Journal of Paediatric Surgeons of Bangladesh (2026) Vol. 17 (1)
Official Journal of the Association of Paediatric Surgeons of Bangladesh
https://doi.org/10.3329/jpsb.v17i1.91220

Journal of Paediatric Surgeons of Bangladesh

Original Article

Association of COVID-19 Infection with Musculoskeletal Function and Physical Performance among Adult Patients

Nobi MG[1], Alam O[2], Azad AK[3], Rashid MI[4]*, Rahman N[5], Sharmin S[6], Mahhamud S[7]

Abstract

Background: Coronavirus disease 2019 (COVID-19) is associated with a wide range of long-term health consequences, including musculoskeletal symptoms and impaired physical performance. Persistent muscle weakness, fatigue, and reduced functional capacity may adversely affect recovery and quality of life among affected individuals. This study aimed to assess the association of COVID-19 infection with musculoskeletal function and physical performance among adult patients.

Methods: This hospital-based cross-sectional analytical study was conducted in the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, from July 2021 to June 2022. A total of 155 adults with a history of confirmed COVID-19 infection were enrolled using purposive sampling. Data were collected through a structured questionnaire and clinical assessments. Muscle strength was evaluated using a handgrip dynamometer, physical performance by the Six-Minute Walk Test (6MWT), and fatigue by the Fatigue Severity Scale (FSS). Associations between COVID-19 severity and musculoskeletal outcomes were analyzed using the Chi-square test.

Results: Among the participants, 39.4% had mild, 37.4% moderate, and 23.2% severe COVID-19 infection. Overall, 72.3% reported at least one musculoskeletal symptom after infection. Muscle weakness (61.9%), joint pain (54.8%), and back pain (47.1%) were the most common complaints. Mean handgrip strength was 28.4±6.2 kg in males and 19.6±4.8 kg in females. The mean 6MWT distance was 412±68 meters, while the mean FSS score was 4.3±1.2. Reduced muscle strength, reduced walking capacity, and moderate-to-severe fatigue were observed in 63.2%, 58.1%, and 70.3% of participants, respectively. The prevalence of muscle weakness, reduced physical performance, and severe fatigue increased significantly with increasing COVID-19 severity ($p<0.001$).

Conclusion: COVID-19 infection is associated with significant musculoskeletal impairment, reduced physical performance, and fatigue, particularly among patients with severe disease. Early rehabilitation interventions may improve functional recovery and long-term outcomes.

Keywords: COVID-19; Musculoskeletal Function; Physical Performance; Muscle Strength; Functional impairment.

1. Mohammad Golam Nobi
Associate Prof., Dept. of Physical Medicine and Rehabilitation
Bangladesh Medical University, Bangladesh
Email: gnobipmr@bmu.ac.bd. Orcid Id: 0009-0006-8282-6819

2. Obaidul Alam
Assistant Prof., Dept. of Physical Medicine and Rehabilitation
Rangpur Medical College, Rangpur, Bangladesh
Email: obaidul.dr@gmail.com

3. Abul Kalam Azad
Associate Prof., Dept. of Physical Medicine and Rehabilitation
Bangladesh Medical University, Bangladesh
Email: drazadpmr@gmail.com. Orcid Id:0000-0003-4570-6202

Correspondence to: Md Imamur Rashid
Associate Prof., Dept. of Physical Medicine and Rehabilitation
Bangladesh Medical University, Bangladesh
Email:imamurrashid1971@gmail.com, Orcid Id: 0009-0008-6452-461

4. Md Imamur Rashid
Associate Prof., Dept. of Physical Medicine and Rehabilitation
Bangladesh Medical University, Bangladesh
Email: imamurrashid1971@gmail.com. Orcid Id:0009-0008-6452-4619

5. Nadia Rahman
Associate Prof., Dept. of Physical Medicine and Rehabilitation
Bangladesh Medical University, Bangladesh
Email: msnadiaoct052012@gmail.com. Orcid Id: 0009-0007-5305-0895

6. Sifat Sharmin
Research Co-ordinator, Dept. of Research & Development
International Network of Doctor's Journal, Bangladesh
Email:sifatsharminlimu@yahoo.com. Orcid Id: 0000-0003-0364-6010

7. Saila Mahhamud
Associate Professor, Department of Anatomy
Greeen Life Medical Hospital, Bangladesh
Email: mahmmadshaila879@gmail.com. Orcid Id: 0009-0002-8079-7808

Introduction

Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has affected millions of people worldwide and remains a major public health concern. Beyond its acute respiratory manifestations, COVID-19 has been associated with persistent health problems involving multiple organ systems, including the musculoskeletal system, resulting in prolonged symptoms and functional impairment among affected individuals [1].

