






# Anxiety and depression in women with and without chronic pelvic pain: prevalence and associated factors

This article was published in the following Dove Press journal:  
*Journal of Pain Research*

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**Objectives:** To investigate the prevalence of anxiety, depression and mixed anxiety and depressive disorder (MADD) and factors associated with these conditions in women with chronic pelvic pain (CPP) compared to a pain-free control group.

**Methods:** A cross-sectional study was conducted with 100 women with CPP and 100 without CPP. The Hospital Anxiety and Depression Scale (HADS) was used to evaluate the presence of anxiety and depression. Sociodemographic, behavioral and clinical characteristics were investigated. Fisher's exact test was used to compare characteristics between groups. A log-binomial regression model was used, with adjustment for age, skin color, schooling, body mass index and pain. Prevalence ratios (PR), together with their 95% confidence intervals (CI), were calculated to investigate factors associated with anxiety, depression and MADD.

**Results:** The prevalence of anxiety was 66% in the CPP group and 49% in the controls ( $p=0.02$ ). Depression was identified in 63% of the women with CPP and in 38% of the controls ( $p<0.01$ ). MADD was present in 54% of the CPP group and in 28% of the controls ( $p<0.01$ ). In the adjusted analysis, CPP (PR=1.3; 95%CI: 1.1–1.6), physical abuse (PR=1.5; 95%CI: 1.2–1.8) and sexual abuse (PR=1.5; 95%CI: 1.1–1.8) were independently associated with anxiety. Women of 25 to 34 years of age were less likely to have anxiety (PR=0.6; 95% CI: 0.4–0.8). CPP (PR=1.6; 95%CI: 1.2–2.2), physical abuse (PR=1.3; 95%CI: 1.1–1.7) and sexual abuse (PR=1.7; 95%CI: 1.3–2.2) were independently associated with depression. CPP (PR=1.9; 95%CI: 1.3–2.7), smoking (PR=1.5; 95%CI: 1.1–2.1), physical abuse (PR=1.4; 95%CI: 1.1–1.9) and sexual abuse (PR=1.4; 95%CI: 1.1–1.8) were independently associated with MADD.

**Conclusions:** The prevalence of anxiety, depression and MADD was higher in women with CPP compared to the pain-free controls. Factors associated with mental disorders were identified. The independent association between CPP and anxiety, depression and MADD was noteworthy. These findings suggest that systematic management of psychological factors could contribute towards improving the mental health of these women.

**Keywords:** sexual abuse, physical abuse, age, smoking, women's health

## Introduction

Chronic pain is a public health issue. However, the term chronic pain includes different types of pain such as chronic low back pain (CLBP) and chronic pelvic pain (CPP). These two distinct conditions merit particular mention in view of their negative repercussions on different areas of life. However, while CLBP consists of pain, muscle tension or stiffness below the costal margin and above the inferior

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gluteal folds, with or without leg pain (sciatica), persisting for more than three months,<sup>1</sup> CPP in women can be described as noncyclic pain in the pelvic region persisting for at least six months, causing functional incapacity or requiring medical care.<sup>2</sup> The prevalence of CPP in women varies across regions and countries. Prevalence rates of CPP have been reported as 19% in Brazil, 60.5% in China and 20% in the United States, with rates being higher in women of reproductive age.<sup>3-6</sup>

The etiology of CPP remains unclear; however, it appears to be multifactorial, involving both gynecological conditions and non-gynecological conditions such as those involving the digestive, urological, neurological and musculoskeletal systems.<sup>7</sup> The cause of CPP remains unidentified in approximately half of the women affected.<sup>6,7</sup> Furthermore, even when organic diseases are diagnosed, their finding appears to be rather incidental, with no epidemiological criteria pointing to the cause of pelvic pain.<sup>8</sup>

CPP could possibly be a functional somatic syndrome, since both conditions share clinical similarities such as pain constituting the principal symptom, chronicity, absence of laboratory findings, being more common in women, worsening with stress and menstruation, and being associated with depression, anxiety and sexual and physical abuse.<sup>8</sup> In addition, CPP represents an economic burden and may be associated with negative repercussions at work, in sexual functioning and mental health.<sup>6,7,9,10</sup> These repercussions, taken together, may exert a negative effect on quality of life.<sup>10,11</sup> Previous studies have shown an association between CPP in women and mood disorders and a history of physical and sexual abuse.<sup>3,6,12</sup>

Anxiety and depression are the mental disorders most commonly investigated in patients with chronic pain. Studies have shown a high frequency of psychological problems in women with CPP, although the rates vary between authors.<sup>10,13</sup> An association has also been reported between symptoms of depression and anxiety and a history of physical and/or sexual abuse both in women with CPP and in those without CPP.<sup>13-18</sup> This emphasizes the importance of evaluating the occurrence of such issues and its relationship with mental disorders.

