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Original Article

Fibromyalgia Syndrome Following Coronavirus Disease 2019

Koronavirüs Hastalığı-2019 Sonrası Fibromiyalji Sendromu

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ABSTRACT

Objective: Fibromyalgia syndrome is a chronic rheumatic disease, the primary symptom of which is widespread body pain, accompanied by other symptoms, and infections play a role in its etiopathogenesis. Our study aims to investigate the symptoms between the patient group diagnosed with fibromyalgia syndrome after being infected with coronavirus disease 2019 and the fibromyalgia syndrome group without infection.

Methods: In this study, 35 patients diagnosed with fibromyalgia after having coronavirus disease 2019 and 35 patients diagnosed with non-coronavirus disease 2019 fibromyalgia according to the 2016 American College of Rheumatology diagnostic criteria, a total of 70 patients, were evaluated. Widespread Pain Index, Symptom Severity Scale, Fibromyalgia Symptom Scale, Fibromyalgia Impact Questionnaire, Beck Anxiety Inventory, Jenkins Sleep Scale, Fatigue Severity Scale, and Visual Analogue Scale were used.

Results: In the study, sociodemographic findings such as age, weight, height, body mass index, marital status, education, Widespread Pain Index, Symptom Severity Scale, Fibromyalgia Symptom Scale, and fibromyalgia syndrome diagnostic criteria were high and similar in both groups. Fibromyalgia Impact Questionnaire, Beck Anxiety Inventory, Jenkins Sleep Scale, Fatigue Severity Scale, and Visual Analogue Scale-pain scores, which were increased in both groups, were statistically higher and more significant in the post-coronavirus disease 2019 fibromyalgia syndrome group than in the fibromyalgia syndrome group ($P < .001$). The scores of fibromyalgia effect, anxiety and sleep disorders, fatigue, and pain severity were higher in fibromyalgia patients after coronavirus disease 2019.

Conclusions: In this study, we revealed that fibromyalgia symptoms might develop after coronavirus disease 2019 and, unlike idiopathic fibromyalgia, symptoms of anxiety and sleep disturbance, fatigue, and pain may be more severe. Thus, we

ÖZ

Amaç: Fibromiyalji sendromu (FM), birincil semptomu yaygın vücut ağrısı olan, birçok semptomun eşlik ettiği ve etiyopatogenezinde enfeksiyonların rol oynadığı kronik romatizmal bir hastalıktır. Çalışmamız, COVID-19 ile enfekte olduktan sonra FM tanısı alan hasta grubu ile enfeksiyonu olmayan FM grubu arasındaki semptomları araştırmayı amaçlamaktadır.

Yöntemler: Bu çalışmada 2016 American of Rheumatology (ACR) tanı kriterlerine göre COVID-19 sonrası fibromiyalji tanısı alan 35 hasta ve COVID-19 dışı fibromiyalji tanısı alan 35 hasta olmak üzere toplam 70 hasta değerlendirildi. Yaygın Ağrı İndeksi (WPI), Semptom Şiddet Ölçeği (SSS), Fibromiyalji Semptom Skalası (FS), Fibromiyalji Etki Anketi (FIQ), Beck Anksiyete Envanteri (BAI), Jenkins Uyku Ölçeği (JSS), Yorgunluk Şiddet Ölçeği (FSS) ve Görsel Analog Skala (VAS) kullanıldı.

Bulgular: Çalışmada yaş, kilo, boy, VKİ, medeni durum, eğitim, WPI, SSS, FS ve FM tanı kriterleri gibi sosyodemografik bulgular her iki grupta da yüksek ve benzerdi. Her iki grupta da artmış olan FIQ, BAÖ, JSS, FSS ve VAS-ağrı skorları PCFM grubunda FM grubuna göre istatistiksel olarak daha yüksek ve anlamlıydı ($P < ,001$). COVID-19 sonrası fibromiyalji hastalarında fibromiyalji etkisi, anksiyete ve uyku bozuklukları, yorgunluk ve ağrı şiddeti skorları daha yüksekti.

Sonuç: Bu çalışmada fibromiyalji semptomlarının COVID-19 sonrası gelişebileceğini ve idiyopatik fibromiyaljiden farklı olarak anksiyete ve uyku bozukluğu, yorgunluk ve ağrı semptomlarının daha şiddetli olabileceğini ortaya koyduk. Böylece COVID-19'un genel sağlığı idiyopatik FM'den daha fazla olumsuz etkileyebileceğini gösterdik.

