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## ESTIMATES OF CAUSES AND ATTITUDES OF PATIENTS WITH POST-COVID-19 SYNDROME AND MUSCULOSKELETAL SYMPTOMS REFERRED FOR OUTPATIENT REHABILITATION

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**Abstract:** The purpose of the study is to assess the causes and attitudes of patients with post-COVID-19 syndrome (PCS) and musculoskeletal symptoms referred to outpatient rehabilitation. **Materials and methods:** The study includes 138 recovery phase patients, after COVID-19 with persistent musculoskeletal symptoms, referred to outpatient rehabilitation. Data were collected regarding demographic characteristics of the patients, educational status, occupation, practice of sports, period since COVID-19, treatment (inpatient or home-outpatient), symptoms and period during which the musculoskeletal symptoms persisted, comorbidities, reasons for visiting a physical medicine specialist, active approach towards rehabilitation. **Results:** The average duration of musculoskeletal symptoms Me(Range) in patients referred for rehabilitation was 13 (7-20) weeks, respectively for women it was 13 (7-20) weeks, for men - 12 (7-19) weeks. 35.5% (49) of the patients were hospitalized due to acute COVID-19 illness, respectively 30.8% (28) of all women and 44.7% (21) of all men. No relationship was found between gender and the severity of the disease, hospital versus home treatment, as well as between patients' BMI and hospitalization. 76.1% (105) of the patients were in active working age, 33.3% (46) of all were workers, 42.8% (59) – office employees, 14.5% (20) – retired workers and 9.4% (13) – retired employees. 4.3% (6) of all patients were actively involved in sports, 28.3% (39) were amateur sportsmen, and 67.4% (93) did not practice any sport activities. On the occasion of persistent post-COVID-19 rheumatic and musculoskeletal complaints, 40.6% (56) of the patients were referred for rehabilitation after examination by a family physician and at his/her discretion. Those actively seeking rehabilitation and referred by a GP for outpatient rehabilitation were 24.6% (34), including 33.0% (30) of all women and 8.5% (4) of all men. 28.3% (39) were referred for rehabilitation by a specialist physician. At the specialist's discretion, 28.6% (26) of women and 27.7% (13) of men were referred for treatment with physical modalities, of whom only 6.5% (9) of women actively sought rehabilitation. 31% (43) of all referred patients, actively sought rehabilitation with physical modalities. 46.4% (64) of all patients had no prior physiotherapy treatment, of whom 34.1% (31) were women and 70.2% (33) were men. Treatment with physical modalities on other occasion was performed by 53.6% (74), respectively 65.9% (60) women and 29.8% (14) men. The leading causes for visiting Physical and Rehabilitation Medicine (PRM) specialist by 68.8% (95) of the patients was back pain, followed by fatigue 46.4% (64), myalgia - 38.4% (53), limited ability to work - 29.7% (41), arthralgia - 23.9% (33), physical activity difficulties - 20.3% (28). Other causes were mentioned by 10.1% (14) of the patients and shortness of breath was experienced by 6.5% (9) of all patients referred for rehabilitation. Fatigue was more pronounced as a symptom by female patients. Myalgia was prevalent, as a symptom in both genders, no difference was found between genders in arthralgia. 15% (21) of patients during their first visit to a PRM physician pointed out one reason, 39% (54) - two reasons, and 45% (63) of all patients referred for rehabilitation indicated three or more reasons. More than 80% of the patients had a comorbidity: 50% (69) had one comorbidity, 18% (25) had two comorbidities, and 16.3% (23) had three or more comorbidities. 5.8% (8) had concomitant cardiovascular disease, 30.4% (42) had hypertensive disease, 16.7% (23) had neurological disease, 9.4% (13) had diabetes mellitus, 59.4% (82) reported pre-existing spondylosis and 19.6% (27) had other diseases. **Conclusion:** Time-persistent musculoskeletal symptoms (fatigue, myalgia, arthralgia, back pain) are a common reason for rehabilitation in patients with Post-COVID-19 (PCS) syndrome. The results of the study showed that more than two-thirds of patients reported more than one reason for seeing PRM specialist, with comorbidities seen in three-quarters of patients. One-third of the patients actively wanted to be referred for rehabilitation. Patient education and the formation of active behaviors in the recovery phase after COVID-19 could reduce the negative health consequences in patients with musculoskeletal symptoms of post-COVID-19 syndrome.

