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Original Research

Post-COVID Patients With New-Onset Chronic Pain 2 Years After Infection: Cross-Sectional Study

Andrés Calvache-Mateo, M.Sc., Alba Navas-Otero, M.Sc., Alejandro Heredia-Ciuró, M.Sc., Javier Matín-Núñez, M.Sc., Irene Torres-Sánchez, Ph.D., Laura López-López, Ph.D.[1], Marie Carmen Valenza, Ph.D.

From the Physiotherapy Department, Faculty of Health Sciences, University of Granada, Granada, Spain

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ABSTRACT

Background: Although pain is common in non-hospitalized post-COVID-19 syndrome, only a few studies have provided information on the pain experience of these patients.
Aim: To identify the clinical and psychosocial profile associated with pain in non-hospitalized patients with post-COVID-19 syndrome.
Method: In this study there were three groups: healthy control group, successfully recovered group, and post-COVID syndrome group. Pain-related clinical profile and pain-related psychosocial variables were collected. Pain-related clinical profile included: pain intensity and interference (Brief Pain Inventory), central sensitization (Central Sensitization Scale), insomnia severity (Insomnia Severity Index), and pain treatment. Pain-related psychosocial variables were: fear of movement and (re)injury (Tampa Scale for Kinesiophobia), catastrophizing (Pain Catastrophizing Scale), depression, anxiety and stress (Depression, Anxiety and Stress Scale), and fear-avoidance beliefs (Fear Avoidance Beliefs Questionnaire).
Results: In all, 170 participants were included in the study (healthy control group n = 58, successfully recovered group n = 57, and post-COVID syndrome group n = 55). Post-COVID syndrome group obtained significantly worse punctuation in pain-related clinical profile and psychosocial variables than the other two groups ($p < .05$).
Conclusions: In conclusion, patients with post-COVID-19 syndrome have experienced high pain intensity and interference, central sensitization, increased insomnia severity, fear of movement, catastrophizing, fear-avoidance beliefs, depression, anxiety, and stress.

The COVID-19 pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has affected the health and lives of people around the world, with the potential for further effects in the future (Haleem et al., 2020; Hu et al., 2021).

There is evidence of a second pandemic generated by all those patients who, after the acute phase of SARS-CoV-2 infection, continue to have long-lasting symptoms. This condition is called long-COVID (Fernández-de-las-Peñas, 2022) or post-COVID-19 syndrome (Soriano et al., 2022) and is generating increase burden on health systems (Menges et al., 2021).

Meta-analyses to date (Cares-Marambio et al., 2021; Fernández-de-las-Peñas, Palacios-Ceña, et al., 2021; Han et al., 2022; Lopez-Leon et al., 2021) show that about 60% of patients develop post-COVID symptoms, with fatigue and dyspnea being the most prevalent. Another relevant post-COVID symptom that can generate a significant burden (Bileviciute-Ljungar et al., 2022) on society is chronic pain (Cares-Marambio et al., 2021; López-León et al., 2021). A meta-analysis by Fernández-de-las-Peñas, Navarro-Santana, et al., 2022 recorded a post-COVID pain prevalence of 10%, however, studies focused on pain symptoms specifically show a prevalence of 45-70% (Bakilan et al., 2021; Fernández-de-las-Peñas, Cancela-Cilleruelo, et al., 2022; Fernández-de-las-Peñas, de-la-Llave-Rincón, et al., 2022; Karaarslan et al., 2021; Herrero-Montes et al., 2022; Soares et al., 2021; Rubio-Rivas et al., 2020). This suggests that it is an underestimated symptom in general post-COVID syndrome

[1] Address correspondence to Laura López López, Ph.D., Department of Physiotherapy, Faculty of Health Sciences, University of Granada, Av. De la Ilustración, 60 18016 Granada, Spain.
E-mail address: lauralopez@ugr.es (L. López-López).

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cohort studies (Fernández-de-las-Peñas, de-la-Llave-Rincón, et al., 2022).

