Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Original Article

Pain, Anxiety, and Quality of Life of COVID-19 Survivors with Myofascial Pain Syndrome: A cross sectional study

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ABSTRACT

Background: People who have survived COVID-19 may develop chronic pain.
Aims: To investigate the difference in pain level, anxiety, functional status, and quality of life in COVID-19 survivors with myofascial pain syndrome (MPS) in the trapezius muscle compared with MPS patients without COVID-19.
Design: Cross-sectional observational study.
Settings: Physical medicine and rehabilitation outpatient clinics of a single tertiary-care hospital.
Participants/Subjects: Eighty patients (40 patients with MPS and 40 patients with MPS + COVID) who were diagnosed with chronic MPS in the trapezius muscle were evaluated.
Methods: Pain level of the patients was evaluated using the visual analogue scale (VAS), the functional status with the Neck Pain and Disability scale, the psychosocial effects of the pain with the Beck Anxiety Inventory, and the quality of life with the Nottingham Health Profile tests, and the two groups (MPS and MPS + COVID) were compared.
Results: A significant difference was observed between the groups in terms of pain, anxiety, and disability ($p < .001$). MPS + COVID group showed significantly greater pain intensity on VAS and higher mean total scores on Nottingham Health Profile, Beck Anxiety Inventory, all Nottingham Health Profile subdomains (pain, emotional reactions, sleep, social isolation, physical mobility, energy) compared with the MPS group ($p < .001$).
Conclusions: After recovering from COVID-19, patients with MPS showed increased pain, anxiety, disability, and decreased quality of life.

Myofascial pain syndrome (MPS) is a disorder characterized with myofascial trigger points and taut bands in the muscles and/or fasciae that are sensitive to palpation, which may lead to limitation of mobility (Borg-Stein & Simons, 2002). The exact prevalence of MPS in the general population has not been reported in the literature. However, 30% to 85% of patients with musculoskeletal pain suffer from this condition (Skootsky et al., 1989). MPS in the trapezius muscle is one of the leading causes of neck pain (Zakharova-Luneva et al., 2012). MPS can be caused directly by traumatic events such as repetitive muscle strain and microtraumas, as well as by indirect factors that cause muscle weakness, including immobilization, sleep disturbance, and emotional stress. Chronic MPS is pain lasting more than 3 months (Nicholas et al., 2019).

The novel coronavirus (SARS-CoV-2) that causes coronavirus disease 2019 (COVID-19) first emerged in Wuhan, China, in December 2019 and rapidly spread all over the world. The reported symptoms of the disease include fever, cough, loss of taste and smell, nausea, vomiting, diarrhea, myalgia, fatigue, arthralgia, headache, and rarely arthritis (Park et al., 2020). Myalgia is the most common musculoskeletal symptom (Huang et al., 2020). As COVID-19 may present with pain symptoms, there are studies in the literature reporting de novo pain in COVID-19 survivors (Soares et al., 2021; Şahin et al., 2021). Chronic pain can also be seen in those who have recovered from the disease. Karaarslan et al. (2022) reported that in 3 of 5 people who survived the disease, at least 1 musculoskeletal symptom still persisted at six months. Anxiety, emotional stress, and sleep disorders have been observed in patients with COVID-19 due to social isolation (Terán-Pérez et al., 2021).

Abbreviations: MPS, myofascial pain syndrome; VAS, visual analogue scale; NPAD, Neck Pain and Disability; BAI, Beck Anxiety Inventory; NHP, Nottingham Health Profile; BMI, body mass index; PASC, post-acute sequelae of COVID.

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To the best of our knowledge, there is no study in the literature except the case series of Patel & Javed (2022) investigating the after-effects of COVID-19 in individuals with myofascial pain syndrome, and whether COVID-19 is associated with any changes in pain, anxiety, functional status, and quality of life after recovery.

The hypothesis of the current study was that there is change in the symptom burden and functional level following SARS-CoV-2 infection in patients with MPS. Thus, in this study, the pain levels, anxiety, functional status, and quality of life were compared in patients with MPS + diagnosis of post-SARS-CoV-2 with those patients with MPS and without history COVID symptoms.