Anahtar Kelimeler: Fibromiyalji, COVID-19, fibromiyalji etki anketi

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showed that coronavirus disease 2019 could negatively affect general health more than idiopathic fibromyalgia syndrome.

Keywords: Fibromyalgia, COVID-19, Fibromyalgia Impact Questionnaire

INTRODUCTION

Fibromyalgia syndrome (FM) is a chronic rheumatic disease, the primary symptom of which is widespread body pain, accompanied by other symptoms such as sleep disturbance, fatigue, stiffness, headache, gastrointestinal complaints, and cognitive and psychiatric disorders. Diagnosis is based on the patient's history and the identification of specific tender points on physical examination.[1,2] It has been stated that neuroplasticity and dysfunction play of pain pathways that that cause localized pain in the central nervous system play a role in the etiopathogenesis of fibromyalgia. Moreover, changes in neurotransmitters, increased sensitivity to pain with widespread pain, genetic and enviromental factors and hormonal changes have been revealed.[3,4]

Another factor in FM etiopathogenesis is the infectious theory. Although no conclusive evidence exists, multiple viral and bacterial illnesses have been studied.[5-7] In 1 study, a clinical picture similar to FM was described in some patients after infection with another coronavirus strain (2003 SARS-COV).[8] In addition, hepatitis C, Epstein Barr, and FM-like clinical manifestations have been reported after viral infections such as Parvovirus B19 and human immunodeficiency virus infection.[8] A similar long-term clinical picture has been observed after some viral and non-viral infections.[9] In previous years, some FM-like symptoms have persisted for a long time after acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection.[8,10,11] Recent publications show that between 40% and 80% of patients continue to show symptoms after coronavirus disease 2019 (COVID-19).[12,13]

The clinical prognosis of COVID-19 is significantly worse in older people with comorbidities such as malignancy, diabetes, lung disease, immunosuppressive therapy, and cardiovascular disease.[14] Fibromyalgia syndrome, a chronic central pain sensitivity disorder, is likely to exacerbate worsening symptoms. During the COVID-19 pandemic, individuals faced psychological stress due to anxiety and fear due to the high rate of death and transmission of the disease, difficulties in accessing health services, social isolation, and economic problems. It is accepted that physical, emotional, mental, or financial stress factors directly and negatively affect the underlying process of central sensitization (CS), which worsens the symptoms. Central sensitization is a pathophysiological process that progresses with structural, chemical, and functional changes in the central nervous system, changes in the functioning of pain, and other sensory stimuli in the brain and spinal cord.[15,16] Chronic symptoms and illnesses are brought on by changes in the central nervous system, the peripheral nervous system, the hypothalamic-pituitary-adrenal axis, neuroplastic alterations, the sympathetic nervous system, and the endogenous opioid system.[16] Additional research into this possible impact is required in the form of well-designed prospective trials. Our study aims to investigate the symptoms in FM patients infected with COVID-19 and to reveal the differences between idiopathic FM and FM after COVID-19.

METHODS

Fibromyalgia patients aged 20-65 years, with and without a history of COVID-19 disease, who applied to the Physical Therapy and Rehabilitation Outpatient Clinic between June 2021 and June 2022, were included in this study. This study was accepted with the decision of Erzincan Binali Yıldırım University Clinical Research Ethics Committee dated 05.24.2021 and numbered E-21142744-804.99-79956. The study was conducted in accordance with the principles of the Declaration of Helsinki. According to the 2016 American College of Rheumatology (ACR) diagnostic criteria, 35 female patients newly diagnosed with fibromyalgia without a history of COVID-19 infection (FM) and 35 female patients newly diagnosed with fibromyalgia with a history of previous COVID-19 infection (PCFM) (70 patients in total) were included in the study. American College of Rheumatology criteria were created with 2 variables: the Widespread Pain Index (WPI) (0-19) and the symptomatic severity scale (SSS) (0-12). The sum of both forms the Fibromyalgia Symptom Scale (FS) (0-31), which measures the global severity of FM.[17] After the anamnesis and physical examination in our Physical Medicine and Rehabilitation polyclinic, patients who wanted to participate in the study signed a voluntary consent form. Regarding diagnostic criteria, SSS and WPI were defined for each patient. These criteria include the spread of pain to at least 4 or 5 regions, the presence of these symptoms for at least 3 months, WPI of more than 7 points, and SSS of more than 5 points (or the WPI 4-6 and SSS scores ≥9). In addition, the Fibromyalgia Impact Questionnaire (FIQ), Beck Anxiety Inventory (BAI), Jenkins Sleep Scale (JSS), Fatigue Severity Scale (FSS), and Visual Analogue Scale (VAS-pain) were used. The FIQ is a 10-item scale that assesses fibromyalgia's physical function and health status. Salaffi et al[18] revised a more reliable way of measuring disease severity based on FIQ scores (FIQ: 0-23 = remission, 24-40 = mild disease, 41-63 = moderate