The characterization of post-COVID pain will allow for a better understanding of the underlying mechanisms, the development of personalized treatment plans, and the identification of patients with a higher predisposition (Chou et al., 2007; Clauw et al., 2020; Fernández-de-las-Peñas, Herrero-Montes et al., 2022). Pain should be approached from the biopsychosocial model (Bilgin et al., 2022; Gatchel et al., 2007; Uceyler et al., 2017) which understands this symptom as a complex dynamic interaction of biologic factors with psychosocial factors, which influences in a determinant way the coping strategies of pain. Consequently, these factors affect on the chronification of pain, the development of disability, the appearance of fear of movement, decreased activity levels and, therefore, decisively modify the patient's prognosis (Lee et al., 2016; Nicholas et al., 2011; Overmeer et al., 2004; Rocha et al., 2021).

Evidence published to date suggests that post-COVID pain follows a nociplastic pain pattern (Fernández-de-las-Peñas, Ryan-Murua, et al., 2022; Pacho-Hernández et al., 2022), which is characterized by an exaggerated response to pain associated with central nervous system-derived symptoms such as sleep problems, psychological disturbances, and mood disorders (Eccleston et al., 2020; Fitzcharles et al., 2021; Nijs et al., 2021). The nociplastic pain pattern is created on the basis of a prolonged systemic inflammatory-immune response, which in turn generates a central sensitization process (Cascella et al., 2021; Fernández-de-las-Peñas, Herrero-Montes et al., 2022; Fernández-de-las-Peñas, Ryan-Murua et al., 2022; Goudman et al., 2021; Nijs et al., 2021; Shanthanna et al., 2022) that is enhanced and prolonged in time by a series of negative psychosocial factors that contribute to the chronification of pain and generate a worse prognosis (Huang et al., 2016; Knox et al., 2021).

Negative psychosocial factors such as anxiety, depression and insomnia appear in patients with post-COVID syndrome (Bottemanne et al., 2021; Fernández-de-las-Peñas, Gómez-Mayordomo, et al., 2021; Kind et al., 2019; López-León et al., 2021; Shanbehzadehet al., 2021). However, the studies conducted so far have been carried out mainly in patients hospitalized during the acute phase of the disease (Bottemanne et al., 2021; Fernández-de-las-Peñas, Gómez-Mayordomo, et al., 2021). In these patients, in addition to the COVID-19-derived factors (Huang et al., 2016; Weng et al., 2021), there are hospitalization-derived factors for pain (Wu et al., 2020).

Therefore, it is necessary to conduct studies in the non-hospitalized population to help characterize the pain of these patients and develop treatment plans tailored to their needs. The aim of this study is to identify the clinical and psychosocial profile associated with pain in non-hospitalized patients with post-COVID-19 syndrome.

Methods

Study Design and Participants

A cross-sectional case-control study was performed. Using the recommended guidelines Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) were applied to develop the study design (Von Elmet al., 2014). We conducted this study in accordance with the Declaration of Helsinki 1975, revised in 2013 (World Medical Association, 2013). Ethical approval for this study was obtained from the Biomedical Research Ethics Committee of Granada.

Three groups of patients were included in this study. The case group was composed of post-COVID syndrome patients meeting the World Health Organization (WHO) definition for this disease (Soriano et al., 2022). In addition, two control groups of patients matched for age and sex were included, a group consisting of patients with a history of SARS-CoV-2 infection and successfully recovered and, finally, a group of healthy controls who did not acquire SARS-CoV-2 infection. Patients in the post-COVID syndrome group were recruited from the "Covid Persistente Andalucía" association. Control patients were recruited by word-of-mouth. Patients were recruited between May 2021 and September 2022.

Patients aged older than 18 years, who agreed to sign the informed consent form were included in the study. Patients were excluded if they had any of the following conditions: neurological or orthopedic pathologies that limited voluntary movement, a cognitive impairment that prevented them from understanding and answering the questionnaires, or if they suffered reinfection with SARS-CoV-2. In addition, all patients who had been hospitalized because of COVID-19 infection and those who had pre-existing chronic pain according to the current International Association for the Study of Pain (IASP) definition (Raja et al., 2020; Treede et al., 2019) before COVID-19 infection were excluded.