**Keywords:** Rehabilitation, Post- COVID-19, Musculoskeletal symptoms, Functional activity

### 1. INTRODUCTION

The emergence of SARS-CoV-2 (severe acute respiratory syndrome-coronavirus-2) in 2019 (Hafeez A. et al. (2019)) sparked the subsequent pandemic of COVID-19. The most vulnerable populations appeared to be the elderly and patients with chronic diseases (Niknam, Z. et al. (2022)). According to the Unified Information Portal for

COVID-19, there have been 1 294 848 cases registered in Bulgaria so far (22 January 2023) and 38 160 deaths after confirmed infection with the virus (Bulgarian Unified Information Portal - COVID-19).

The pandemic spread of coronavirus infection (Dong et al. (2020)) has resulted in the infection of large number of people who, after overcoming the acute phase of the disease, have required prolonged care and rehabilitation due to the persistence of a series of clinical complaints after the acute infection. There is now a considerable accumulation of evidence that COVID-19 is a multisystem disease that is severe and can be fatal. In addition to pulmonary, cardiovascular, neurological, musculoskeletal, hepatic, kidney, dermatological, psychosocial, and cognitive impairments are observed (Vladimirova- Kitova L. (2021); Kostov K. (2021) Barker-Davies et al. (2020); Shi et al. (2020); Herman et al. (2020); Zhang, C., Shi, L., & Wang, F. S. (2020). Wang al. (2020))

It is estimated that between 10% and 20% of patients who have experienced acute symptomatic COVID-19 will develop a clinical picture with persistent manifestations lasting more than a month (Greenhalgh et al. (2020)) even more than a year Castro JP et al. (2022))

The UK National Health Service (NHS) defines PCS as unexplained, persistent signs or symptoms over 12 weeks occurring during or after COVID-19 infection. (National Institute for Health and Care Excellence (2020)) The term "persistent COVID-19" is commonly used to describe signs and symptoms that persist or develop after acute COVID-19. It includes continuous symptomatic COVID-19, called ongoing symptomatic COVID-19 (4 to 12 weeks), and post-COVID-19 syndrome ( $\geq 12$  weeks). (Jimeno-Almazán A. et al. (2021)) The most common manifestations are: fatigue, postexertional malaise, dyspnoea, headache, including neurocognitive complaints such as brain fog, difficulties in performing activities of daily living (Baig (2020); Kostov K (2021)). Patients often complain of psychoemotional difficulties: high levels of stress, increased irritability, depression, sleep disturbances, disorientation, etc. (Pfefferbaum & North (2020); Fujita et al. (2021); Hou et al. (2020))

Problems of a long-term nature, related to functional recovery and reaching pre-morbid physical activity have begun to come to the fore (Lauwers M. et al. (2022)). Physical and rehabilitation medicine has an important role in the recovery period in patients after COVID-19, in order to maintain the functional state of the body and limit the pathological consequences. Raikov G. (2021) Conducting rehabilitation after COVID-19 disease is a very important part of the recovery process. It should be tailored according to the degree of damage and severity of coronavirus infection-induced dysfunctions. Rehabilitation is aimed at overcoming symptoms and improving functional capacity, respiratory function, and relieving dyspnoea (Mollova K. et al. (2022)) and to increase quality of life (Petrova M. et al. (2023))

Depending on the clinic, comorbidities, and functional status of patients with post-COVID-19s, rehabilitation should be conducted in inpatient or outpatient settings. (Kostov K. (2021)) This assessment should be performed by a multidisciplinary team of specialists, (Takeva I. et al. (2021)) including a medical specialist in Physical and Rehabilitation Medicine, specialists from different medical specialties (pulmonologists, cardiologists, neurologists, rheumatologists, etc.), and the GP of the patient experiencing the acute phase of COVID-19.