disease, 64-82 = severe disease, and >83 = very severe disease) and the FS (FS: 0-5 = remission, 6-15 = mild disease, 16-20 = moderate disease, 21-25 = severe disease, and >25 = very severe disease). Sociodemographic characteristics, history of chronic illness, post-COVID-19 chronic body pain, sleep disturbance, morning stiffness, chronic headache, fatigue, paresthesia, swelling sensation, dysmenorrhea, irritable bowel syndrome, depression, restless legs syndrome, temporomandibular dysfunction, dry eyes and mouth, loss of balance, short-term memory loss, concentration disorder, Raynaud-like symptoms were questioned. In addition, complaints related to previous COVID-19 were questioned (such as fever, cough, shortness of breath, loss of sense of taste and smell, fatigue, myalgia, diarrhea, abdominal pain, flu-like conditions), and laboratory findings, radiological examination characteristics, hospitalization history, and drugs used during treatment were examined. Data collection in research was conducted prospectively, except for the data obtained from file scanning.

Exclusion criteria of the study included those with chronic inflammatory disease, autoimmune disease, endocrine disease, neurological disease, neuromuscular disease, severe psychiatric disease, malignancy disease, and heart or lung disease. Pregnant or breastfeeding women and those who have received antidepressant, analgesic, corticosteroid, or nonsteroidal anti-inflammatory drug therapy in the last 3 months were also excluded.

Statistical Analysis

Data analysis was made in the IBM Statistical Package for Social Sciences version 25.0 (IBM SPSS Corp.; Armonk, NY, USA) package program. Descriptive statistics are shown as mean ± standard deviation and median (min-max) for numerical variables and frequency and (%) for categorical variables. For numerical variables between groups, the significance of the difference in terms of means was evaluated with the Student's *t*-test, the difference in terms of median values was evaluated with the Mann–Whitney *U* test, and categorical variables were evaluated with the Pearson chi-square test. For $P < .05$, the results were considered statistically significant.

RESULTS

All of the patients in both groups included in the study were female. Both groups' demographic findings, such as age, weight, height, body mass index (BMI), marital status, and education, were similar (Table 1). The mean age was 43.56 ± 12.0 years in the PCFM group and 43.94 ± 14.3 years in the FM group. Body mass index was 25.9 ± 2.6 in the PCFM group and 25.6 ± 2.7 in the FM group. The mean time for patients with COVID-19 to apply to our outpatient clinic and to be diagnosed with FM was 8.65 ± 2.1 months. No patient with COVID-19 infection