Musculoskeletal disorders are among the leading causes of disability worldwide and are associated with pain, reduced mobility, and impaired physical function[2,3]. In Bangladesh, musculoskeletal conditions constitute a significant public health burden, affecting a considerable proportion of the adult population and contributing to disability and reduced quality of life[4]. The COVID-19 pandemic has further exacerbated these concerns through direct disease-related effects as well as indirect consequences such as reduced physical activity, prolonged inactivity, and lifestyle modifications [5-7].

Physical activity plays a crucial role in maintaining musculoskeletal health, muscle strength, and functional capacity through complex interactions between the musculoskeletal and physiological systems [8]. However, restrictions imposed during the pandemic, together with the effects of COVID-19 infection itself, have been associated with decreased physical activity levels, reduced exercise tolerance, muscle weakness, fatigue, and impaired physical performance [5,6]. These impairments may limit an individual's ability to perform daily activities and negatively affect overall quality of life.

Recent studies have reported a high prevalence of musculoskeletal manifestations among individuals following COVID-19 infection, including muscle weakness, joint pain, myalgia, fatigue, and reduced physical function [3,9]. Furthermore, the severity of COVID-19 infection appears to be associated with the extent of subsequent musculoskeletal and functional impairments [10]. Despite growing international evidence, data regarding the impact of COVID-19 infection on musculoskeletal function and physical performance among adult patients in Bangladesh remain limited.

Therefore, this study was undertaken to assess the association of COVID-19 infection with musculoskeletal function and physical performance among adult patients attending the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka. The findings of this study may contribute to a better understanding of post-COVID musculoskeletal sequelae and provide evidence for the development of appropriate rehabilitation strategies for affected individuals.

METHODOLOGY

This hospital-based cross-sectional analytical study was conducted in the Department of Physical Medicine and Rehabilitation, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh. The study period extended from July 2021 to June 2022. The aim was to evaluate the impact of COVID-19 infection on musculoskeletal function and physical performance among adult patients.

The study population included adult patients aged 18 years and above with a history of confirmed COVID-19 infection who attended the Department of Physical Medicine and Rehabilitation during the study period. Patients were selected using a purposive sampling technique. A total of 155 participants were enrolled in the study based on predefined inclusion and exclusion criteria.

Patients with confirmed COVID-19 infection documented by RT-PCR or clinical diagnosis and who were at least four weeks post-acute infection were included in the study. Individuals with pre-existing musculoskeletal disorders such as rheumatoid arthritis, advanced osteoarthritis with functional limitation, neuromuscular diseases, history of stroke or other neurological conditions affecting mobility, severe psychiatric illness, pregnant women, and those who declined to participate were excluded from the study.

The severity of COVID-19 infection was classified according to World Health Organization (WHO) clinical criteria. Mild cases were defined as symptomatic patients without evidence of pneumonia or hypoxia. Moderate cases included patients with clinical or radiological evidence of pneumonia with oxygen saturation (SpO_2) ≥94% on room air. Severe cases were defined as patients with SpO_2 <94%, signs of respiratory distress, or those requiring hospitalization, oxygen therapy, or intensive care support. Data were collected using a structured interviewer-administered questionnaire along with clinical and functional assessments. Musculoskeletal function was evaluated based on patient-reported symptoms including muscle pain, joint pain, stiffness, and functional limitations, supported by clinical examination. Muscle strength was assessed using a handgrip dynamometer, and the best of three measurements for each hand was recorded in kilograms. Physical performance was assessed using the Six-Minute Walk Test (6MWT) following standardized American Thoracic Society guidelines, and the total walking distance in meters was recorded. Fatigue was evaluated using the Fatigue Severity Scale (FSS), where a mean score of ≥4 indicated significant fatigue.

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics were expressed as frequency, percentage, mean, and standard deviation. The Chi-square (χ^2) test was used to assess the association between COVID-19 severity and musculoskeletal outcomes. A p-value of less than 0.05 was considered statistically significant.

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of BSMMU. Written informed consent was obtained from all participants prior to data collection.

