

# Correlation between levels of perceived stress and depressive symptoms in the functional disability of patients with fibromyalgia

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## SUMMARY

**OBJECTIVE:** The aim of this study was to evaluate the factors that are most correlated with the levels of functional disability in patients with fibromyalgia. **METHODS:** This is a cross-sectional descriptive study in which 42 patients diagnosed with fibromyalgia according to the criteria of the American College of Rheumatology reported their status using the following questionnaires: the Beck Depression Inventory, the Perceived Stress Scale 14, the Revised Fibromyalgia Impact Questionnaire, the Visual Analog Pain Scale, and the Health Assessment Questionnaire.

**RESULTS:** Moderate to severe levels of depression (Beck Depression Inventory:  $22.35 \pm 10.39$ ), moderate to severe functional disability (Health Assessment Questionnaire:  $1.28 \pm 0.58$ ), and high levels of stress (Perceived Stress Scale 14:  $31.59 \pm 10.02$ ) were found. The correlation adjusted by multiple regression as a function of the Health Assessment Questionnaire indicated a negligible to weak positive correlation with perceived stress ( $r=0.11$ ), while a moderately strong positive correlation was observed with the Visual Analog Pain Scale ( $r=0.55$ ). Regarding physical exercise, one of the pillars of the treatment, a moderate negative correlation was found with the Health Assessment Questionnaire ( $r=-0.4$ ).

**CONCLUSION:** The pain levels were moderately influenced by depression severity. The factors most linked to functional disability are due to the pain levels but not to the perception of stress.

**KEYWORDS:** Fibromyalgia. Stress, psychological. Chronic pain. Depression. Sickness impact profile.

## INTRODUCTION

Fibromyalgia is a syndrome characterized by widespread chronic pain, fatigue, sleep disturbances, and functional symptoms<sup>1</sup>. It is associated with other comorbidities such as mood disorders and rheumatic diseases<sup>2,3</sup>. The multiple symptoms and pathologies often associated with fibromyalgia make its diagnosis difficult, promoting underdiagnosis and undertreatment<sup>4</sup>. In Brazil, the prevalence varies between 0.2 and 4.7%, with a higher incidence in women, especially between 45 and 64 years of age<sup>5</sup>.

The pathophysiology of fibromyalgia is still not well established. However, the most accepted hypothesis is due to an abnormality in the transmission of painful stimuli, amplifying the pain sensation due to an imbalance in inhibiting afferent and efferent pathways by neurotransmitters and neuropeptides<sup>6-8</sup>.

Such dysregulation could be due to psychological stress and genetics, among others<sup>9</sup>.

While in 1990, the American College of Rheumatology (ACR) considered generalized pain and the presence of 11 out of 18 tender points as a diagnostic criterion, in 2010, there was a new consensus that gave more prominence to other somatic symptoms and cognitive problems through the Polysymptomatic Distress Scale score (PSD)<sup>9,10</sup>.

When assessing the condition of patients with fibromyalgia, the Revised Fibromyalgia Impact Questionnaire (FIQR) is often used in clinical studies and involves questions related to functional capacity, global impact, and physical and psychological symptoms in the last 7 days<sup>11</sup>. Another point of analysis is measuring the level of psychological stress, which can be performed using the Perceived Stress Scale 14 (PSS-14), which

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quantifies the perception of stress in the face of everyday events in the last 4 weeks<sup>12</sup>.

Concerning the emotional nature of fibromyalgia, the Beck Depression Inventory (BDI) is universally used to assess the levels of depression in this group of patients<sup>13</sup>. In addition, another tool with high applicability in assessing patients with the disease is the Health Assessment Questionnaire (HAQ), which determines the functional capacity of various activities performed in the last week<sup>14,15</sup>.

Given the above, this study sought to measure the levels of perceived stress, pain, and depression, in addition to correlating them with each other, to identify the factors most related to functional disability.

## METHODS

This is a cross-sectional descriptive study, approved by the Research Ethics Committee, involving human beings of the State University of Ponta Grossa, under protocol CAAE 28752514.0.0000.0105, in which patients being followed up at the rheumatology outpatient clinics of the Hospital Universitário Regional dos Campos Gerais (HURCG) and in the private practice of rheumatology, Dr. Carolyn Maria de Geus Wenceslau, who met the modified ACR 2010 Criteria for the diagnosis of fibromyalgia<sup>16</sup>, reported their status using five questionnaires, namely, FIQR, HAQ, BDI, PSS-14, and a socioeconomic questionnaire. The Widespread Pain Index (WPI), a component of the modified 2010 ACR Criteria, was also analyzed. Individuals with comorbidities that could explain the pain were excluded from the study. The patients answered the questionnaires during their routine appointments, after completing the free and informed consent form.

The impact of fibromyalgia on the quality of life in patients with fibromyalgia was assessed by the FIQR, which is composed of 21 items that cover functionality, impact of the disease, and psychological and physical symptoms, including the level of pain measured by the Visual Analog Scale (VAS)<sup>11,17</sup>.