The goal of outpatient rehabilitation of patients with consequences after the acute phase of COVID-19 is to improve the quality of life of patients with post-COVID symptoms by minimizing the adverse economic consequences, providing highly skilled medical care in outpatient settings as an alternative to costly inpatient treatment of these patients. (Kashilska Y. & Petkov A. (2021))

**The purpose** of the study is to assess the causes and attitudes of patients with post-COVID-19 syndrome (PCS) and musculoskeletal symptoms referred to outpatient rehabilitation.

## 2. MATERIALS AND METHODS

The study includes 138 recovery phase patients 55.7(13.0)(21-80) age(Mean(SD)(Range)), after COVID-19 with persistent musculoskeletal symptoms, referred to outpatient rehabilitation. Data were collected regarding demographic characteristics of the patients, educational status, occupation, practice of sports, period since COVID-19, treatment (inpatient or home-outpatient), symptoms and period during which the musculoskeletal symptoms persisted, comorbidities, reasons for visiting a PRM specialist, active approach towards rehabilitation. SPSSv.24 was used for statistical processing. Statistical significance of changes was accepted as  $p < 0.05$ .

## 3. RESULTS

The average duration of musculoskeletal symptoms Me(Range) in patients referred for rehabilitation was 13 (7-20) weeks, respectively for women it was 13 (7-20) weeks, for men - 12 (7-19) weeks. 35.5% (49) of the patients were hospitalized due to acute COVID-19 illness, respectively 30.8% (28) of all women and 44.7% (21) of all men. No relationship was found between gender and the severity of the disease, hospital versus home treatment ( $\chi^2(1)=2.619$ ;  $p=0.134$ ), as well as between patients' BMI and hospitalization ( $Z=1.682$ ,  $p=0.093$ ). 76.1% (105) of the patients were in active working age, 33.3% (46) of all were workers, 42.8% (59) – office employees, 14.5% (20) – retired

workers and 9.4% (13) – retired employees. 4.3% (6) of all patients were actively involved in sports, 28.3% (39) were amateur sportsmen, and 67.4% (93) did not practice any sport activities. (tabl.1)

**Table 1. Demographic characteristics of patients referred for rehabilitation**

Indicator Mean(SD)	Total 138	Female 91 (66%)	Male 47 (34%)
Age	55.7 (13.0)	56.0 (12.8)	55.2 (13.4)
Height in cm	168.7 (6.9)	164.8 (4.4 )	176.2 (4.3)
Weight in kg	79.8 (9.8)	74.9 (7.4)	89.4 (6.1)
BMI кг/м <sup>2</sup>	28.0 (2.3)	27.6 (2.6)	28.8 (1.4)
<b>Education</b>	Total 138 % (n)	Female % (n)	Male % (n)
1 Primary	24.6 (34)	23.1 (21)	27.3 (13)
2 Secondary	39.9 (55)	38.5 (35)	42.6 (20)
3 University	35.5 (49)	38.5 (35)	29.8 (14)
<b>Profession</b>	Total 138	Female % (n)	Male % (n)
1 Worker	33.3 (46)	25.3 (23)	48.9 (23)
2 Employee	42.8 (59)	46.2 (42)	36.2 (17)
3 Retired worker	14.5 (20)	15.4 (14)	12.8 (6)
4 Retired employee	9.4 (13)	13.2 (12)	2.1 (1)
<b>Sport</b>	Total 138 % (n)	Female % (n)	Male % (n)
Active	4.3 (6)	3.3 (3)	6.4 (3)
Amateur	28.3 (39)	23.1 (21)	38.3 (18)
Do not practice	67.4 (93)	73.6 (67)	55.3 (26)