In view of the increasing evidence associating a psychosocial context with CPP, the objective of the present study was to investigate the prevalence of anxiety, depression and mixed anxiety and depressive disorder (MADD) and the factors associated with these conditions in women with CPP compared to a group of controls without CPP.

## Patients and methods

### Sample size

Sample size was calculated based on the power to detect a statistically significant difference between two prevalence rates. Considering an expected prevalence rate of anxiety of 73% in the group with CPP, as based on a previous report,<sup>10</sup> a sample size of 100 women in each group (in the CPP group and in the control group without CPP) would be sufficient to detect differences of approximately 20%, with a power of 80% and a significance level of 0.05. This sample size would also be sufficient to detect a difference of 20% between the groups, considering an expected prevalence rate of depression of 40%, as previously described.<sup>10</sup>

### Participants

A cross-sectional study was conducted between October 2014 and February 2016 at the Department of Obstetrics and Gynecology, Teaching Hospital, Federal University of Goiás, Goiânia, Goiás, Brazil. All the procedures complied with the Declaration of Helsinki. The institution's internal review board approved the study protocol and all the participants signed an informed consent form.

Participant selection has already been described in a publication resulting from a study on the quality of life of women with CPP.<sup>11</sup> Women at least 18 years old with a complaint of CPP and who were being followed up as outpatients were invited to participate in the study. The cause of CPP was not investigated, since that was not one of the objectives of that study. The women with CPP were included in the study irrespective of whether or not they were undergoing any form of treatment for the pain. The comparison group included women of at least 18 years of age without CPP who were being seen for benign gynecological diseases such as fibroids, endometrial polyps and ovarian cysts. The exclusion criteria were being pregnant, having been pregnant in the preceding 12 months and having a history of cancer. A total of 207 consecutive women, who had been attending outpatient consultations, were invited to participate in the study, 103 with CPP and 104 pain-free controls. Three women with CPP and four pain-free women refused to participate in the study, alleging lack of time. Therefore, the final sample consisted of 100 women with CPP and 100 controls.

Certain sociodemographic, behavioral and clinical characteristics were selected for inclusion in the study based on the best evidence available in the literature on

mental disorders in women with CPP. Data on these characteristics were collected at interviews and included: age, skin color, body mass index (BMI; kg/m<sup>2</sup>), marital status, monthly family income (Brazilian reais, R\$), schooling, employment status, parity, menopausal status, physical abuse, sexual abuse, physical activity, smoking and alcohol consumption. Hypertension and diabetes mellitus were self-reported. History of physical abuse was based on the answer to the question: "Have you ever suffered physical abuse?" (yes/no). A history of sexual abuse was established from the question: "Have you ever suffered sexual abuse?" (yes/no). Current smokers and those who had stopped smoking less than a year previously were defined as smokers, while never-smokers and those who had stopped smoking over a year ago were considered non-smokers. Menopausal status was classified as postmenopausal following at least 12 months of amenorrhea.

In the CPP group, the duration of pain was investigated. The intensity of pelvic pain was evaluated using a 10-cm (0–10 points) visual analogue scale, with zero representing the absence of pain and 10 the worst pain imaginable.

### Anxiety and depression

The Hospital Anxiety and Depression Scale (HADS) was used to identify symptoms of anxiety and depression.<sup>19</sup> This is a 14-item self-report questionnaire, with two subscales containing seven items each, the first dealing with anxiety (HAD-A) and the second with depression (HAD-D). Each item is awarded a score of 0 to 3, resulting in a range of 0 to 21 based on the sum of the scores obtained for each subscale. The HADS has been validated for use in Brazilian Portuguese.<sup>20</sup> A cut-off point of  $\geq 8$  was established for a diagnosis of anxiety and for depression.<sup>20</sup>

### Statistical analysis

Associations between sociodemographic, behavioral and clinical variables and the outcome measures (anxiety and depression) were calculated as prevalence ratios (PR) with their respective 95% confidence intervals (CI) using log-binomial regression models.<sup>21</sup> These models allow crude and adjusted PR to be calculated, taking into consideration the effect of possible confounders such as age, skin color, schooling, BMI and pain. When the 95%CI around the PR does not include 1.0, this indicates a statistically significant association ( $p < 0.05$ ). The entire statistical analysis was performed using the SAS statistical software program, version 9.4 (SAS Institute, Cary, NC, USA).