RESULTS

A total of 155 adult patients with history of COVID-19 infection attending BSMMU were included in the study. The results are presented below in structured tables with corresponding descriptions.

Socio-demographic characteristics of study participants

Table 1 shows that the highest proportion of participants belonged to the 40–59 years age group (48.4%). Males were slightly higher than females (56.8% vs 43.2%). Regarding BMI, 42.6% were overweight, while 29.0% were obese.

Table 1: Socio-demographic characteristics of study participants (N=155)

Characteristics	Frequency (n)	Percentage (%)
Age group (years)		
20–39	51	32.9
40–59	75	48.4
≥60	29	18.7
Gender		
Male	101	65.2
Female	54	34.8
BMI category		
Normal	44	28.4
Overweight	66	42.6
Obese	45	29.0

Clinical characteristics of COVID-19 infection

Table 2 shows that the majority of participants had mild COVID-19 infection (39.4%), followed by moderate (37.4%) and severe cases (23.2%). Among clinical symptoms, fever (82.6%) and fatigue (74.2%) were the most common, followed by cough (68.4%), myalgia (55.5%), and dyspnea (41.9%).

Table 2: Clinical characteristics of COVID-19 infection (N=155)

Variables	Frequency (n)	Percentage (%)
Severity of COVID-19		
Mild	61	39.4
Moderate	58	37.4
Severe	36	23.2
Common symptoms during infection		
Fever	128	82.6
Fatigue	115	74.2
Cough	106	68.4
Myalgia	86	55.5
Dyspnea	65	41.9

Musculoskeletal symptomsafter COVID-19 infection

Table 3 shows that 72.3% of participants reported at least one musculoskeletal symptom after COVID-19 infection. The most common complaint was muscle weakness (61.9%), followed by joint pain (54.8%) and back pain (47.1%). Shoulder stiffness (38.7%), knee pain (35.5%), and hand grip weakness (33.5%) were also reported among a considerable proportion of participants.

Table 3: Musculoskeletal symptoms after COVID-19 infection (N=155)

Musculoskeletal symptoms	Frequency (n)	Percentage (%)
Muscle weakness	96	61.9
Joint pain	85	54.8
Back pain	73	47.1
Shoulder stiffness	60	38.7
Knee pain	55	35.5
Hand grip weakness	52	33.5
Any musculoskeletal symptom	112	72.3

Muscle strength and physical performance

Table 4 demonstrates reduced physical performance among participants. Mean handgrip strength was lower in females (19.6 ± 4.8 kg) compared to males (28.4 ± 6.2 kg). The mean 6-minute walk distance was 412 ± 68 meters, indicating reduced exercise capacity compared to normal expected values. The mean Fatigue Severity Scale score was 4.3 ± 1.2, suggesting moderate fatigue among the participants.

Table 4: Muscle strength and physical performance among participants

Variables	Mean ± SD
Handgrip strength (kg) – Male	28.4 ± 6.2
Handgrip strength (kg) – Female	19.6 ± 4.8
6-minute walk distance (meters)	412 ± 68
Fatigue Severity Scale (FSS) score	4.3 ± 1.2

Functional impairment

Table 5 shows a high prevalence of functional impairment among participants. Reduced muscle strength was observed in 63.2% of participants, while 58.1% had reduced walking capacity (<80% of predicted). Marked functional limitation (<60% of predicted) was found in 21.3% of participants. Overall, moderate to severe fatigue was reported in 70.3% of the study population.

Table 5: Functional impairment among study participants

Outcome	Frequency (n)	Percentage (%)
Reduced muscle strength	98	63.2
Reduced walking capacity (<80% predicted)	90	58.1
Marked functional limitation (<60% predicted)	33	21.3
Moderate to severe fatigue	109	70.3

COVID-19 severity and musculoskeletal outcomes

Table 6 demonstrates a statistically significant association between COVID-19 severity and musculoskeletal outcomes. The prevalence of muscle weakness, reduced 6-minute walk test (6MWT) performance, and severe fatigue increased progressively with increasing severity of COVID-19 infection. Patients with severe COVID-19 showed the highest proportion of muscle weakness (80.6%), reduced 6MWT performance (80.6%), and severe fatigue (86.1%), compared to those with mild and moderate disease. The differences across severity groups were statistically significant for all outcomes ($p < 0.001$).