On the occasion of persistent post-COVID-19 rheumatic and musculoskeletal complaints, 40.6% (56) of the patients were referred for rehabilitation after examination by a family physician and at his/her discretion. Those actively seeking rehabilitation and referred by a GP for outpatient rehabilitation were 24.6% (34), including 33.0% (30) of all women and 8.5% (4) of all men. 28.3% (39) were referred for rehabilitation by a specialist physician. At the specialist's discretion, 28.6% (26) of women and 27.7% (13) of men were referred for treatment with physical modalities, of whom only 6.5% (9) of women actively sought rehabilitation. 31% (43) of all referred patients, actively sought rehabilitation with physical modalities. 46.4% (64) of all patients had no prior physiotherapy treatment, of whom 34.1% (31) were women and 70.2% (33) were men. (tabl.2)

**Table 2 Distribution of patients referred to rehabilitation.**

Referring physician for FRM treatment	138	66 (91)	34 (47)
GP at his/her discretion % (n)	40.6 (56)	28.6 (26)	63.8 (30)
GP – active patient's approach % (n)	24.6 (34)	33.0 (30)	8.5 (4)
Specialist at his/her discretion % (n)	28.3 (39)	28.6 (26)	27.7 (13)
Specialist – active patient's approach % (n)	6.5 (9)	6.5 (9)	0 (0.0)

Treatment with physical modalities on other occasion was performed by 53.6% (74), respectively 65.9% (60) women and 29.8% (14) men. The leading causes for visiting Physical and Rehabilitation Medicine (PRM) specialist by 68.8% (95) of the patients was back pain, followed by fatigue 46.4% (64), myalgia - 38.4% (53), limited ability to work - 29.7% (41), arthralgia - 23.9% (33), physical activity difficulties - 20.3% (28). Other causes were mentioned by 10.1% (14) of the patients and shortness of breath was experienced by 6.5% (9) of all patients referred for rehabilitation. Fatigue was more pronounced as a symptom by female patients ( $\chi^2(1)=4.360$ ,  $p=0.048$ ). Myalgia was prevalent, as a symptom in both genders ( $\chi^2(1)=1.186$ ,  $p=0.356$ ), no difference was found between genders in arthralgia ( $\chi^2(1)=0.103$ ,  $p=0.749$ ).

Limitations in working capability were reported by 25.3% of women and 38.3% of men. Overall, for all patients, 29.7% reported limited ability to work as the reason for seeing a physician, with no gender difference ( $\chi^2(1)=2.517$ ,  $p=0.113$ ). Difficulty with physical activity was reported by 22.0% of women and 17.0% of men. Overall, for the entire group, 20.3% of patients had limited physical activity. There was no statistical correlation between limited activity after acute illness from COVID-19 and patient gender -  $\chi^2(1)=0.471$ ,  $p=0.493$ . Of all patients referred for rehabilitation, 6.5% had shortness of breath, (5.5% of females and 8.5% of males), with no statistical correlation between patient gender and complaints of shortness of breath ( $\chi^2(1)=0.462$ ,  $p=0.490$ ). Other reasons for visiting a

medical doctor were given by 10.1% of patients, with no statistically significant difference between women and men - ( $\chi^2(1)=0.537$ ,  $p=0.554$ ). The distribution of reported symptoms and complaints as reason for seeing a doctor are presented in Table 3.