## Results

Over half the women with CPP (54%) and over half the controls (56%) were under 40 years of age ( $p = 0.58$ ). In the CPP group, 16% of the women reported smoking compared to 6% of the controls ( $p = 0.04$ ). There was no statistically significant difference between the groups in relation to any of the other characteristics evaluated (Table 1).

The prevalence of anxiety was 66% in the group of women with CPP and 49% in the controls ( $p = 0.02$ ). Depression was identified in 63% of the CPP group and in 38% of the controls ( $p < 0.01$ ). MADD was present in 54% and 28% of the women in the CPP and control groups, respectively ( $p < 0.01$ ) (Table 2).

In the adjusted analysis, CPP (PR=1.3; 95%CI: 1.1–1.6), physical abuse (PR=1.5; 95%CI: 1.2–1.8) and sexual abuse (PR=1.5; 95%CI: 1.1–1.8) were independently associated with anxiety. Women of 25 to 34 years of age were less likely to suffer anxiety (PR=0.6; 95%CI: 0.4–0.8) (Table 3).

Following adjustment for the covariates, CPP (PR=1.6; 95%CI: 1.2–2.2), physical abuse (PR=1.3; 95%CI: 1.1–1.7) and sexual abuse (PR=1.7; 95%CI: 1.3–2.2) were independently associated with depression (Table 4).

Following regression analysis, CPP (PR=1.9; 95%CI: 1.3–2.7), smoking (PR=1.5; 95%CI: 1.1–2.1), physical abuse (PR=1.4; 95%CI: 1.1–1.9) and sexual abuse (PR=1.4; 95%CI: 1.1–1.8) were independently associated with MADD (Table 5).

The mean duration of CPP was  $7.0 \pm 6.0$  years and the mean intensity of the pain was  $7.8 \pm 2.1$ . No statistically significant association was found between either the intensity or the duration of the pain and anxiety, depression or MADD (data not shown).

## Discussion

The present study was designed to investigate the prevalence of anxiety, depression and MADD and the factors associated with these conditions in women with CPP compared to pain-free controls. The global prevalence of anxiety in women worldwide is 4.6%, with a rate of 9.3% in Brazil, while the global prevalence of depression is 5.1% worldwide and 5.8% in Brazil.<sup>22</sup> In the present study, the prevalence of anxiety in women with CPP was 66%, with prevalence rates of depression and MADD of 63% and 54%, respectively. These rates were significantly higher compared to those found in the control group. Despite this difference, the prevalence of mental disorders

**Table 1** Characteristics of the group of women with chronic pelvic pain and the pain-free control group

Characteristics		With pain (n=100)		Without pain (n=100)		p-value <sup>a</sup>
		n	(%)	n	(%)	
Age (years)	<25	6	(6)	12	(12)	0.58
	25–34	29	(29)	26	(26)	
	35–39	19	(19)	18	(18)	
	40–44	26	(26)	21	(21)	
	≥45	20	(20)	23	(23)	
Skin color	White	33	(33)	27	(27)	0.61
	Black	12	(12)	10	(10)	
	Brown	53	(53)	62	(62)	
	Yellow	2	(2)	1	(1)	
Marital status	Single	21	(21)	30	(30)	0.22
	Married	67	(67)	58	(58)	
	Divorced	10	(10)	12	(12)	
	Widowed	2	(2)	0	0	
Monthly family income (R\$)	≤1,000	25	(25)	24	(24)	0.50
	1,001–1,600	25	(25)	32	(32)	
	1,600–2,300	26	(26)	18	(18)	
	>2,300	24	(24)	26	(26)	
Schooling	<11 years	52	(52)	44	(44)	0.32
	≥11 years	48	(48)	56	(56)	
Employment status	Employed	44	(44)	54	(54)	0.28
	Unemployed	7	(7)	8	(8)	
	Retired	2	(2)	4	(4)	
	Homemaker	47	(47)	34	(34)	
Smoking	Smoker	16	(16)	6	(6)	0.04
	Nonsmoker	84	(84)	94	(94)	
Physical activity	No	73	(73)	81	(81)	0.24
	Yes	27	(27)	19	(19)	
Body mass index (kg/m <sup>2</sup> )	<25	50	(50)	43	(43)	0.46
	25.00–29.99	35	(35)	36	(36)	
	≥30	15	(15)	21	(21)	
Alcohol consumption	No	64	(64)	58	(58)	0.47
	Yes	36	(36)	42	(42)	
Diabetes	No	93	(93)	98	(98)	0.10
	Yes	7	(7)	2	(2)	
Hypertension	No	83	(83)	84	(84)	1.00
	Yes	17	(17)	16	(16)	
Physical abuse	No	75	(75)	74	(74)	1.00
	Yes	25	(25)	26	(26)	
Sexual abuse	No	82	(82)	89	(89)	0.23
	Yes	18	(18)	11	(11)	
Menopausal status	Premenopausal	79	(79)	79	(79)	1.00
	Postmenopausal	21	(21)	21	(21)	
Parity	Nulliparous	14	(14)	25	(25)	0.07
	≥1	86	(86)	75	(75)	

Note: <sup>a</sup>Fisher's exact test.