Methods

Study Design

This was a cross-sectional, observational clinical study. The medical ethics committee of the university hospital approved the study in accordance with the Declaration of Helsinki, and written informed consent was obtained from all patients (Approval number 2021/0149).

Participants

Eighty patients (40 patients with MPS and 40 patients with MPS + COVID-19) who were diagnosed with chronic MPS in the trapezius muscle were consecutively recruited from the physical medicine and rehabilitation outpatient clinics of the university hospital. The diagnosis of MPS was made according to the Travell and Simons criteria. Travell and Simons defined the myofascial trigger point as "a hyperirritable spot, usually within a taut band of skeletal muscle or in the muscle fascia which is painful on compression and can give rise to characteristic referred pain, motor dysfunction, and autonomic phenomena." They defined specific criteria for trigger points as: the palpable hard area of the muscle known as the taut band, the trigger point showing localized tenderness in the taut band, the characteristic pain, numbness, tingling pattern when continuous pressure is applied to the trigger point in the taut band, and local twitch response when the taut band bent transversely (Travell & Simons, 1983).

The participants applied to the clinic for MPS symptom managements, and all patients who verbally stated that they had a diagnosis of MPS for a minimum of 6 months were included in the study. Participants were examined by 2 experienced physical medicine and rehabilitation specialists, and the diagnosis of MPS was confirmed.

Among 80 patients aged 18 to 65 years who presented to the outpatient clinic from March to November 2021, 40 patients were diagnosed with COVID-19 less than 3 months before entry into study, and 40 never developed COVID-19 symptoms. The MPS + COVID group were symptomatic, polymerase chain reaction (PCR)-positive patients, who showed the duration of illness ranged from 5 days to 20 days, and recovered from COVID symptoms and also demonstrated PCR negativity. Whereas the MPS without COVID group was the patients whose negativity was demonstrated by PCR. Participants were selected primarily from MPS patients with trigger points in the trapezius muscle. Patients with trigger points in other muscle groups were not included in the study. Exclusion criteria were having cervical radiculopathy or myelopathy, polyneuropathy, diagnosis of fibromyalgia, malignancy, pregnant women, cognitive dysfunction, and having survived COVID-19 more than 3 months ago.

Assuming a pooled standard deviation of 15 units, the study would require a sample size of 36 subjects for each group (a total sample size of 72 subjects, assuming equal group sizes), to achieve a power of 80% (1-β) and a at 95% confidence level (1-a), for detecting a true difference in means between the test and the reference group of 10 (Apaydın, 2017).

Data Collection

Age, sex, body mass, stature and employment status of each patient were recorded during outpatient visits. Patients' pain intensity was evaluated by using the visual analogue scale (VAS) (Boonstra et al., 2008) and functional status with the Neck Pain and Disability (NPAD) scale. Anxiety was measured with the Beck Anxiety Inventory (BAI), and quality of life with the Nottingham Health Profile (NHP) test. Measurements from the two groups (MPS and MPS + COVID) were compared.

The Neck Pain and Disability scale is a 20-item questionnaire, which was designed using the Million Visual Analogue Scale as a template. The items explore pain intensity, its interference with vocational, recreational, social, and functional aspects of living, as well as the presence and extent of associated emotional factors. The validity and reliability of the test were established by Goolkasian et al. (2002), its validity in chronic, non-traumatic neck pain were established by En et al. (2009), and its cross-cultural adaptation was established by Bicer et al. (2004) (Bicer et al., 2004; En et al., 2009; Goolkasian et al., 2002).

The Beck Anxiety Inventory is a rating scale created by Aaron T. Beck, MD, and is used for screening purposes. The inventory consists of a total of 21 questions that address anxiety symptoms including numbness or tingling in any part of the body, sweating, tremor, fear of losing control, being terrified, fear of dying, nervousness, indigestion/discomfort in the stomach or feeling like choking. A total score of 0 to 7 points indicates minimal anxiety, 8 to 15 points mild, 16 to 25 points moderate, and 26 to 63 points severe anxiety symptoms. The validity and reliability of the test were established by Fydrich et al. (1992), and its cross-cultural adaptation was established by Ulusoy et al. (1998) (Fydrich et al., 1992; Ulusoy et al., 1998).