Table 1. Comparison of post-COVID FMS and FMS patients

	Post-COVID FMS (n = 35)	FMS (n = 35)	*P*
Age (years)			
Mean ± SD	43.54 ± 12.0	43.94 ± 14.3	.900*
Median (min-max)	41(20-65)	46(20-65)	
Weight (kg)			
Mean ± SD	70.09 ± 7.6	70.09 ± 7.2	1.000*
Median (min–max)	72 (52-86)	68 (56-86)	
Height (cm)			
Mean ± SD	164.6 ± 5.8	165.6 ± 5.0	.420*
Median (min–max)	165 (150-175)	165 (156-174)	
BMI			
Mean ± SD	25.9 ± 2.6	25.6 ± 2.7	.636*
Median (min–max)	26.4 (20.8-30.4)	25.8 (20.1-32.9)	
Marital status			
Married	30 (85.7%)	29 (82.9%)	.743Φ
Single	5 (14.3%)	6 (17.1%)	
Education			
Primary school	20 (57.1%)	22 (62.9%)	.853Φ
High school	10 (28.6%)	8 (22.9%)	
University	5 (14.3%)	5 (14.3%)	
WPI			
Mean ± SD	13.0 ± 2.0	11.7 ± 2.1	.007Ψ
Median (min–max)	13 (9-16)	12.0 (9-16)	
SSS			
Mean ± SD	9.54 ± 0.66	9.31 ± 0.83	.201Ψ
Median (min–max)	10 (8-11)	9 (8-11)	
FS			
Mean ± SD	22.9 ± 3.2	20.9 ± 2.7	.008Ψ
Median (min–max)	22 (18-35)	21 (17-27)	
BAI			
Mean ± SD	39.8 ± 6.6	32.5 ± 6.5	**<.001**Ψ
Median (min–max)	42 (28-54)	34 (22-42)	
JSS			
Mean ± SD	15.0 ± 2.0	12.4 ± 2.4	**<.001**Ψ
Median (min–max)	15 (12-19)	13 (8-16)	
FIQ			
Mean ± SD	63.8 ± 8.9	58.4 ± 6.7	**.005***
Median (min–max)	65.4 (48.7-85.1)	58.6 (45.0-68.3)	
FSS			
Mean ± SD	5.7 ± 0.9	4.5 ± 0.9	**<.001***
Median (min–max)	5.7 (4.4-7.3)	4.6 (3-6.1)	
PVAS (cm)			
Mean ± SD	7.6 ± 0.9	4.5 ± 0.9	**<.001***
Median (min–max)	7.5 (6.2-9.4)	4.6 (3-6.1)	

*Student's *t* test; ΦPearson chi Square; ΨMann–Whitney *U* test.
It shows significant *P* values at the .05 level.
BAI, Beck Anxiety Inventory; BMI, body mass index; COVID-19, coronavirus disease 2019; FIQ, Fibromyalgia Impact Questionnaire; FS, Fibromyalgia Symptom Scale; FSS, Fatigue Severity Scale; JSS, Jenkins Sleep Evaluation Scale; PVAS, Pain Visual Analogue Scale; SD, Standard deviation; SSS, Symptom Severity Scale; WPI, Widespread Pain Index.

Table 2. Correlation of BMI, FIQ with BAI, JSS, FSS, VAS

	BAI (n = 70)		JSS (n = 70)		FSS (n = 70)		VAS (n = 70)	
	r	*P*	*r*	*P*	*r*	*P*	*r*	*P*
BMI	0.329	**.005**	0.357	**.002**	0.389	**.001**	0.192	.111
FIQ	0.380	**.001**	0.389	**.001**	0.355	**.003**	0.354	**.003**

Spearman's correlation test, Correlation is significant at the 0.05 level.
BAI, Beck Anxiety Inventory; BMI, body mass index; FIQ, Fibromyalgia Impact Questionnaire; FSS, Fatigue Severity Scale; JSS, Jenkins Sleep Evaluation Scale; VAS, Visual Analogue Scale.

had a history of hospitalization. They received temporary symptomatic treatment during the illness and remained in quarantine at home.

Widespread Pain Index and SSS, which are the conditions of the 2016 ACR fibromyalgia diagnostic criteria, met these conditions in both groups. Widespread Pain Index scores were higher in both PCFM and FM groups but were statistically significantly higher in the PCFM group than in the FM group ($P = .007$). Symptom Severity Scale was high in both groups, but there was no statistical difference between the 2 groups ($P = .201$). Therefore, the FS obtained by the sum of WPI and SSS was statistically significant in both groups ($P = .008$). Beck Anxiety Inventory, in which we evaluated anxiety in these groups, was statistically significantly higher in the PCFM group than in the FM group ($P < .001$). Evaluating the frequency of sleep problems in 4 items, JSS revealed that sleep disturbance in the PCFM group was statistically higher than in the FM group ($P < .001$). The FIQ score, which evaluates the situation for FM patients, ranges from 0 to 100. High scores indicate that the disease affects the person more. In our study, FIQ was statistically higher in the PCFM group than in the FM group ($P = .005$). Fatigue Severity Scale, which has proven validity and reliability, was used to evaluate the level of fatigue. A higher score in the FSS, which consists of a total of 9 questions and the score range is 9-63, indicates severe fatigue. The cut-off value for pathological fatigue was determined as 4 and above. In our study, FSS in the PCFM group shows that the fatigue severity in the PCFM group is statistically higher than the FM group ($P < .001$). In the VAS-pain scoring, which we aimed to measure the pain level, the pain level in the PCFM group was found to be statistically higher than the FM group ($P < .001$). In addition, as seen in Table 2, there was a small positive correlation between BMI and BAI, JSS, FSS, VAS. Furthermore, there was also a small positive correlation between FIQ and BAI, JSS, FSS, VAS. Similarly, there was also a small positive correlation between BMI and FIQ.

