms of fibromyalgia.

The present study had the strength of not having any patient loss or missing data. The limitations include the lack of investigating other medical conditions since it could be a possible confounder for the results of the study. Besides that, the snowball technique is one of the main limitations of this study, since it has a high risk of bias, in which this sampling method could affect outputs of questionnaires. Sampling method used in this study for the case group (convenience sampling), in which patients were called from a hospital ambulatory, is a method that has no way to know if the sample is representative of all population, meaning that this reduces external validity from this study.

Therefore, even for the daughters of women with fibromyalgia who do not have a diagnosis, studies should evaluate catastrophizing, anxiety, and depression as a preventive measure with appropriate guidelines for a better quality of life. Further studies should be conducted to evaluate possible genetic factors in daughters of women with fibromyalgia and to compare daughters with mothers who have the same syndrome. Studies should be performed to analyze the time to event (fibromyalgia) and possible treatments to avoid the development of the syndrome.

Conflicts of interest

The authors declare no conflicts of interest.

References

1. Barbero M, Fernández-de-las-Peñas C, Palacios-Ceña M, et al. Pain extent is associated with pain intensity but not with widespread pressure or thermal pain sensitivity in women with fibromyalgia syndrome. Clin Rheumatol. 2017;36:1427–32.
2. Bushnell MC, Čeko M, Low LA. Cognitive and emotional control of pain and its disruption in chronic pain. Nat Rev Neurosci. 2013;14:502–11.
3. Steingrímsdóttir ÓA, Landmark T, Macfarlane GJ, et al. Defining chronic pain in epidemiological studies: A systematic review and meta-analysis. Pain. 2017;158:2092–107.
4. Choy EHS. The role of sleep-in pain and fibromyalgia. Nat Rev Rheumatol. 2015;11:513–20.
5. Boomershine C. Fibromyalgia: The Prototypical Central Sensitivity Syndrome. Curr Rheumatol Rev. 2015;11:131–45.
6. Arnold LM, Fan J, Russell IJ, et al. The fibromyalgia family study: A genome-wide linkage scan study. Arthritis Rheum. 2013;65:1122–8.
7. Góes SM, Stefanello JMF, Homann D, et al. Torque and muscle activation impairment along with insulin resistance are associated with falls in women with fibromyalgia. J Strength Cond Res. 2016;30:3155–64.

8. Soriano-Maldonado A, Amris K, Ortega FB, et al. Association of different levels of depressive symptoms with symptomatology, overall disease severity, and quality of life in women with fibromyalgia. Qual Life Res. 2015;24:2951–7.
9. Efrati S, Golan H, Bechor Y, et al. Hyperbaric oxygen therapy can diminish fibromyalgia syndrome - Prospective clinical trial. PLoS One. 2015;10:e0127012.
10. Block PR, Thorn BE, Kapoor S, et al. Pain catastrophizing, rather than vital signs, associated with pain intensity in patients presenting to the emergency department for pain. Pain Manag Nurs. 2017;18:102–9.
11. Reiter S, Eli I, Mahameed M, et al. Pain Catastrophizing and pain persistence in temporomandibular disorder patients. J Oral Facial Pain Headache. 2018;32:309–20.
12. Henderson LA, Akhter R, Youssef AM, et al. The effects of catastrophizing on central motor activity. Eur J Pain (United Kingdom). 2016;20:639–51.
13. Dunn LK, Durieux ME, Fernández LG, et al. Influence of catastrophizing, anxiety, and depression on in-hospital opioid consumption, pain, and quality of recovery after adult spine surgery. J Neurosurg Spine. 2018;28:119–26.
14. Craner JR, Sperry JA, Koball AM, et al. Unique contributions of acceptance and catastrophizing on chronic pain adaptation. Int J Behav Med. 2017;24:542–51.
15. Lee JE, Kim SH, Shin SK, et al. Attentional Engagement for Pain-Related Information among Individuals with Chronic Pain: The Role of Pain Catastrophizing. Pain Res Manag. 2018;2018:6038406.
16. Loggia ML, Berna C, Kim J, et al. The Lateral Prefrontal Cortex Mediates the Hyperalgesic Effects of Negative Cognitions in Chronic Pain Patients. J Pain. 2015;16:692–9.
17. Burns JW, Gerhart JI, Post KM, et al. The Communal Coping Model of Pain Catastrophizing in Daily Life: A Within-Couples Daily Diary Study. J Pain. 2015;16:1163–75.
18. Caumo W, Ruehlman LS, Karoly P, et al. Cross-Cultural Adaptation and Validation of the Profile of Chronic Pain: Screen for a Brazilian Population. Pain Med (United States). 2013;14:52–61.
19. Bertolazi AN, Fagondes SC, Hoff LS, et al. Validation of the Brazilian Portuguese version of the Pittsburgh Sleep Quality Index. Sleep Med. 2011;12:70–5.
20. Sehn F, Chachamovich E, Vidor LP, et al. Cross-Cultural Adaptation and Validation of the Brazilian Portuguese Version of the Pain Catastrophizing Scale. Pain Med (United States). 2012;13:1425–35.
21. Wagnild GM, Young HM. Development and psychometric evaluation of the Resilience Scale. J Nurs Meas. 1993;1:165–78.
22. Warmenhoven F, Van Rijswijk E, Engels Y, et al. The Beck Depression Inventory (BDI-II) and a single screening question as screening tools for depressive disorder in Dutch advanced cancer patients. Support Care Cancer. 2012;20:319–24.
23. Kaipper MB, Chachamovich E, Hidalgo MPL, et al. Evaluation of the structure of Brazilian State-Trait Anxiety Inventory using a Rasch psychometric approach. J Psychosom Res. 2010;68:223–33.
24. Montoya P, Pauli P, Batra A, et al. Altered processing of pain-related information in patients with fibromyalgia. Eur J Pain. 2005;9:293–303.
25. Andreoli L, Tincani A. Undifferentiated connective tissue disease, fibromyalgia, and the environmental factors. Current Opinion in Rheumatology. 2017;29:355–60.
26. Fitzcharles MA, Rampakakis E, Ste-Marie PA, et al. The association of socioeconomic status and symptom severity in persons with fibromyalgia. J Rheumatol. 2014;41:1398–404.
27. McAllister SJ, Vincent A, Hassett AL, et al. Psychological resilience, affective mechanisms, and symptom burden in a tertiary-care sample of patients with fibromyalgia. Stress Heal. 2015;31:299–305.
28. Sturgeon JA, Zautra AJ, Arewasikporn A. A multilevel structural equation modeling analysis of vulnerabilities and resilience resources influencing affective adaptation to chronic pain. Pain. 2014;155:292–8.
29. Gerdle B, Ghafouri B, Ernberg M, et al. Chronic musculoskeletal pain: Review of mechanisms and biochemical biomarkers as assessed by the microdialysis technique. J Pain Res. 2014;7:313–26.
30. Nugraha B, Karst M, Engeli S, et al. Brain-derived neurotrophic factor, and exercise in fibromyalgia syndrome patients: A mini review. Rheumatol Int. 2012;32:2593–9.