The Nottingham Health Profile is a generic quality-of-life questionnaire that measures health problems perceived by the individual and the extent to which these problems affect routine daily activities. The NHP consists of two parts. Part I comprises 38 items that evaluate six dimensions related to health status: Energy (3 items); pain (8 items); emotional reactions (9 items); sleep (5 items); social isolation (5 items); and physical activity (8 items). Part 2 asks the individuals to indicate whether or not their health status affects activity in 7 areas of daily life: work; looking after the home; home life; sex life; interests and hobbies; and holidays. Scores for each section range between 0 (worst health) and 100 (best health). The validity and reliability of the test were established by Hunt et al. (1985), and its cross-cultural adaptation was established by Kücükdeveci et al. (2000) (Hunt et al., 1985; Kücükdeveci et al., 2000).

Statistical Analysis

For descriptive statistics, numbers and percentages were reported for categorical variables, and mean, standard deviation (SD), median, and minimum and maximum for numerical variables. Whether the numerical variables followed a normal distribution was checked using the Shapiro-Wilk test. The Mann-Whitney *U* test was used for comparisons between groups in terms of scale scores and VAS averages since the sample does not follow a normal distribution. Differences between the groups in terms of the distribution of categorical variables were investigated using the Pearson's χ^2 test. The SPSS, version 25.0 software package (IBM Corp.,

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Table 1
Descriptive Statistics of the Participants (n = 80)

	Mean	Median	SD	Min-Max
Age (y)	42.57	43.00	11.71	20-62
Body mass (kg)	70.75	70.00	13.69	44-110
Stature (m)	1.62	1.61	.06	1.43-1.80
BMI (kg/m^2)	26.81	26.80	4.66	17.85-39.26
Pain duration (months)	29.31	24.00	15.72	5-60
VAS score	6.30	6.00	1.23	4-8
Beck Anxiety Inventory score	16.10	15.50	10.12	2-39
Neck Pain and Disability score	51.43	54.50	16.53	16-77
Nottingham Health Profile score				
Pain	47.79	44.81	31.99	0-100
Emotional reactions	34.21	26.06	27.77	0-92.78
Sleep	31.96	21.68	32.08	0-100
Social isolation	26.82	.00	33.04	0-100
Physical mobility	35.40	32.56	21.41	0-88.46
Energy	49.69	38.00	40.33	0-100
NHP part 1 total score	225.25	181.07	160.27	18.26-571.93
NHP part 2 total score	2.82	2.00	1.79	0-6
	n	%		
Group	MPS	40	50.0	
	MPS + COVID	40	50.0	
Sex	Female	67	83.8	
	Male	13	16.3	
Employment status	Unemployed	33	41.3	
	Employed	47	58.8	
Anxiety level	None	24	30.0	
	Mild	16	20.0	
	Moderate	22	27.5	
	Severe	18	22.5	

SD = standard deviation; BMI = body mass index; VAS = visual analogue scale; NHP = Nottingham Health Profile; MPS = myofascial pain syndrome.

Table 2
Comparison Between the Groups in Terms of Sex and Employment Status (n = 80)

			Group		
			MPS (n = 40)	MPS + COVID (n = 40)	*p*
Sex	Female	Count	36	31	.13
		% within group	90.0	77.5	
	Male	Count	4	9	
		% within group	10.0	22.5	
Employment	Employed	Count	18	15	.49
		% within group	45.0	37.5	
	Unemployed	Count	22	25	
		% within group	55.0	62.5	

MPS = myofascial pain syndrome.

Armonk, NY) was used for statistical analyses, and statistical significance level was set at 0.05.