Outcome Measures

Patients were initially contacted by telephone to inform them of the study and to arrange a face-to-face assessment. Once informed consent was obtained, an assessment of demographic characteristics, pain related clinical profile, and pain related psychosocial variables were performed.

The demographic characteristics included the anthropometric data, weeks since infection, percentage of smokers, percentage of patients with others diseases, comorbidities assessed with the Charlson comorbidities index (Casas Duran et al., 2020; Charlson et al., 1987), the quality of life evaluated by the EuroQol-5 dimensions 5 Levels (EQ-5D-5L) (Herdman et al., 2011; Hernández et al., 2018), and physical activity through the International Physical Activity Questionnaire Short Form (IPAQ-SF) (Craig et al., 2003; Roman-Viñas et al., 2010).

Pain-related clinical profile included: pain intensity and interference, central sensitization, insomnia severity, and pain treatment. Pain intensity and interference were measured with the Brief Pain Inventory (BPI). The pain intensity section of the BPI is composed of four items and the pain interference section is composed of seven items. For the intensity section, the responses range from 0 (no pain) to 10 (worst pain) and for the interference section, the responses range from 0 (no interference) to 10 (total interference). To obtain the severity and interference index, the mean of the corresponding items is calculated, obtaining values between 0 and 10, with a higher score reflecting greater pain intensity and interference. The BPI has been established as a reliable and valid tool for assessing pain severity and interference (Keller et al., 2004; Tan et al., 2004). The Spanish version of this scale has a high internal consistency ($\alpha = 0.93$) (de Andrés Ares et al., 2015).

Central sensitization was measured with the Central Sensitization Inventory (CSI) (Roldán-Jiménez et al., 2021). The first part of the CSI is composed of 25 items that evaluate the frequency of presentation of the most common symptoms related to central sensitization syndrome. The score for each item ranges from 0 (never) to 4 (always) with a maximum score of 100. The higher the score, the greater the level of central sensitization. This questionnaire has a second part, which is not scored, that evaluates the presence of 7 disorders related to central sensitization. The Spanish version of this scale has a high internal consistency ($\alpha = 0.872$ (Cuesta-Vargas et al., 2016).

The Insomnia Severity Index (ISI) measured the severity of both nocturnal and daytime insomnia symptoms (Bastien et al., 2001). This index consists of 7 different items evaluating different

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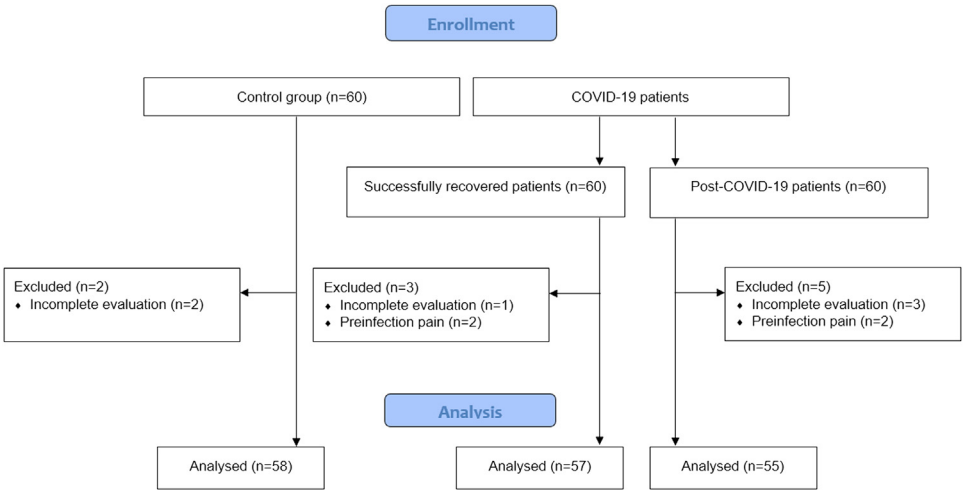

Fig. 1. Flow Diagram.

aspects of insomnia in the past 2 weeks, each of which is a Likert point scale (0-4). The final score provides an overall index of insomnia severity and ranges from 0 to 28. The higher the score on this scale, the greater the severity of insomnia. The psychometric properties of this index have been shown to be good, including high diagnostic accuracy (Bastien et al., 2001; Morin et al., 2011; Wong et al., 2017). The Spanish version of the ISI is a reliable and valid instrument with adequate internal consistency ($\alpha = 0.82$) (Fernández-Mendoza et al., 2012).