**Table 2** Prevalence of anxiety, depression and mixed anxiety and depressive disorder in the group of women with chronic pelvic pain and in the pain-free control group

Variables		With pain (n=100)		Without pain (n=100)		p-value <sup>a</sup>
		n	(%)	n	(%)	
Anxiety	No	34	(34)	51	(51)	0.02
	Yes	66	(66)	49	(49)	
Depression	No	37	(37)	62	(62)	<0.01
	Yes	63	(63)	38	(38)	
Anxiety and depression	Both conditions	54	(54)	28	(28)	<0.01

Note: <sup>a</sup>Fisher's exact test.

in the pain-free controls is noteworthy. The high frequency of mental disorders in the control group could be related to the fact that the women have benign gynecological disorders. Previous studies have shown that benign diseases such as ovarian cysts and fibroids could exert a negative impact on women's mental health, giving rise to disorders that include anxiety and depression.<sup>23,24</sup>

In a study conducted in Brazil, 73% and 40% of the women with CPP had anxiety and depression, respectively.<sup>10</sup> In a cross-sectional study conducted in the United States involving 107 women with CPP, the prevalence of anxiety was 38.6%, while the prevalence of depression was 25.7%.<sup>13</sup> However, other authors have reported no significant differences in anxiety levels between women with and without CPP.<sup>9</sup> The discrepancies in results across the different studies may be due to the use of different instruments such as the Beck Anxiety Inventory and the Beck Depression Inventory and the HADS.<sup>9,10,25</sup> In addition, the prevalence of mental disorders may differ across regions, cultures and countries.<sup>26</sup> Another important point is that while some authors included a group without CPP for comparison, as in the present study, other investigators evaluated only women with CPP.<sup>9,10,13,25</sup> However, analysis of the studies showed a high prevalence of anxiety and depression in women with CPP. Therefore, it is important to identify the factors associated with these conditions.

In this study, CPP was independently associated with anxiety, depression and MADD. Previous studies with women have shown an association between CPP and mental disorders such as depression, anxiety, neuroticism and somatization.<sup>3,12</sup> In a population-based study conducted in Scotland with 2,088 women, having depression was significantly associated with CPP (odds ratio [OR] =1.61; 95%CI: 1.09–2.38).<sup>6</sup> In a systematic review with

meta-analysis, anxiety (OR=2.28; 99%CI: 1.41–3.7) and depression (OR=2.69; 99%CI: 1.86–3.88) were associated with CPP in women.<sup>12</sup> Depression may be present in up to one-third of patients with chronic pain.<sup>27</sup> On the other hand, around 65% of depressed patients have some type of chronic pain.<sup>28</sup> The present findings, taken together with the results of other studies, indicate a consistent association between chronic pain, including CPP, and mental disorders. This evidence should be taken into consideration when defining the diagnostic and therapeutic management of such disorders in women with CPP.

The present findings show that women of 25 to 34 years of age were less likely to have anxiety compared to younger women. Age can be a determining factor in anxiety symptoms.<sup>29</sup> The prevalence of anxiety disorders increases between 10 and 19 years of age and peaks at 20 to 24 years of age.<sup>26</sup> The reason why the 25–34-years age group is less likely to experience symptoms of anxiety is unclear. In general, women in this age group have completed their education, are employed, married and have children. Although there is no evidence at the present moment, factors such as being employed and having already formed a family could hypothetically protect these women's mental health. If confirmed, this hypothesis could at least partially explain the results of the present study. Therefore, future studies are required to delve further into the association between age and mental diseases.