Results

Eighty patients with MPS were included in the study. Mean age of the participants were 42.57 years (SD, 11.71; range, 20-62). Table 1 shows the distributions of categorical variables and descriptive statistics of numerical variables.

In Table 2, the descriptive statistics and *p* values for the differences between the groups in sex and employment status are presented. No statistically significant difference was detected between the groups in terms of sex and employment status ($p = .13$; $p = .49$, respectively).

In Table 3, the descriptive statistics and *p* values for the differences between the groups in terms of age, body mass, stature, body mass index (BMI), and pain duration are shown. No significant difference was observed between the MPS group and MPS + COVID group with respect to age, body mass, stature, BMI, and duration of pain ($p = .14$; $p = .32$; $p = .26$; $p = .49$; $p = .15$, respectively).

As shown in Table 4, a significant difference was observed between the groups with regard to BAI scores ($p < .001$). Compared with MPS patients, patients with MPS + COVID showed higher BAI scores, indicating more severe anxiety in those patients .

Table 5 presents descriptive statistics and *p* values for the difference between groups in terms of VAS, NPAD, BAI, NHP subdomain scores and NHP part 1 and part 2 total scores. MPS + COVID group showed significantly greater pain intensity on VAS and higher mean total scores on NPAD, BAI, all NHP subdomains (pain, emotional reactions, sleep, social isolation, physical mobility, energy), and NHP part 1 and part 2 compared with the MPS group (all $p < .001$).

Discussion

MPS is a non-inflammatory, painful musculoskeletal disease that affects muscles and connective tissue, accompanied by hypersensitive foci known as trigger points (Travell & Simons, 1983).

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Table 3
Descriptive Statistics and Differences Between the Groups in Age, Body Weight, Height, BMI and Pain Duration (n = 80)

	Group	Mean	Median	SD	Min	Max	*p*
Age (y)	MPS (n = 40)	40.72	39.50	12.41	21.00	62.00	.14
	MPS + COVID (n = 40)	44.42	44.50	10.80	20.00	62.00	
Body mass (kg)	MPS (n = 40)	69.82	67.00	15.51	50.00	110.00	.32
	MPS + COVID (n = 40)	71.67	72.00	11.70	44.00	100.00	
Stature (m)	MPS (n = 40)	1.61	1.60	.07	1.43	1.80	.26
	MPS + COVID (n = 40)	1.63	1.62	.06	1.53	1.78	
BMI (kg/m^2)	MPS (n = 40)	26.73	26.29	5.26	19.78	39.13	.49
	MPS + COVID (n = 40)	26.88	27.49	4.05	17.85	39.26	
Pain duration (months)	MPS (n = 40)	26.65	24.00	15.35	5.00	48.00	.15
	MPS + COVID (n = 40)	31.97	33.00	15.82	6.00	60.00	

MPS = myofascial pain syndrome; SD = standard deviation; BMI = body mass index.

Table 4
Comparison of Anxiety Levels Between the Groups (n = 80)

			Group		
			MPS	MPS + COVID	*p*
Anxiety level	None	Count	22	2	<.001*
		% within group	55.0	5.0	
	Mild	Count	14	2	
		% within group	35.0	5.0	
	Moderate	Count	3	19	
		% within group	7.5	47.5	
	Severe	Count	1	17	
		% within group	2.5	42.5	

MPS = myofascial ***pain syndrome***.

Table 5
Descriptive Statistics and Differences Between the Groups in VAS, NPAD, BAI, and NHP Scores (n = 80)