In addition, patients were asked about the treatment they were currently receiving for pain. Data were collected on any type of treatment patients were receiving, both non-pharmacologic and pharmacologic treatment.

The assessment of pain related psychosocial variables included: fear of movement and (re)injury, catastrophizing, depression, anxiety, stress, and fear-avoidance beliefs.

The Spanish version of the Tampa Scale for Kinesiophobia (TSK) was used to measure fear of movement and (re)injury. The scale consists of 11 items which are a 4-point Likert scale (1-4). The final score ranges from 11 to 44 points, with higher scores expressing greater fear of movement and (re)injury. The Spanish version of this scale shows moderate internal consistency ($\alpha = 0.79$) (Gómez-Perez et al., 2011).

Catastrophizing was measured with the Pain Catastrophizing Scale (PCS) (Sullivan et al., 1995). This scale consists of 13 items structured on a 5-point Likert scale ranging from 0 (not at all) to 4 (all the time). This scale assesses three components of catastrophizing: helplessness, magnification, and rumination (Osman et al., 1997; Van Damme et al., 2002). The items describe different thoughts and feelings that individuals can experience when they are in pain. The Spanish version of this scale used in this study showed appropriate internal consistency ($\alpha = 0.79$) (García-Campayo et al., 2010).

The Depression, Anxiety and Stress Scale (DASS-21) (Lovibond et al., 1996) was used to measure stress, anxiety, and depression. The DASS-21 is a questionnaire composed of three subscales (stress, anxiety, depression). These subscales consist of 7 items measured on a 4-point Likert-type scale. A final score is obtained for each subscale (0-21) and for the final scale (0-63), the higher the score, the worse stress, anxiety, and depression. The Spanish version of the DASS-21 has shown strong psychometric properties for the different subscales: depression ($\alpha = 0.93$), anxiety ($\alpha = 0.86$) and stress ($\alpha = 0.91$) and for the total scoring ($\alpha = 0.96$) (Daza et al., 2002).

Fear Avoidance Beliefs Questionnaire (FABQ) was used to measure fear avoidance and beliefs. This questionnaire consists of 16 items. The score for each item ranges from 0 (strongly disagree) to 6 (strongly agree). Within this questionnaire two subscales are defined, the FAB-work subscale reflects fear-avoidance beliefs about work, and the FAB-physical activity subscale reflects fear-avoidance beliefs about physical activities. The Spanish version shows high internal consistency ($\alpha = 0.93$) (Kovacs et al., 2006).

Statistical Analysis

G*Power 3.1.9.2 software (3.1.9.2v; Statistical Power Analyses for Windows, Universität Düsseldorf, Germany) was used to perform a priori power analysis. This analysis was based on a pilot study (unpublished) of 15 subjects (effect size of 0.05). This suggested that a sample size of 53 in each group will have 95% power to detect a probability of 0.5. To allow for a dropout rate of 10%, we decided to have approximately 60 patients in each study group.

Data were analyzed using the Statistical Package of Social Science (SPSS) program for Windows (version 26 IBM, Armonk, NY, USA). Nominal data were expressed as frequency (percentage). Continuous variables were presented as mean and standard deviation (SD). The normality of the data was first tested with the one-sample Kolmogorov-Smirnov test.