Physical and sexual abuse were found to be associated with anxiety, depression and MADD in both the unadjusted and adjusted analyses. Other studies, however, have reported conflicting findings regarding these associations.<sup>14–16,18,30</sup> Some authors identified an association between sexual abuse and anxiety and depression.<sup>18,30</sup> Others have described an association between physical and

**Table 3** Factors associated with anxiety in women with chronic pelvic pain and in pain-free controls

Factors		Total	Anxiety		Crude	Adjusted
			n	(%)	PR (95%CI)	PR (95%CI) <sup>a</sup>
Pain	Without pain	100	49	(49.0)	Reference	Reference
	With pain	100	66	(66.0)	1.3 (1.1–1.7) <sup>b</sup>	1.3 (1.1–1.6) <sup>b</sup>
Age (years)	<25	18	14	(77.8)	Reference	Reference
	25–34	55	26	(47.3)	0.6 (0.4–0.9) <sup>b</sup>	0.6 (0.4–0.8) <sup>b</sup>
	35–39	37	22	(59.5)	0.7 (0.5–1.1)	0.7 (0.4–1.0)
	40–44	47	26	(55.3)	0.7 (0.4–1.1)	0.7 (0.4–1.0)
	≥45	43	27	(62.8)	0.8 (0.5–1.1)	0.7 (0.5–1.2)
Skin color	White	60	33	(55.0)	Reference	Reference
	Black	22	15	(68.2)	1.2 (0.8–1.8)	1.2 (0.8–1.8)
	Brown	115	66	(57.4)	1.0 (0.7–1.4)	1.0 (0.7–1.3)
	Yellow	3	1	(33.3)	0.6 (0.1–3.1)	0.6 (0.1–2.3)
Marital status	Single	51	25	(49.0)	Reference	Reference
	Married	125	73	(58.4)	1.1 (0.8–1.4)	1.1 (0.8–1.6)
	Divorced	22	15	(68.2)	1.2 (0.9–1.7)	1.2 (0.8–1.9)
	Widowed	2	2	(100.0)	–	–
Monthly family income (R\$)	≤1,000	49	29	(59.2)	Reference	Reference
	1,001–1,600	57	31	(54.4)	0.9 (0.6–1.3)	0.9 (0.7–1.2)
	1,600–2,300	44	29	(65.9)	1.1 (0.8–1.5)	1.0 (0.7–1.3)
	>2,300	50	26	(52.0)	0.8 (0.6–1.3)	0.8 (0.6–1.2)
Employment status	Employed	98	49	(50.0)	Reference	Reference
	Unemployed	15	11	(73.3)	1.5 (1.1–2.1) <sup>b</sup>	1.2 (0.8–1.6)
	Retired	6	3	(50.0)	1.0 (0.4–2.3)	1.0 (0.6–1.6)
	Homemaker	81	52	(64.2)	1.3 (0.9–1.7)	1.1 (0.9–1.3)
Schooling	<11 years	96	56	(58.3)	Reference	Reference
	≥11 years	104	59	(56.7)	0.9 (0.7–1.2)	1.0 (0.7–1.3)
Smoking	Nonsmoker	178	98	(55.1)	Reference	Reference
	Smoker	22	17	(77.3)	1.4 (1.1–1.8) <sup>b</sup>	1.1 (0.8–1.4)
Physical activity	Yes	46	23	(50.0)	Reference	Reference
	No	154	92	(59.7)	1.2 (0.8–1.6)	1.2 (0.8–1.5)
Body mass index (kg/m <sup>2</sup> )	<25	93	52	(55.9)	Reference	Reference
	25.00–29.99	71	40	(56.3)	1.0 (0.7–1.3)	1.0 (0.7–1.4)
	≥30	36	23	(63.9)	1.1 (0.8–1.5)	1.2 (0.8–1.7)
Alcohol consumption	No	122	71	(58.2)	Reference	Reference
	Yes	78	44	(56.4)	1.0 (0.8–1.3)	1.0 (0.7–1.4)
Diabetes	No	191	108	(56.5)	Reference	Reference
	Yes	9	7	(77.8)	1.4 (0.9–2.0)	1.1 (0.6–1.8)
Hypertension	No	167	95	(56.9)	Reference	Reference
	Yes	33	20	(60.6)	1.1 (0.7–1.5)	1.0 (0.7–1.5)
Physical abuse	No	149	76	(51.0)	Reference	Reference
	Yes	51	39	(76.5)	1.5 (1.2–1.9) <sup>b</sup>	1.5 (1.2–1.8) <sup>b</sup>
Sexual abuse	No	171	91	(53.2)	Reference	Reference
	Yes	29	24	(82.8)	1.6 (1.2–1.9) <sup>b</sup>	1.5 (1.1–1.8) <sup>b</sup>
Menopausal status	Premenopausal	158	91	(57.6)	Reference	Reference
	Postmenopausal	42	24	(57.1)	1.0 (0.7–1.3)	1.0 (0.7–1.4)
Parity	Nulliparous	39	20	(51.3)	Reference	Reference
	≥1	161	95	(59.0)	1.2 (0.8–1.6)	1.2 (0.7–1.9)

**Notes:** <sup>a</sup>Prevalence ratio adjusted for age, skin color, schooling, body mass index and pain. <sup>b</sup>Significant association ( $p < 0.05$ ).