**Table 3 Distribution of symptoms and causes for seeking FRM.**

Reasons for visiting a specialist in FRM n (%)	Total 138 % (n)	Female 91% (n)	Male 47% (n)
Back Pain	68.8 (95)	71.4 (65)	63.8 (30)
Fatigue	46.4 (64)	52.7 (48)	46.4 (16)
Myalgia	38.4 (53)	35.2 (32)	44.7 (21)
Artralia	23.9 (33)	23.1 (21)	25.5 (12)
Breath Shortness	6.5 (9)	5.5 (5)	8.5 (4)
Difficulties in Physical Activities	20.3 (28)	22.0 (20)	17.0 (8)
Limitations in Working Capacity	29.7 (41)	25.3 (23)	38.3 (18)
Other Symptoms	10.1 (14)	8.8 (8)	12.8 (6)

\*Patients were given choice to point out more than one cause

15% (21) of patients during their first visit to a PRM physician pointed out one reason, 39% (54) - two reasons, and 45% (63) of all patients referred for rehabilitation indicated three or more reasons. More than 80% of the patients had a comorbidity: 50% (69) had one comorbidity, 18% (25) had two comorbidities, and 16.3% (23) had three or more comorbidities. 5.8% (8) had concomitant cardiovascular disease, 30.4% (42) had hypertensive disease, 16.7% (23) had neurological disease, 9.4% (13) had diabetes mellitus, 59.4% (82) reported pre-existing spondylosis and 19.6% (27) had other diseases.

#### 4. DISCUSSION

There is an increasing number of patients who have experienced coronavirus infection and who have increased need for post-coronavirus care and recovery. Long-term effects of COVID-19 are associated with impaired pulmonary and physical function, reduced quality of life, and emotional distress (Barker-Davies et al. (2020)) After suffering from acute COVID-19, the clinical picture may evolve to residual symptoms that persist as a consequence of organ failure established after the acute phase, or to the emergence of new symptoms or syndromes that develop after the initial infection, regardless of the severity of the disease and regardless of whether the infection was asymptomatic or mild. (Jimeno-Almazán et al. (2021); Yong SJ. (2021))

There is an increased need for post-acute rehabilitation after COVID-19, especially in adults with comorbidities. Medical rehabilitation is an essential element and provides a continuum of care for patients. (Cevei M. et al. (2022) Grabowski DC & Joynt Maddox KE (2020)) Musculoskeletal symptoms such as myalgia, joint pain and fatigue are common. (Huang, C. et al. (2020). Fernández-de-Las-Peñas, C. et al. (2022)) Often muscle weakness, can be a consequence of the patients being bedridden for a long time (catabolic muscle loss is seen after the first week in patients treated in intensive care (Hosey MM & Needham DM. (2020))), due to the use of steroid medications or neuromuscular blocking agents (Simpson & Robinson, L. (2020)) or by directly damaging skeletal muscle by binding SARS-CoV-2 to ACE2 receptors and the penetration of the virus into the muscle cell, (Fernandes T. et al., (2020)) or by an indirect mechanism related to the dysregulation of the immune response to SARS-CoV-2 invasion and the resulting "cytokine storm". Abnormal release of cytokines and chemokines (IL-6, IL-1 $\beta$ , IL-8, IFN- $\gamma$ , IP-10, TNF- $\alpha$ ) results in a hyperimmune inflammatory response that can lead to multi-organ damage (Dos Santos et al (2022)). It is also accepted that increased incidence of thrombotic events in the periphery, which impairs blood flow to the muscles, may be responsible for the musculoskeletal damage. (Magro C. et al. (2020)) Other consequences of prolonged hypokinesia include deterioration of cardiorespiratory system function, the occurrence of contractures, joint stiffness, postural instability, neuropathy, etc. Acquired muscle weakness and muscle loss leading to deterioration of the musculoskeletal system contribute to delayed recovery and deterioration of patients' functional abilities (Simpson & Robinson (2020)).