For nominal variables, the χ^2 test was used to identify differences between groups. Normally distributed continuous variables were compared with a one-way analysis of variance (ANOVA). If the ANOVA analysis showed a significant interaction for each variable, the Bonferroni post hoc test was used to identify specific mean differences. A 95% confidence interval (CI) was used for statistical analysis. A p value of $\leq .05$ was set to indicate significant differences. The overall p values were adjusted for multiplicity with the Bonferroni method. No attempt at imputation was made for missing data.

Results

A total of 180 participants agreed to participate in this study and were considered eligible. The distribution of participants is shown in Fig. 1.

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Table 1
Descriptive Characteristic of the Sample.

Variables	Healthy Controls Group (n = 58)	Successfully Recovered Group (n = 57)	Post-COVID Group (n = 55)	F/*p*
Age	45.43 ± 3.63	44.74 ± 3.04	45.51 ± 3.28	.924
Sex (% female)	69	66.7	70.9	.889
Weeks since infection		103.23 ± 9.04	104.98 ± 12.18	.752
BMI (kg/m^2)	25.66 ± 3.12	25.15 ± 3.26	24.88 ± 3.09	.901
Smoker (%)	15.5	21.1	25.5	.275
Other diseases (%)	22.4	14	18.2	.508
Charlson index	0.40 ± 0.70	0.19 ± 0.44	0.22 ± 0.42	2.454
EQ-5D-mobility	1.24 ± 0.54	1.11 ± 0.36	2.26 ± 1.21	35.85[b,c]
EQ-5D-self-care	1.05 ± 0.22	1.09 ± 0.29	1.87 ± 1.09	28.07[b,c]
EQ-5D-usual activities	1.17 ± 0.50	1.07 ± 0.32	3.00 ± 1.11	127.74[b,c]
EQ-5D-anxiety or depression	1.45 ± 0.68	1.25 ± 0.51	3.46 ± 0.77	191.43[b,c]
EQ-5D-pain or discomfort	1.31 ± 0.57	1.37 ± 0.56	2.46 ± 1.20	34.18[b,c]
EQ-5D VAS	83.60 ± 13.55	85.40 ± 13.97	42.71 ± 23.41	106.59[b,c]
IPAQ-walking	1170.53 ± 603.29	1026.68 ± 524.22	507.78 ± 465.59	23.76[b,c]
IPAQ-moderate	786.21 ± 599.86	731.23 ± 626.27	119.56 ± 269.90	27.52[b,c]
IPAQ-vigorous	1293.43 ± 878.04	1380.91 ± 570.23	185.18 ± 304.72	61.61[b,c]
IPAQ-total	3250.17 ± 1253.65	3138.82 ± 958.98	812.53 ± 667.98	106.94[b,c]

[a]Significant differences between the healthy controls group and the successfully recovered group.
[b] Significant differences between the healthy controls group post-COVID group.
[c] Significant differences between the successfully recovered group and post-COVID group.Data are expressed as mean ± standard deviation.BMI = body mass index; EQ-5D = Euroqol-5 Dimensions; VAS = visual analogue scale; IPAQ = International Physical Activity Questionnaire.

Table 2
Pain related clinical profile.

Variables	Healthy Controls Group (n = 58)	Successfully Recovered Group (n = 57)	Post-COVID Group (n = 55)	F/*p*
BPI-intensity	0.66 ± 1.43	0.93 ± 1.74	5.07 ± 2.42	94.27[b,c]
BPI-interference	0.56 ± 1.63	0.82 ± 1.87	5.78 ± 3.14	91.76[b,c]
SC	17.69 ± 14.30	18.81 ± 16.24	54.53 ± 17.10	96.99[b,c]
ISI	6.03 ± 5.13	6.35 ± 7.34	14.06 ± 7.12	26.53[b,c]
Non-pharmacologic treatment (%)	24.1	22.8	40	.083
Physiotherapy	78.57	69.23	72.73	
Psychology	21.43	30.77	27.27	
Pharmacologic treatment for pain (%)	10.3	14	76.4	<.001[a]
NSAIDS	50	50	26.2	
Paracetamol	33.3	37.5	21.4	
Muscle relaxants	16.7	12.5	19	
Tramadol	0	0	14.3	
Codeine	0	0	4.8	
Metamizole	0	0	14.3	

[a] p <,001.
[b] Significant differences between the healthy controls group and post-COVID group.
[c] Significant differences between the successfully recovered group and post-COVID group.BPI = Brief Pain Inventory; ISI = Insomnia Severity Index; NSAIDS = Nonsteroidal anti-inflammatory drugs.Data are expressed as mean ± standard deviation.