**Table 4** Factors associated with depression in women with chronic pelvic pain and in pain-free controls

Factors		Total	Depression		Crude	Adjusted
			n	(%)	PR (95%CI)	PR (95%CI) <sup>a</sup>
Pain	Without pain	100	38	(38.0)	Reference	Reference
	With pain	100	63	(63.0)	1.7 (1.2–2.2) <sup>b</sup>	1.6 (1.2–2.2) <sup>b</sup>
Age (years)	<25	18	7	(38.9)	Reference	Reference
	25–34	55	26	(47.3)	1.2 (0.6–2.3)	1.0 (0.5–1.9)
	35–39	37	20	(54.1)	1.4 (0.7–2.7)	1.2 (0.6–2.2)
	40–44	47	25	(53.2)	1.4 (0.7–2.6)	1.1 (0.6–2.2)
	≥45	43	23	(53.5)	1.4 (0.7–2.6)	1.1 (0.6–2.2)
Skin color	White	60	29	(48.3)	Reference	Reference
	Black	22	13	(59.1)	1.2 (0.7–1.9)	1.2 (0.7–1.9)
	Brown	115	57	(49.6)	1.0 (0.7–1.4)	1.0 (0.7–1.3)
	Yellow	3	2	(66.7)	1.4 (0.5–3.2)	1.3 (0.4–3.6)
Marital status	Single	51	21	(41.2)	Reference	Reference
	Married	125	64	(51.2)	1.2 (0.8–1.8)	1.1 (0.7–1.6)
	Divorced	22	15	(68.2)	1.7 (1.1–2.6) <sup>b</sup>	1.3 (0.8–2.1)
	Widowed	2	1	(50.0)	1.2 (0.2–5.0)	0.9 (0.2–3.8)
Monthly family income (R\$)	1,000 or less	49	29	(59.2)	Reference	Reference
	1,001–1,600	57	28	(49.1)	0.8 (0.5–1.2)	0.8 (0.5–1.2)
	1,600–2,300	44	22	(50.0)	0.8 (0.5–1.2)	0.8 (0.5–1.1)
	>2,300	50	22	(44.0)	0.7 (0.5–1.1)	0.8 (0.5–1.2)
Employment status	Employed	98	43	(43.9)	Reference	Reference
	Unemployed	15	8	(53.3)	1.2 (0.7–2.1)	1.4 (0.8–2.5)
	Retired	6	3	(50.0)	1.1 (0.4–2.6)	1.3 (0.5–3.0)
	Homemaker	81	47	(58.0)	1.3 (0.9–1.8)	1.2 (0.9–1.7)
Schooling	<11 years	96	55	(57.3)	Reference	Reference
	≥11 years	104	46	(44.2)	0.8 (0.5–1.1)	0.9 (0.6–1.2)
Smoking	Nonsmoker	178	83	(46.6)	Reference	Reference
	Smoker	22	18	(81.8)	1.7 (1.3–2.3) <sup>b</sup>	1.1 (0.8–1.4)
Physical activity	Yes	46	17	(37.0)	Reference	Reference
	No	154	84	(54.6)	1.5 (0.9–2.2)	1.5 (0.9–2.2)
Body mass index (kg/m <sup>2</sup> )	<25	93	47	(50.5)	Reference	Reference
	25.00–29.99	71	33	(46.5)	0.9 (0.6–1.3)	0.8 (0.6–1.2)
	≥30	36	21	(58.3)	1.2 (0.8–1.6)	1.2 (0.8–1.8)
Alcohol consumption	No	122	67	(54.9)	Reference	Reference
	Yes	78	34	(43.6)	1.3 (0.9–1.7)	1.2 (0.8–1.6)
Diabetes	No	191	93	(48.7)	Reference	Reference
	Yes	9	8	(88.9)	1.8 (1.3–2.4) <sup>b</sup>	1.3 (0.6–2.6)
Hypertension	No	167	83	(49.7)	Reference	Reference
	Yes	33	18	(54.6)	1.1 (0.7–1.6)	1.0 (0.6–1.5)
Physical abuse	No	149	69	(46.3)	Reference	Reference
	Yes	51	32	(62.8)	1.4 (1.1–1.8) <sup>b</sup>	1.3 (1.1–1.7) <sup>b</sup>
Sexual abuse	No	171	76	(44.4)	Reference	Reference
	Yes	29	25	(86.2)	1.9 (1.5–2.4) <sup>b</sup>	1.7 (1.3–2.2) <sup>b</sup>
Menopausal status	Premenopausal	158	81	(51.3)	Reference	Reference
	Postmenopausal	42	20	(47.6)	0.9 (0.6–1.3)	1.1 (0.7–1.7)
Parity	Nulliparous	39	16	(41.0)	Reference	Reference
	≥1	161	85	(52.8)	1.3 (0.8–1.9)	1.0 (0.6–1.6)