Table 6: Association between COVID-19 severity and musculoskeletal outcomes

Severity	Muscle weakness n (%)	Reduced 6MWT n (%)	Severe fatigue n (%)	p-value
Mild	28 (45.9)	24 (39.3)	33 (54.1)	<0.001
Moderate	39 (67.2)	37 (63.8)	45 (77.6)	<0.001
Severe	29 (80.6)	29 (80.6)	31 (86.1)	<0.001

DISCUSSION

The present study demonstrated that musculoskeletal symptoms, reduced muscle strength, impaired physical performance, and fatigue were common among adults recovering from COVID-19 infection. More than two-thirds of the participants reported at least one musculoskeletal symptom, with muscle weakness and joint pain being the most frequent complaints. These findings are consistent with previous studies that reported a high prevalence of persistent musculoskeletal manifestations following COVID-19 infection, even among patients with mild to moderate disease [11,12].

Physical performance was notably affected in the study population. The mean six-minute walk distance was reduced, and more than half of the participants exhibited decreased walking capacity. Similar reductions in exercise tolerance and functional performance among post-COVID patients have been reported in earlier studies, indicating persistent limitations in physical functioning after recovery from acute infection[13,14]. Furthermore, reduced muscle strength was observed in a substantial proportion of participants, supporting evidence that COVID-19 may lead to prolonged muscle deconditioning and impaired functional capacity [15,16].

Fatigue was another prominent finding, with the majority of participants experiencing moderate to severe fatigue. Persistent fatigue has been consistently identified as one of the most common long-term sequelae of COVID-19 and has been associated with reduced quality of life and limitations in daily activities [14, 17].

A significant association was observed between COVID-19 severity and adverse musculoskeletal outcomes. The prevalence of muscle weakness, reduced walking performance, and severe fatigue increased progressively from mild to severe disease categories. Similar findings have been reported in previous studies, where patients with more severe COVID-19 experienced greater functional impairment and poorer physical performance during recovery [13,14].

The observed impairments may be attributed to systemic inflammation, prolonged inactivity, hospitalization, muscle deconditioning, and reduced physical activity during and after illness. Pandemic-related restrictions and sedentary lifestyles may have further contributed to worsening musculoskeletal health and physical performance [18-20].

Overall, the findings suggest that COVID-19 infection has a substantial impact on musculoskeletal function and physical performance, particularly among patients with severe disease.

CONCLUSION

This study demonstrated a high prevalence of musculoskeletal symptoms and functional impairment among adult patients with a history of COVID-19 infection. Muscle weakness, joint pain, back pain, reduced muscle strength, impaired walking capacity, and moderate to severe fatigue were common findings. Physical performance, as assessed by handgrip strength and the 6-minute walk test, was notably reduced among the participants. Furthermore, the severity of COVID-19 infection was significantly associated with adverse musculoskeletal outcomes, with patients experiencing severe disease showing the greatest degree of muscle weakness, reduced exercise capacity, and fatigue. These findings highlight the substantial impact of COVID-19 on musculoskeletal function and physical performance and emphasize the importance of early assessment, rehabilitation, and long-term follow-up of affected patients to improve functional recovery and quality of life.