The demographic characteristics of the sample are shown in Table 1.

No statistically significant differences were found between groups in the anthropometric data, weeks since infection, percentage of smokers, percentage of patients with other diseases, and comorbidities. Statistically significant differences were found regarding the quality of life and physical activity. The group of post-COVID syndrome patients demonstrated worse results in quality of life and physical activity levels, with statistically significant differences with respect to the group of healthy controls and the group of successfully recovered patients.

The pain related clinical profile of the different groups is presented in Table 2.

Statically significant differences in pain intensity and pain interference were found between the post-COVID syndrome group and both control groups, with the post-COVID syndrome group showing higher levels of pain intensity and pain interference. The CSI and ISI score also indicated higher levels of central sensitization and insomnia severity in the post-COVID syndrome group compared with the control groups, with these differences being statistically significant.

No significant differences were found with respect to the proportion of patients who treated their pain non-pharmacologically, although the results did show that the proportion of patients in the three groups who went to physiotherapy was higher than the percentage of patients who went to a psychologist. When comparing the proportion of pain pharmacologically, statistically significant differences were found, being considerably higher in the post-COVID syndrome group of patients (76.4%) compared with the healthy control group (10.3%) and the successfully recovered group (14%). The most commonly used drugs in the three groups were nonsteroidal anti-inflammatory drugs (NSAIDS), followed by paracetamol, and muscle relaxants.

The assessment of pain-related psychosocial variables included fear of movement and (re)injury, catastrophizing, depression, anxiety, stress, and fear-avoidance beliefs.

Table 3 shows the assessment of pain related psychosocial variables results.

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Table 3
Pain related psychosocial variables.

Variables	Healthy Controls Group (n = 58)	Successfully Recovered Group (n = 57)	Post-COVID Group (n = 55)	F
TSK	16.55 ± 9.44	13.81 ± 7.20	25.06 ± 6.67	30.86[a,b]
PCS-helplessness	2.90 ± 3.42	2.16 ± 3.09	9.93 ± 5.70	57.93[a,b]
PCS-magnification	1.59 ± 1.97	2.09 ± 3.15	5.15 ± 2.72	29.38[a,b]
PCS-rumination	2.47 ± 2.97	1.91 ± 3.14	7.02 ± 3.91	38.85[a,b]
PCS-total	6.95 ± 7.71	6.16 ± 8.89	22.09 ± 10.64	53.95[a,b]
DASS-depression	2.76 ± 4.00	2.14 ± 3.76	7.02 ± 5.41	19.98[a,b]
DASS-anxiety	2.60 ± 4.11	2.54 ± 3.45	9.11 ± 3.98	53.35[a,b]
DASS-stress	4.35 ± 4.41	4.79 ± 5.12	9.26 ± 5.27	16.88[a,b]
DASS-total	9.71 ± 11.66	9.47 ± 11.06	25.38 ± 12.56	33.50[a,b]
FABQ-physical activity	5.38 ± 6.75	4.25 ± 5.95	9.91 ± 6.40	12.30[a,b]
FABQ-work	5.05 ± 7.08	3.74 ± 5.79	18.95 ± 10.77	60.14[a,b]
FABQ-total	10.43 ± 12.64	7.98 ± 9.34	28.86 ± 13.76	50.07[a,b]

[a] Significant differences between the healthy controls group and post-COVID group.
[b] Significant differences between the successfully recovered group and post-COVID group.Data are expressed as mean ± standard deviation.TSK = Tampa Scale for Kinesiophobia; PCS = Pain Catastrophizing Scale; DASS = Depression Anxiety and Stress Scales; FAB = Fear-Avoidance Beliefs questionnaire.