	Group	Mean	Median	SD	Min	Max	*p*
VAS score	MPS (n = 40)	5.35	5.00	0.80	4.00	8.00	<.001*
	MPS + COVID (n = 40)	7.25	7.00	0.77	5.00	8.00	
Neck Pain and Disability score[a]	MPS (n = 40)	38.07	37.00	12.00	16.00	61.00	<.001*
	MPS + COVID (n = 40)	64.80	64.00	6.60	47.00	77.00	
Beck Anxiety Inventory score	MPS (n = 40)	8.32	7.00	4.82	2.00	21.00	<.001*
	MPS + COVID (n = 40)	23.87	24.00	7.77	5.00	39.00	
Nottingham Health Profile score							
Pain							
	MPS (n = 40)	26.13	20.67	21.12	0.00	100.00	<.001*
	MPS + COVID (n = 40)	69.45	67.63	25.77	22.90	100.00	
Emotional reactions	MPS (n = 40)	14.73	10.47	14.33	0.00	59.70	<.001*
	MPS + COVID (n = 40)	53.70	57.83	24.06	10.47	92.78	
Sleep							
	MPS (n = 40)	12.11	0.00	20.76	0.00	100.00	<.001*
	MPS + COVID (n = 40)	51.81	56.53	29.09	0.00	100.00	
Social isolation	MPS (n = 40)	5.42	0.00	12.91	0.00	51.37	<.001*
	MPS + COVID (n = 40)	48.23	57.31	33.24	0.00	100.00	
Physical mobility	MPS (n = 40)	20.83	19.87	14.55	0.00	54.47	<.001*
	MPS + COVID (n = 40)	49.96	49.86	16.79	19.87	88.46	
Energy	MPS (n = 40)	20.92	24.00	25.72	0.00	100.00	<.001*
	MPS + COVID (n = 40)	78.46	100.00	30.58	0.00	100.00	
NHP part 1 total score	MPS (n = 40)	98.96	83.73	75.84	18.26	354.00	<.001*
	MPS + COVID (n = 40)	351.55	361.62	116.46	102.21	571.93	
NHP part 2 total score	MPS (n = 40)	1.40	1.00	0.87	0.00	3.00	<.001*
	MPS + COVID (n = 40)	4.25	4.50	1.27	2.00	6.00	

VAS = visual analogue scale; NPAD = Neck Pain and Disability; BAI = Beck Anxiety Inventory; NHP = Nottingham Health Profile; SD = standard deviation; MPS = myofascial pain syndrome.
[a] Shows normal distribution.

The precise pathophysiological mechanism of MPS is still not fully understood, but evidence is increasingly strengthening the role of central sensitization in the pathophysiology of MPS (Shakouri et al., 2020). Many etiologic factors have been identified including chronic injury caused by repetitive microtraumas, and acute injury caused by sudden muscle loading, genetic factors, fatigue, and stress (Borg-Stein & Simons, 2002). Common risk factors include traumatic events, ergonomic factors (e.g., abnormal posture), structural factors (e.g., spondylosis, scoliosis), and systemic factors (e.g., vitamin D deficiency) (Saxena et al., 2015).

In MPS, pain is usually associated with psychological symptoms, including most commonly depression and anxiety (Im & Han, 2013). In addition to increased depression and anxiety in chronic MPS patients, ongoing COVID-19 pandemic and associated social isolation measures are also a source of anxiety and depression (Deng et al., 2021).

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Decreased health-related quality of life in patients with MPS has been reported in the literature (Celiker et al., 2010). During the COVID-19 pandemic, long periods of inactivity as a result of lockdowns or prolonged hospitalization in some cases also resulted in an increase in musculoskeletal symptoms and reduced quality of life (Ferreira et al., 2021).

In chronic pain syndromes, reports of poor health status due to anxiety, depression, and immobilization caused by the COVID-19 pandemic are available in the literature (Batres-Marroquín et al., 2022; Hruschak et al., 2021). However, to the best of our knowledge, there is no study investigating the aggravating effect of COVID-19 on the aforementioned adverse outcomes in individuals with chronic pain syndrome such as chronic MPS. Therefore, in this study, differences in health outcomes in chronic MPS patients who survived COVID-19 were discussed.