The level of psychological stress was analyzed using PSS-14, which contains 14 items that quantify the perception of stress in the face of everyday events in the last 4 weeks<sup>12</sup>. The depressive symptoms were analyzed using the BDI, which is composed of 21 questions. Based on the scores, BDI classifies symptoms into four categories: absence (<10); mild to moderate (10–18); moderate to severe (19–29), and severe (30–63)<sup>13</sup>.

The level of functional disability was measured using the HAQ questionnaire, which contains 20 questions that determine functional capacity in various activities carried out in the last week<sup>14</sup>. The socioeconomic questionnaire collected

demographic and clinical data such as age, gender, income, education, duration of the disease, and the presence of other comorbidities.

The verification of the presence of outliers with consequent exclusion was carried out. The sample was tested for distribution normality by the Shapiro-Wilk test. The correlation coefficient ( $r$ ) was determined by Pearson's test. Multiple regression was performed to adjust the various variables with the determination index. Tests whose  $p$ -value was less than 5% (0.05) were considered statistically significant. Analyses were performed using the statistical program MedCalc 5.1 (Belgium).

## RESULTS

A total of 48 patients were interviewed, of whom 5 were excluded due to the presence of comorbidities. Outliers analysis detected one patient, who was also excluded. Thus, data from 42 patients were evaluated.

There were 40 females (95%) and 2 males (5%), with a mean age of 50.25 ( $\pm 9.41$ ) years. It was observed that 79% were economically active, and there was a predominance of individuals with the completion of secondary education (24%). Regarding family income, 98% received less than six minimum wages.

The mean age at diagnosis was 45.61 $\pm 9.67$  years, with a disease progression time of 4.66 $\pm 4.36$  years (Table 1). It was found that most patients had moderate to severe depression, with a mean BDI score of 22.35 $\pm 10.39$ .

The FIQR indicated an average of 64.12 $\pm 19.05$  with a VAS index of 7.69 $\pm 2.42$ . The WPI revealed an average of 13.93 $\pm 3.99$ , and the PSD average value was 22.59 $\pm 5.11$ .

**Table 1.** Mean, standard deviation, and range of analyzed variables (n=42).

	Mean (SD)	Range
Age (years)	50.28 ( $\pm 9.41$ )	20–70
Age at diagnosis (years)	45.61 ( $\pm 9.67$ )	18–70
Disease duration (years)	4.66 ( $\pm 4.36$ )	0–16
BDI (0–63)	22.35 ( $\pm 10.39$ )	04–42
FIQR (0–100)	64.12 ( $\pm 19.05$ )	13–96
HAQ (0–3)	1.28 ( $\pm 0.58$ )	0.25–2.75
PSS-14 (0–56)	31.59 ( $\pm 10.02$ )	06–47
VAS (0–10)	7.69 ( $\pm 2.42$ )	02–10
PSD (0–31)	22.59 ( $\pm 5.11$ )	10–30
WPI (0–19)	13.93 ( $\pm 3.99$ )	05–19

SD: standard deviation; BDI: Beck Depression Inventory; FIQR: The Revised Fibromyalgia Impact Questionnaire; HAQ: Health Assessment Questionnaire; PSS-14: Perceived Stress Scale 14; VAS: Visual Analog Scale; PSD: Polysymptomatic Distress Scale; WPI: Widespread Pain Index.

As for the HAQ score, a mean of  $1.28 \pm 0.58$  was found, indicating a higher prevalence of individuals with moderate to severe functional disability. The PSS-14 showed a mean value of  $31.59 \pm 10.02$ . Only 14 patients (33%) reported practicing regular physical exercise.

Analysis of the questionnaires in pairs (Table 2) indicated a powerful and statistically significant correlation between BDI and PSS-14 ( $r=0.75$ ), HAQ and FIQR ( $r=0.75$ ), and VAS and FIQR ( $r=0.75$ ). We also observed a weak and significant correlation between the PSS-14 and the PSD ( $r=0.3$ ), in addition to a weak correlation outside of significance between the PSS-14 and the HAQ ( $r=0.28$ ).

The most used drug class was simple analgesics, with 31 (74%) individuals using it, followed by 28 (67%) using tricyclic antidepressants and 23 (55%) using SSRI (selective serotonin reuptake inhibitors). The most common combination was simple analgesics and tricyclic antidepressants, with 20 (48%) patients using it.

The correlation adjusted by multiple regression as a function of the HAQ (Table 3) indicated a negligible to weak positive correlation for the PSS-14 ( $r=0.11$ ). At the same time, compared with the VAS, it showed a moderate to strong positive correlation ( $r=0.55$ ). On the contrary, physical exercise showed a moderate negative correlation ( $r=-0.4$ ). The coefficient of determination ( $R^2$ ) calculation for the PSS-14 indicated

a rate of 0.01. In contrast, the VAS had a considerable coefficient in the participation of disability with an  $R^2$  of 0.30. The practice of physical exercise had been proved to be a protective factor for the levels of functional disability with an  $R^2$  of 0.16.