Patients in the post-COVID syndrome group had higher levels of fear of movement and (re)injury, as well as catastrophizing. The results of the TSK, the different subscales, and the total PCS score indicated greater scores in the post-COVID syndrome group of patients, reaching a statistically significant difference with respect to the group of healthy controls and the successfully recovered group.

With respect to depression, anxiety, and stress, the DASS-21 scale demonstrated significantly worse results in the post-COVID syndrome group with respect to both control groups in the three subscales and in the total score.

Finally, with respect to fear-avoidance beliefs, measured with the FABQ, it was noted that the results shown by both control groups were significantly better than the results found in the post-COVID syndrome group of patients, both in the physical activity subscale, the work subscale, and in the total scoring.

No statistically significant differences were found between the group of healthy controls and the group of successfully recovered patients in any variable.

Discussion

The aim of this study was to identify the clinical and psychosocial profile associated with pain in non-hospitalized patients with post-COVID-19 syndrome. The results have shown that patients with post-COVID-19 syndrome have obtained higher scores in pain intensity and interference, central sensitization, insomnia severity, fear of movement, catastrophizing, fear-avoidance beliefs, depression, anxiety and stress, compared with the control groups.

The sample of subjects included in this study was representative of the general population with the post-COVID-19 syndrome, with similar sociodemographic characteristics (Fernandez-de-Las-Penas et al., 2022; Seang et al., 2022). The higher prevalence of post-COVID-19 syndrome in the female sex has been previously demonstrated. These differences in prevalence are generated because of different symptomatic, inflammatory, and immune responses between men and women (Bilgin et al., 2022; Pelà et al., 2022).

Pain has been previously studied in post-COVID patients. Khoja et al. (2022) concluded that musculoskeletal pain was one of the most common symptoms in post-COVID patients. They also affirmed that the majority of the published studies reported the prevalence of pain, but literature exploring the characteristics and the profile of patients is needed. Our results not only have concluded that pain intensity and severity was significantly higher in the post-COVID syndrome group, but we have also explored the pain-clinical and psychosocial profile of these patients. Significant poor results were found in post-COVID syndrome group in central sensitization, fear of movement, catastrophizing, and fear-avoidance beliefs, compared with the control groups. It is well documented in the pain literature that all of these factors exacerbate the experience of pain and predispose individuals to pain chronification (Asmundson et al., 2009).

Our results have demonstrated a decreased quality of life in the post-COVID syndrome group compared with the other two control groups. Malik et al., 2022 carried out a systematic review with the aim of evaluating the prevalence of poor quality of life in post-COVID-19 syndrome, and they concluded that post-COVID syndrome was related to poor quality of life. They thought that a possible reason was the fact that post-COVID patients have higher stress levels and psychological issues inhibiting them from relaxing and may result in sleep disturbances (Bellan et al., 2021). These results are in line with those found in our study. We have found significant levels of insomnia as well as stress, anxiety, and depression in the post-COVID syndrome group.

Limitations

One limitation of this study could be the fact that the sample was obtained from an association of patients with the post-COVID-19 syndrome, which makes the patients included more proactive in seeking help, perhaps because they have a greater intensity of symptoms. In future studies, it would also be interesting to include an evaluation of serum biomarkers in patients with the post-COVID-19 syndrome to assess changes in these and compare them with both control groups. Additionally, a longitudinal design would allow us to observe changes in pain levels over time. Finally, we have collected some information about the specific description of the pain in the participants. Nevertheless, the information collected is not sufficient to identify a more specific profile. In future studies, it could be improved.

Conclusion

Identification of the COVID-19 aftermaths will be crucial for health care professionals. This study has revealed that patients with post-COVID-19 syndrome have shown high pain intensity and interference, central sensitization, insomnia severity, fear of movement, catastrophizing, fear-avoidance beliefs, depression, anxiety, and stress. These findings have important implications for the development of future interventions to improve the management of these patients.

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Clinical Implications

These findings have important implications for the development of future interventions to improve the management of these patients.

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