**Notes:** <sup>a</sup>Prevalence ratio adjusted for age, skin color, schooling, body mass index and pain. <sup>b</sup>Significant association ( $p < 0.05$ ).

**Table 5** Factors associated with mixed anxiety and depressive disorder in women with chronic pelvic pain and in pain-free controls

Factors		Total	Mixed anxiety and depression		Crude	Adjusted
			n	(%)	PR (95%CI)	PR (95%CI) <sup>a</sup>
Pain	Without pain	100	28	(28.0)	Reference	Reference
	With pain	100	54	(54.0)	1.9 (1.3–2.8) <sup>b</sup>	1.9 (1.3–2.7) <sup>b</sup>
Age (years)	<25	18	6	(33.3)	Reference	Reference
	25–34	55	20	(36.4)	1.1 (0.5–2.3)	0.9 (0.4–1.9)
	35–39	37	17	(46.0)	1.4 (0.6–2.9)	1.1 (0.5–2.3)
	40–44	47	20	(42.6)	1.3 (0.6–2.7)	1.1 (0.5–2.3)
	≥45	43	19	(44.2)	1.3 (0.6–2.8)	1.2 (0.5–2.6)
Skin color	White	60	23	(38.3)	Reference	Reference
	Black	22	11	(50.0)	1.3 (0.7–2.2)	1.4 (0.8–2.4)
	Brown	115	47	(40.9)	1.1 (0.7–1.6)	1.0 (0.6–1.5)
	Yellow	3	1	(33.3)	0.8 (0.1–4.4)	0.6 (0.1–3.2)
Marital status	Single	51	16	(31.4)	Reference	Reference
	Married	125	53	(42.4)	1.4 (0.8–2.1)	1.2 (0.7–2.0)
	Divorced	22	12	(54.6)	1.7 (0.9–3.0)	1.4 (0.8–2.5)
	Widowed	2	1	(50.0)	1.6 (0.3–6.7)	1.3 (0.2–6.4)
Monthly family income (R\$)	1,000 or less	49	24	(49.0)	Reference	Reference
	1,001–1,600	57	20	(35.1)	0.7 (0.4–1.1)	0.7 (0.4–1.1)
	1,600–2,300	44	19	(43.2)	0.8 (0.5–1.4)	0.7 (0.4–1.2)
	>2,300	50	19	(38.0)	0.7 (0.4–1.2)	0.8 (0.4–1.2)
Employment status	Employed	98	33	(33.7)	Reference	Reference
	Unemployed	15	8	(53.3)	1.6 (0.9–2.7)	1.8 (0.9–3.3)
	Retired	6	3	(50.0)	1.5 (0.6–3.5)	1.6 (0.6–4.0)
	Homemaker	81	38	(46.9)	1.4 (0.9–2.0)	1.3 (0.8–1.8)
Schooling	<11 years	96	43	(44.8)	Reference	Reference
	≥11 years	104	39	(37.5)	0.8 (0.6–1.2)	1.0 (0.6–1.5)
Smoking	Nonsmoker	178	66	(37.1)	Reference	Reference
	Smoker	22	16	(72.7)	2.0 (1.4–2.7) <sup>b</sup>	1.5 (1.1–2.1) <sup>b</sup>
Physical activity	Yes	46	14	(30.4)	Reference	Reference
	No	154	68	(44.2)	1.5 (0.9–2.3)	1.5 (0.9–2.4)
Body mass index (kg/m <sup>2</sup> )	<25	93	40	(43.0)	Reference	Reference
	25.00–29.99	71	25	(35.2)	0.8 (0.5–1.2)	0.7 (0.5–1.1)
	≥30	36	17	(47.2)	1.1 (0.7–1.7)	1.2 (0.7–1.8)
Alcohol consumption	No	122	53	(43.4)	Reference	Reference
	Yes	78	29	(37.2)	1.2 (0.8–1.7)	1.1 (0.7–1.5)
Diabetes	No	191	75	(39.3)	Reference	Reference
	Yes	9	7	(77.8)	2.0 (1.3–2.9) <sup>b</sup>	1.9 (0.8–4.6)
Hypertension	No	167	67	(40.1)	Reference	Reference
	Yes	33	15	(45.5)	1.1 (0.7–1.7)	0.9 (0.5–1.5)
Physical abuse	No	149	51	(34.2)	Reference	Reference
	Yes	51	31	(60.8)	1.8 (1.2–2.4) <sup>b</sup>	1.4 (1.1–1.9) <sup>b</sup>
Sexual abuse	No	171	59	(34.5)	Reference	Reference
	Yes	29	23	(79.3)	1.3 (1.7–3.0) <sup>b</sup>	1.4 (1.1–1.8) <sup>b</sup>
Menopausal status	Premenopausal	158	65	(41.1)	Reference	Reference
	Postmenopausal	42	17	(40.5)	0.9 (0.6–1.5)	1.0 (0.6–1.6)
Parity	Nulliparous	39	13	(33.3)	Reference	Reference
	≥1	161	69	(42.9)	1.3 (0.7–2.1)	1.0 (0.5–1.7)