A large number of patients in the recovery phase after SARS-CoV-2 have clinical symptoms months after acute infection. (Chopra V. et al. (2021); Goërtz et al. (2021); Mandal et al. (2021)) consider that the likelihood of symptoms persisting over time is greater with increasing age and depending on the severity of the course. (Carvalho-Schneider C. et al. (2021)) According to some authors, women are more likely to suffer from PCS. (Davis HE. et al. (2020); Valiente-De Santis L. et al. (2020); Augustin et al. (2021)). They are more likely to find an association between fatigue and myalgia than men, which is consistent with the results of the present study. Long-term health consequences can occur even after very mild COVID-19 treated in an outpatient setting. Often the symptoms of the

syndrome after COVID-19, are interrelated, as 80% of patients may have more than one (Lopez-Leon S. et al. (2021)), two or more symptoms, sometimes more than ten (Carfi A. et al. (2021); Dennis A. et al. (2021); Jimeno-Almazán et al. (2021)). Musculoskeletal symptoms of fatigue, myalgia and arthralgia are common in COVID-19. (Vaishya R. et al. (2021) In another study, Bakılan F. et al. (2021) reported that 85.7% of patients were found to have at least one or more musculoskeletal symptoms that started or were worsened by COVID-19. The most common symptom was fatigue (71.8%), spinal pain (70.7%) and myalgia (60.7%). Back pain was the most common (30.4%). The incidence of dyspnea was 30%, cough 18.5% and chest pain 10.7%. (Bakılan F. et al. (2021) According to Karaarslan F. et al. (2022) 3 months after COVID-19, 89.0% of patients had at least one symptom, 74.6% had at least one rheumatic and musculoskeletal symptom, and 82.1% had at least one other symptom of COVID-19. After 6 months, 59.6% of patients had at least one symptom, 43.2% had at least one rheumatic and musculoskeletal symptom, and 51.2% had at least one other COVID-19 symptom. In terms of rheumatic and musculoskeletal symptoms, 31.6% had fatigue, 18.6% had joint pain, and 15.1% had myalgia. (Karaarslan F et al. (2022))

By conducting rehabilitation, the possible consequences of physical deconditioning, functional impairment due to hypokinesia, stiffness and joint and muscle pain, which often occur together, especially in older patients, are minimized and delayed. Thus, long-term recovery and functional independence of patients is facilitated and improved (Carda S. et al. (2020); Gerasimova D. et al. (2021); Kasnakova P. et al. (2022)) Rehabilitation programs should be, individualized, tailored to meet the needs of each patient. They should address the specific deficits caused by COVID-19 and existing comorbidities. Individual rehabilitation programmes should include means to manage possible dyspnea, aerobic exercise, strength training, balance and coordination training, functional and occupational rehabilitation (occupational therapy) and psychological support ((Cevei M. et al. (2022); De Biase et al. (2022))

In the rehabilitation process, it is necessary to make an accurate assessment of the patients' functional abilities, which will allow the gradual incorporation of physiotherapeutic methods that are as effective as possible in terms of functional recovery, without causing excessive strain on the cardiovascular and respiratory systems. (Mratskova G.(2021)) The design of a comprehensive rehabilitation programme requires an objective assessment of general and local clinical status and rehabilitation potential involving a multidisciplinary team of specialists.

An essential element of functional recovery after COVID-19 is the active participation of patients in the rehabilitation process. According to current recommendations, good awareness (Negm AM et al. (2022)) and an adequate and active attitude towards one's own health play an important role. Many patients underestimate their active participation in the healing process and physicians underestimate the importance of learning. The formation of an active attitude related to the application of physical medicine treatment tools could have a significant impact on the recovery process of patients with musculoskeletal symptoms in PCS.

## 5. CONCLUSION

Time-persistent musculoskeletal symptoms (fatigue, myalgia, arthralgia, back pain) are a common reason for rehabilitation in patients with Post-COVID-19 (PCS) syndrome. The results of the study showed that more than two-thirds of patients reported more than one reason for seeing PRM specialist, with comorbidities seen in three-quarters of patients. One-third of the patients actively wanted to be referred for rehabilitation. Patient education and the formation of active behaviors in the recovery phase after COVID-19 could reduce the negative health consequences in patients with musculoskeletal symptoms of PCS.

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