DISCUSSION

In this study, no difference was found between PCFM and FM patients in terms of meeting the fibromyalgia criteria. Widespread Pain Index, SSS, and FS scores were high and similar in both groups. However, the scores obtained from BAI, JSS, FIQ, FSS, and VAS-pain were higher and more significant in the PCFM group than in the FM group.

There has been an increasing number of studies reporting the link between post-COVID-19 symptoms and FM syndrome. Some studies have described elevated autoantibody titers, pain syndromes, and increased autonomic dysfunction in the sera of those recovering from novel coronavirus infection.[19] Bileviciute-Ljungar et al[20] reported that 40% of patients evaluated after COVID-19 met the 2016 ACR diagnostic criteria for FM.

Beck Anxiety Inventory, which we use to determine the severity of anxiety, can be divided into 3 anxiety levels as low, moderate, and severe.[21] In our study, the BAI score was higher in both PCFM and FM groups but significantly higher in the PCFM group than in the FM group. The pandemic has resulted in high anxiety levels in rheumatic diseases, including anxiety and depression. Consistent with our study, Yathish et al[22] reported in their study that COVID-19 negatively affects fibromyalgia patients and their anxiety levels are higher than before. Jenkins Sleep Scale was used to assess sleep disorders such as difficulty falling asleep and waking several times during the night, difficulty staying asleep, and waking up tired. In our study, severe sleep disturbance was observed in both PCFM and FM groups, and the score in the PCFM group was high. Cankurtaran et al[23] showed that fear and anxiety of COVID-19 negatively affect FM symptom severity, sleep quality, and anxiety levels in FM patients.

Salaffi et al[24] studied the impact of coronavirus infection on the condition of many FM patients and noted an increase in FM symptoms.[24] In addition to more pain, symptoms such as fatigue, sleep disturbances, and muscle stiffness were increased. They attributed this to the increased mental and physical stress after the COVID-19 infection and the adverse effects of viral neurotoxicity on autonomic function. During the pandemic, increased anxiety and decreased physical activity increased FIQ scores and aggravated the symptoms.[25]

Patients recuperating from COVID-19 are reported to have physical weariness, the intensity of which varies

according to prognosis. It has been reported that COVID-19 effectively increases patients' fatigue, decreases their vitality, and negatively affects their physical well-being.[26]

In their study, Aldhahi et al[27] found that among patients recovering from COVID-19, women had more perceived severe fatigue symptoms than men. In this study, we detected high FSS scores in both groups. However, scores in the PCFM group were higher than in the FM group.

A recent study found that musculoskeletal "nociceptive pain" was the most common post-COVID-19 pain type.[28] In addition, the combination of broad pain symptoms with a high central sensitivity score, referred to as "neoplastic pain," matches fibromyalgia symptoms. There is a correlation between neoplastic pain and exacerbated pain symptomatology and symptoms connected to the central nervous system. These symptoms include exhaustion, trouble sleeping, memory loss, and mood disorders. According to the most recent hypotheses, COVID-19 cytokine and interleukin-induced storms could be responsible for sensitizing pain pathways.[29] Ursini et al[30] conducted a web-based cross-sectional survey to investigate the prevalence and predictors of FM in patients recovering from COVID-19, as FM patients also have similar symptoms. They reported that 189 of 616 participants who had pain after COVID-19 infection, that is, 30%, met the diagnostic criteria of ACR FM.

Gavrilova et al[31] stated that COVID-19 infection as a stimulating factor might lead to immunological reactions against connective tissue proteins and the development of FS. They noted that patients with COVID-19 generally have less severe pain sensations than idiopathic fibromyalgia.[31] On the contrary, in this study, we found that PCFM patients had more severe pain than FM patients.