REFERENCE

1. Greve JM, Brech GC, Quintana M, Soares AL, Alonso AC. Impacts of COVID-19 on the immune, neuromuscular, and musculoskeletal systems and rehabilitation. Revista Brasileira de Medicina do Esporte. 2020 Jul 29;26(4):285-8.
2. Sardina AL, Gamaldo AA, Andel R, Johnson S, Baker TA, Thorpe RJ, McEvoy C, Evans MK, Zonderman AB. Cross-sectional examination of musculoskeletal pain and physical function in a racially and socioeconomically diverse sample of adults. The Journals of Gerontology: Series A. 2021 Feb 1;76(2):368-77.
3. Laisram N, Kumar A, Wadgave Y. Prevalence of musculoskeletal disorders amongst adult population of India. Epidemiology International. 2019 Jan 1.
4. Zahid-Al-Quadir A, Zaman MM, Ahmed S, Bhuiyan MR, Rahman MM, Patwary I, Das BB, Hossain SA, Paul S, Shahin A, Rahman M. Prevalence of musculoskeletal conditions and related disabilities in Bangladeshi adults: a cross-sectional national survey. BMC rheumatology. 2020 Dec 16;4(1):69.
5. Said CM, Batchelor F, Duque G. The impact of the COVID-19 pandemic on physical activity, function, and quality of life. Clinics in geriatric medicine. 2022 Apr 22;38(3):519.
6. Woods JA, Hutchinson NT, Powers SK, Roberts WO, Gomez-Cabrera MC, Radak Z, Berkes I, Boros A, Boldogh I, Leeuwenburgh C, Coelho-Júnior HJ. The COVID-19 pandemic and physical activity. Sports medicine and health science. 2020 Jun 1;2(2):55-64.
7. Ahmed S, Akter R, Islam MJ, Muthalib AA, Sadia AA. Impact of lockdown on musculoskeletal health due to COVID-19 outbreak in Bangladesh: A cross sectional survey study. Heliyon. 2021 Jun 1;7(6).
8. Cariati I, Bonanni R, Onorato F, Mastrogregori A, Rossi D, Iundusi R, Gasbarra E, Tancredi V, Tarantino U. Role of physical activity in bone–muscle crosstalk: Biological aspects and clinical implications. Journal of functional morphology and kinesiology. 2021 Jun 21;6(2):55.
9. Azadvari M, Haghparast A, Nakhostin-Ansari A, Razavi SZ, Hosseini M. Musculoskeletal symptoms in patients with long COVID: A cross-sectional study on Iranian patients. Heliyon. 2022 Aug 1;8(8).
10. Jeyaraman M, Selvaraj P, Jeyaraman N, Shivashankar PG, Muthu S. Assessment of risk factors in post-COVID-19 patients and its associated musculoskeletal manifestations: a cross-sectional study in India. Journal of Orthopaedics. 2022 Sep 1;33:131-6.
11. Dos Santos PK, Sigoli E, Braganca LJ, Cornachione AS. The musculoskeletal involvement after mild to moderate COVID-19 infection. Frontiers in Physiology. 2022 Mar 18;13:813924.
12. Gulzar R, Rasheed A, Riaz S, Adnan WA, Hafeez U, Malik AM. Musculoskeletal Symptoms in Patients Recovering from COVID-19. Muscles, Ligaments & Tendons Journal (MLTJ). 2022 Jan 1;12(1).
13. Van Gassel RJ, Bels J, Remij L, van Bussel BC, Posthuma R, Gietema HA, Verbunt J, van der Horst IC, Damink SW, van Santen S, van de Poll MC. Functional outcomes and their association with physical performance in mechanically ventilated coronavirus disease 2019 survivors at 3 months following hospital discharge: a cohort study. Critical care medicine. 2021 Oct 1;49(10):1726-38.
14. Verma CV, Mhatre SD, Mangaonkar AN, Kaneria MV, Bharmal RN. Impact of COVID-19 on Fatigue and Exercise Capacity in Patients Treated at a Dedicated COVID Hospital. Journal of The Association of Physicians of India. 2021 Apr 1;69:16-20.
15. Fernández-Lázaro D, Santamaría G, Sánchez-Serrano N, Lantarón Caeiro E, Seco-Calvo J. Efficacy of therapeutic exercise in reversing decreased strength, impaired respiratory function, decreased physical fitness, and decreased quality of life caused by the post-COVID-19 syndrome. Viruses. 2022 Dec 15;14(12):2797.
16. Santy-Tomlinson J. The musculoskeletal implications of deconditioning in older adults during and following COVID-19. International Journal of Orthopaedic and Trauma Nursing. 2021 Jun 24;42:100882.
17. Betschart M, Rezek S, Unger I, Ott N, Beyer S, Böni A, Gisi D, Shannon H, Spruit MA, Sieber C. One year follow-up of physical performance and quality of life in patients surviving COVID-19: a prospective cohort study. Swiss medical weekly. 2021 Oct 28;151(4344):w30072-.
18. Argus M, Pääsuke M. Effects of the COVID-19 lockdown on musculoskeletal pain, physical activity, and work environment in Estonian office workers transitioning to working from home. Work. 2021 Jul 16;69(3):741-9.
19. Sharma S, Gohil R, Patel S, Kishore K, Singh A, Rajnish RK, Dhillon MS, PATEL S, Dhillon M. Impact of the COVID-19 lockdown and confinement measures on the musculoskeletal health of the urban geriatric population. Cureus. 2021 Nov 2;13(11).
20. Santy-Tomlinson J. The musculoskeletal implications of deconditioning in older adults during and following COVID-19. International Journal of Orthopaedic and Trauma Nursing. 2021 Jun 24;42:100882.