## DISCUSSION

Few studies correlated stress and depression with the functional impact in patients with fibromyalgia, thus defining their roles in symptomatology<sup>18</sup>. Gorenstein et al.<sup>19</sup> considered scores greater than 16 on the BDI as the threshold for depression. In this perspective, in the present sample, 69% of individuals were depressed, similar to the study by Homann et al.<sup>20</sup>, which found around 75%.

The excessive daily consumption of simple analgesics and SSRIs found in this study corroborates the findings of Gormsen

**Table 3.** Coefficient of correlations between the multiple variables analyzed and the disability measured by the Health Assessment Questionnaire, adjusted by multiple regression (n=42).

	r	p
PSS-14	0.11	0.5
VAS	0.55	0.0002
Physical exercise	-0.4	0.001

PSS 14: Perceived Stress Scale 14; VAS: Visual Analog Scale.

**Table 2.** Analysis of the questionnaires in pairs (n=42).

	BDI	PSS-14	FIQR	HAQ	VAS	PSD
BDI	-					
PSS-14	$r=0.75$					
	$p<0.0001$	-				
	95%CI (0.58-0.86)					
FIQR	$r=0.59$	$r=0.52$				
	$p<0.0001$	$p=0.0004$	-			
	95%CI (0.35-0.76)	95%CI (0.26-0.71)				
HAQ	$r=0.52$	$r=0.28$	$r=0.75$			
	$p=0.0004$	$p=0.07$	$p<0.0001$	-		
	95%CI (0.26-0.71)	95%CI (-0.02-0.59)	95%CI (0.57-0.86)			
VAS	$r=0.38$	$r=0.35$	$r=0.75$	$r=0.58$		
	$p=0.01$	$p=0.02$	$p<0.0001$	$p=0.0001$	-	
	95%CI (0.09-0.61)	95%CI (0.04-0.59)	95%CI (0.58-0.86)	95%CI (0.34-0.75)		
PSD	$r=0.49$	$r=0.3$	$r=0.6$	$r=0.55$	$r=0.5$	
	$p=0.0009$	$p=0.04$	$p<0.0001$	$p=0.0001$	$p=0.0009$	-
	95%CI (0.22-0.69)	95%CI (0.001-0.55)	95%CI (0.37-0.77)	95%CI (0.3-0.74)	95%CI (0.22-0.69)	

BDI: Beck Depression Inventory; PSS-14: Perceived Stress Scale 14; FIQR: The Revised Fibromyalgia Impact Questionnaire; HAQ: Health Assessment Questionnaire; VAS: Visual Analog Scale; PSD: Polysymptomatic Distress Scale; CI: Confidence interval.

et al.<sup>18</sup>, in which it was demonstrated that the high prevalence of depression intensifies fibromyalgia pain. Homann et al.<sup>21</sup> also stated that pain is a debilitating characteristic and can be considered one of the leading causes of functional incapacity. This was corroborated by the strong positive correlation between FIQR and VAS and the moderately high correlation between HAQ and VAS adjusted by multiple regression found in the present study.

Homann et al.<sup>20</sup> identified a greater perception of stress in patients with fibromyalgia compared to healthy individuals. The present study showed a high level of perception of stress and had as a limitation the non-pairing with a control sample.

González-Ramírez et al.<sup>22</sup> related stress to the pathophysiology of fibromyalgia and the severity of symptoms such as pain. In contrast, in this study, the result of the correlation between pain and stress was positive and weakly moderate, indicating a low association between them. Furthermore, the concept of catastrophizing, more present in depressive patients and defined as a tendency to perceive pain as something unbearable<sup>23</sup>, was something less observed considering the weakly moderate correlation between BDI and pain levels.

Busch et al.<sup>24</sup>, in a systematic review, indicated a great benefit of aerobic exercise in treating fibromyalgia in multiple aspects, such as pain, fatigue, and physical capacity. In this sense, in the present study, a moderate negative correlation was found between exercise and functional disability. Thus, aerobic physical exercise should be encouraged as one of the main therapeutic methods.

A moderately strong positive correlation was found between the VAS and the HAQ and a weak one between the PSS-14

and the HAQ, indicating that functional incapacity is due to the levels of pain but not to the perception of stress. In addition, physical exercise had been proved to be a protective factor against functional disability.

Among the limitations of the present study are the small number of patients in the sample, the lack of pairing with healthy individuals, and the lack of longitudinal follow-up.

## CONCLUSION

The following symptoms were found in patients with fibromyalgia: moderate to severe levels of depression, moderate to severe functional disability, and high-stress levels. The severity of depression moderately influences the pain levels, and the factors most linked to functional disability are due to the pain levels but not to the perception of stress. Physical exercise had been proved to be a protective factor against functional disability.

## AUTHORS' CONTRIBUTIONS

**LGRF:** Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Writing – original draft. **CMGW:** Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Writing – review & editing. **AAMS:** Writing – review & editing. **LHJD:** Writing – review & editing. **MH:** Writing – review & editing. **DGL:** Data curation, Investigation, Writing – review & editing. **FPM:** Data curation, Writing – review & editing. **MDS:** Conceptualization, Data curation, Formal Analysis, Methodology, Project administration, Supervision, Visualization, Writing – review & editing.

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