Pain severity was found to be significantly greater in the MPS + COVID group. Hruschak et al. (2021) investigated the changes in pain intensity caused by social distancing during the COVID-19 lockdown, and reported that female sex, non-white race, lower education level, disability, fibromyalgia, and greater pain catastrophizing were independently associated with worse pain. Thus, the presence of fibromyalgia independently increases the severity of pain as a result of social isolation during COVID-19 pandemic. Soares et al. (2021) reported that COVID-19 was associated with a significantly higher prevalence of de novo chronic pain, especially in the head and neck. Additionally, in a case series, worsening exacerbations of pain, more specifically trigger points were reported in patients with MPS after being diagnosed with COVID-19. It can be argued that COVID-19 and MPS may be linked, suggesting that COVID-19 may intensify pain in MPS. Potential pathologic mechanisms include coronavirus-induced hypoxic muscle dysfunction or psychological stress triggering pain receptors, leading to MPS (Patel & Javed, 2022).

Aggravated pain observed in these patients can also be attributed to post-acute sequelae of COVID (PASC). It has been reported that 10% to 20% of patients diagnosed with COVID-19 have symptoms that persist for more than one month, and this is called post-acute sequelae of COVID (PASC) (Nalbandian et al., 2021). Patients who have survived COVID-19 but continue to suffer from permanent sequelae of the infection or whose complaints last much longer than expected are included in this group. Although the reason for the prolongation of the symptoms in these patients is not yet known, persistent stimulation of the immune system has been implicated. The most commonly reported symptoms of PASC are fatigue, shortness of breath, cough, joint pain, chest pain, depression, muscle pain, gastrointestinal problems, headache, and confusion (Garrigues et al., 2020). However, since the time since infection of all patients in the COVID + MPS group was not recorded and there was no group that had COVID without MPS, there is not enough information to reach this conclusion.

In a systematic review, Lee et al. (2015) examined the mechanisms underlying the pain and disability relationship in people with low back and neck pain, and reported that pain intensity is associated with disability. However, pain is a complex problem which is influenced by psychological, physical, and social factors. As a result of their review, the authors stated that the most important factors involved in the pain–disability relationship are self-efficacy, psychological distress, and fear. Consistently, in the current study, disability due to neck pain was significantly greater in the MPS + COVID group. Considering increased psychological distress and fear in COVID-19 survivors, an increase in disability can also be expected.

In a study by Ferreira et al. (2021), individuals quarantined at home reported higher anxiety and lower quality of life levels, and people with greater anxiety tended to have a lower quality of life. A study investigating the effect of social isolation on musculoskeletal problems reported significantly higher anxiety and neck disability scores in the group with high social distance (Kim et al., 2021).

Quality of life was evaluated using six subdomains and two total scores of NHP in our study. The MPS + COVID group had worse quality of life in all subdomains (energy, pain, emotional reactions, sleep, social isolation, physical activity). Significant symptom burden, including anxiety, sleep disturbances, fatigue, limited exercise tolerance, and memory and executive dysfunction, has been demonstrated in COVID-19 survivors (Li, 2020). Thus, it is an expected finding that all these problems lead to reduced quality of life as reported in our study. COVID-19 caused deterioration of functional status and decrease in energy through inflammatory processes, increased pain through immobilization, and subsequently affected all subdomains of quality of life. This decrease in quality of life is greater in individuals with chronic pain, such as MPS, as shown in the present study.

It is important that health care providers following MPS patients in clinical practice are aware of the adverse effects of COVID-19 on their pain, disability, and quality of life. If these patients have had COVID-19, increasing the dose in patients receiving medical treatment, shortening the interval in patients receiving dry needling/ trigger point injection, or adding physical therapy agents to the treatment may be considered in the management of pain.

Limitations

The major limitation of the study is the relatively small sample size. In addition, a limited number of studies have investigated the long-term effects of COVID-19 in people with chronic pain which mostly focused on the effects of the social isolation imposed by the COVID-19 pandemic. Therefore, the comparison of this study with the literature has been limited. In future studies, the pathophysiologic mechanisms underlying the relationship between chronic pain and COVID-19 should be investigated, along with an assessment as to whether there is a difference in the effectiveness of pain management.

Conclusion

In a convenience sample of people with MPS attending an outpatient clinic for pain management, people with MPS who identified that they had symptoms consistent with COVID-19, when compared to those who did not have COVID symptoms, had significantly more pain, anxiety and depression.

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