**Notes:** <sup>a</sup>Prevalence ratio adjusted for age, skin color, schooling, body mass index and pain. <sup>b</sup>Significant association ( $p < 0.05$ ).



sexual abuse and impaired mental health.<sup>14,15</sup> In a cross-sectional study conducted in the United States involving 273 women with CPP, a history of physical or sexual abuse in childhood, adolescence or in adult life was significantly associated with symptoms of depression.<sup>14</sup> In another study, conducted in Australia with 230 pain-free women in general practice clinics, adult sexual violence was significantly associated with anxiety, however not with depression, following adjustment for childhood sexual abuse.<sup>18</sup> Conversely, in a prospective study, the Netherlands Study of Depression and Anxiety (NESDA), conducted with 1,209 participants, 66% women, physical abuse was associated with depression and MADD; however, sexual abuse was not associated with mental disorders.<sup>16</sup> On the other hand, another study found an association between sexual abuse and MADD.<sup>17</sup> The differences between the studies could be due to the different definitions of physical and sexual abuse and the different criteria used to diagnose depression and anxiety. However, despite some conflicting results, the association between physical and sexual abuse and mental disorders is consistent. In this respect, the present findings confirm the results of earlier studies, indicating a significant association between physical and sexual abuse and anxiety, depression and MADD.

Another factor found to be independently associated with MADD in the present cohort was smoking. Studies have shown an association between smoking and anxiety and depression in patients with chronic diseases.<sup>31,32</sup> In the cross-sectional Nord-Trøndelag Health Study (HUNT-2), conducted with 60,814 participants, a significant association was found between smoking and MADD (OR=1.82; 95%CI: 1.69–1.95).<sup>33</sup> Some authors investigated the effect of nicotine on the central nervous system.<sup>34</sup> In animal models, exposure to nicotine in adolescence was associated with anxiety- and depression-like behaviors due to the persistent state of hyperactive dopamine activity in the ventral tegmental area concomitant with hyperactive neuronal activity states in the prefrontal cortex.<sup>34</sup> In addition, smoking could be associated with MADD because this behavior is not very socially acceptable in Brazil, negatively affecting women's self-esteem, as has already been reported in a different cultural setting.<sup>32</sup>

Some limitations of the present study should be taken into consideration when interpreting its findings. The cross-sectional design does not permit any causal inferences to be made. Another limitation refers to the lack of

data on the use of medication for mental disorders. The cause of CPP was not investigated; however, evidence suggests that mental disorders in women with CPP are more likely to reflect the effects of chronic pain rather than being the cause of that pain.<sup>35</sup>

The strongpoints of this study include the existence of a control group of pain-free women and the use of a covariate-adjusted regression model. To the best of our knowledge, this is the first study to show an association between CPP and MADD. Furthermore, the use of the HADS is important, since this is a validated instrument widely used in health research, including in patients with chronic pain. Another important point that should be mentioned is the identification of associations between socio-demographic, behavioral and clinical factors and anxiety, depression and MADD.

The findings of the present study suggest that systematic management of psychological factors could contribute towards improving the mental health of women with CPP. Therefore, biopsychosocial and interdisciplinary management is recommended.

## Conclusion

In conclusion, anxiety, depression and MADD were more prevalent in women with CPP compared to those without CPP. A significant association was found between pelvic pain, physical abuse, sexual abuse and smoking and mental disorders. The independent association between CPP and anxiety, depression and MADD was particularly noteworthy.

## Author contributions

All authors contributed to data analysis, drafting or revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

## Disclosure

The authors report no conflicts of interest in this work.

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