Factors such as increased sedentary life, immobilization, pain due to sarcopenia, decreased functional capacity, and fatigue has emerged during the pandemic. In this process, it is evident that exercise habits have changed, and the time allocated to many physical activities, especially outdoor activities, has decreased. Changes in exercise regimens and physical activity patterns are not the only things that might cause symptomatology; things like kinesiophobia can also do it.[32] The research reveals that multi-faceted rehabilitation regimens and aerobic exercise have beneficial impacts on post-COVID-19 symptoms such as tiredness, anxiety, reduced functional ability, and kinesiophobia.[33]

There are some limitations of this study. Among these limitations are the low number of patients, the risk of incomplete and erroneous patient reports in the questionnaires, the inability to examine symptoms with more detailed quantitative measurements, and data collection from only one region and one hospital.

In conclusion, this study revealed that fibromyalgia symptoms may develop after COVID-19 and that, unlike idiopathic fibromyalgia, anxiety, sleep disturbance, fatigue, and pain symptoms may be more severe. Thus, we showed that it could negatively affect general health status more than idiopathic FM. The significantly higher scores of all tests in PCFM patients suggest that global FM symptoms are more severe in PCFM patients. There is a need for multicenter, more comprehensive studies on FM patients after COVID-19.

Ethics Committee Approval: Ethics committee approval was obtained for this study with the decision of the Clinical Research Ethics Committee of Erzincan Binali Yıldırım University (Date: May 24, 2021, Decision No: E-21142744-804.99-79956).

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

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REFERENCES

1. Häuser W, Fitzcharles MA. Facts and myths pertaining to fibromyalgia. *Dial Clin Neurosci*. 2018;20(1):53-62. [CrossRef]

2. Arnold LM, Gebke KB, Choy EHS. Fibromyalgia: management strategies for primary care providers. *Int J Clin Pract*. 2016;70(2):99-112. [CrossRef]
3. Cheng JC, Anzolin A, Berry M, et al. Dynamic functional brain connectivity underlying temporal summation of pain in fibromyalgia. *Arthritis Rheumatol*. 2022;74(4):700-710. [CrossRef]
4. Vilarino GT, Andreato LV, de Souza LC, Branco JHL, Andrade A. Effects of resistance training on the mental health of patients with fibromyalgia: a systematic review. *Clin Rheumatol*. 2021;40(11):4417-4425. [CrossRef]
5. Rasa S, Nora-Krukle Z, Henning N, et al. Chronic viral infections in myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS). *J Transl Med*. 2018;16(1):268. [CrossRef]
6. Baio P, Brucato A, Buskila D, et al. Autoimmune diseases and infections: controversial issues. *Clin Exp Rheumatol*. 2008; 26(1):S74-S80.
7. Rivera J, Rodríguez T, Pallarés M, et al. Prevalence of post-COVID-19 in patients with fibromyalgia: a comparative study with other inflammatory and autoimmune rheumatic diseases. *BMC Musculoskelet Disord*. 2022;23(1):471. [CrossRef]
8. Moldofsky H, Patcai J. Chronic widespread musculoskeletal pain, fatigue, depression and disordered sleep in chronic post-SARS syndrome; a case-controlled study. *BMC Neurol*. 2011;11:37. [CrossRef]
9. Ablin JN, Shoenfeld Y, Buskila D. Fibromyalgia, infection and vaccination: two more parts in the etiological puzzle. *J Autoimmun*. 2006;27(3):145-152. [CrossRef]
10. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China. *JAMA*. 2020;323(11):1061-1069. [CrossRef]
11. Callard F, Perego E. How and why patients made Long Covid. *Soc Sci Med*. 2021;268:113426. [CrossRef]
12. Nalbandian A, Sehgal K, Gupta A, et al. Post-acute COVID-19 syndrome. *Nat Med*. 2021;27(4):601-615. [CrossRef]
13. Hickie I, Davenport T, Wakefield D, et al. Post-infective and chronic fatigue syndromes precipitated by viral and non-viral pathogens: prospective cohort study. *BMJ*. 2006; 333(7568):575. [CrossRef]
14. Whitaker M, Elliott J, Chadeau-Hyam M, et al. Persistent COVID-19 symptoms in a community study of 606,434 people in England. *Nat Commun*. 2022;13(1):1957. [CrossRef]
15. Clauw DJ, Arnold LM, McCarberg BH, FibroCollaborative. The science of fibromyalgia. *Mayo Clin Proc*. 2011;86(9): 907-911. [CrossRef]
16. Arnold LM, Bennett RM, Crofford LJ, et al. AAPT diagnostic criteria for fibromyalgia. *J Pain*. 2019;20(6):611-628. [CrossRef]
17. Wolfe F, Clauw DJ, Fitzcharles MA, et al. Fibromyalgia criteria and severity scales for clinical and epidemiological studies: a modification of the ACR preliminary diagnostic criteria for fibromyalgia. *J Rheumatol*. 2011;38(6):1113-1122. [CrossRef]
18. Salaffi F, Di Carlo M, Bazzichi L, et al. Definition of fibromyalgia severity: findings from a cross-sectional survey of 2339 Italian patients. *Rheumatol (Oxf Engl)*. 2021;60(2): 728-736. [CrossRef]
19. Dotan A, Shoenfeld Y. Post-COVID syndrome: the aftershock of SARS-CoV-2. *Int J Infect Dis*. 2022;114:233-235. [CrossRef]
20. Bileviciute-Ljungar I, Norrefalk JR, Borg K. Pain burden in post-COVID-19 syndrome following mild COVID-19 infection. *J Clin Med*. 2022;11(3):771. [CrossRef]
21. Oh H, Park K, Yoon S, et al. Clinical utility of Beck Anxiety Inventory in clinical and nonclinical Korean samples. *Front Psychiatry*. 2018;9:666. [CrossRef]
22. Yathish GC, Singh YP, Prasad S, et al. Psychological impact of coronavirus disease 2019 pandemic on patients with rheumatological disorders: a web-based cross-sectional multicentric survey. *Indian J Rheumatol*. 2021;16(2):200. [CrossRef]
23. Cankurtaran D, Tezel N, Ercan B, Yildiz SY, Akyuz EU. The effects of COVID-19 fear and anxiety on symptom severity, sleep quality, and mood in patients with fibromyalgia: a pilot study. *Adv Rheumatol*. 2021;61(1):41. [CrossRef]
24. Salaffi F, Giorgi V, Sirotti S, et al. The effect of novel coronavirus disease-2019 (COVID-19) on fibromyalgia syndrome. *Clin Exp Rheumatol*. 2021;39(3)(suppl 130):72-77. [CrossRef]
25. Cavalli G, Cariddi A, Ferrari J, et al. Living with fibromyalgia during the COVID-19 pandemic: mixed effects of prolonged lockdown on the well-being of patients. *Rheumatol (Oxf Engl)*. 2021;60(1):465-467. [CrossRef]
26. Gaber T. Assessment and management of post-COVID fatigue. *Prog Neurol Psychiatry*. 2021;25(1):36-39. [CrossRef]
27. Aldhahi MI, Alshehri MM, Alqahtani F, Alqahtani AS. A pilot study of the moderating effect of gender on the physical activity and fatigue severity among recovered COVID-19 patients. *PLOS ONE*. 2022;17(7):e0269954. [CrossRef]
28. D'Souza RS, Kilgore AE, D'Souza S. Manifestations of pain during the COVID-19 pandemic portrayed on social media: a cross-sectional study. *Pain Med*. 2022; 23(2): 229 -233. [CrossRef]
29. Fernández-de-Las-Peñas C, Parás-Bravo P, Ferrer-Pargada D, et al. Sensitization symptoms are associated with psychological and cognitive variables in COVID-19 survivors exhibiting post-COVID pain. *Pain Pract*. 2022; [CrossRef]
30. Ursini F, Ciaffi J, Mancarella L, et al. Fibromyalgia: a new facet of the post-COVID-19 syndrome spectrum? Results from a web-based survey. *RMD Open*. 2021;7(3):e001735. [CrossRef]
31. Gavrilova N, Soprun L, Lukashenko M, et al. New clinical phenotype of the post-covid syndrome: fibromyalgia and joint hypermobility condition. *Pathophysiology*. 2022;29(1): 24-29. [CrossRef]
32. Kocyigit BF, Akyol A. The relationship between COVID-19 and fibromyalgia syndrome: prevalence, pandemic effects, symptom mechanisms, and COVID-19 vaccines. *Clin Rheumatol*. 2022;41(10):3245-3252. [CrossRef]
33. Fugazzaro S, Contri A, Esseroukh O, et al. Rehabilitation interventions for post-acute COVID-19 syndrome: a systematic review. *Int J Environ Res Public Health*. 2022;19(9): 5185. [CrossRef]