

Musculoskeletal Features of Post Covid-19 Patients Attending in a Tertiary Academic Hospital of Bangladesh

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Abstract

Background: This is a baseline study performed to assess the relation between musculoskeletal features among the Covid-19 patients. However, no substantial amount of data or previous studies was revealed regarding this issue. This study can be crowned as a pioneer in the arena of Covid-19 infection. **Objective:** To observe the demographic incidence, clinicopathological spectrum of post Covid-19 patients in Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh. **Materials and Methods:** This is a cross sectional observational study conducted among 207 cases including musculoskeletal symptoms, socio-demographic characteristics and oxygen saturation >95% in the department of physical medicine and rehabilitation, BSMMU, Dhaka, Bangladesh. Statistical analysis was performed on the tabulated data by chi-square test and independent t test. **Results:** The mean age was 40.3±9.6 years with male predominance. The most frequent symptoms were respiratory symptoms followed by musculoskeletal pain. Upper back pain was significantly higher in female and shoulder pain among male. **Conclusion:** Most common symptoms were pain over neck, shoulder, upper back, lower back, hip or thigh, wrist or hands. Older age group significantly suffered with pain in lower back and ankle. Post Covid follow up research is recommended.

Keywords: Covid-19, Musculoskeletal features, Post-covid pain.

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Introduction

SARS-CoV-2 belongs to the corona virus family of positive sense, single-stranded RNA viruses. In addition to SARS-CoV-2, there are 6 other strains of corona virus those are known to infect humans, including 4 less severe strains that cause mild symptoms, as well as the more pathogenic viruses SARS-CoV-1, which causes severe acute respiratory syndrome (SARS), and MERS-CoV, which was responsible for the Middle East respiratory syndrome (MERS).^{1,2}

So far, the most common notable early symptoms of the disease were cough, headache and fever.

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However, recently, the evidence is emerging on the effect of Covid-19 on the musculoskeletal systems.³ Musculoskeletal symptoms are occurring in one-quarter to one-half of symptomatic patients with Covid-19.⁴ Because of the emerging nature of Covid-19, the mechanistic effects of the infection on skeletal muscle are yet to be understood. In a mouse model of SARS, within 4 days of infection, there was a rapid 20% decrease in body mass.⁵ Using muscle tissue collected postmortem from patients with Covid-19 who had died, several small studies have provided insight into the nature of muscle dysfunction as a result of SARS-CoV-1 infection.^{6,7} Widespread muscle fiber atrophy was noted, with sporadic and focal muscle fiber necrosis and immune cell infiltration.⁶ Electron micrographs revealed myofibril disarray and Z disc streaming,⁸ which would disrupt force transmission as noted in other muscle diseases.⁹ Neuronal demyelination has also been reported in patients with Covid-19, which may also contribute to muscle weakness and fatigue. In addition to potential direct viral infection, the cytokines and pro-inflammatory signaling molecules induced by the infection could lead to pathological changes in skeletal muscle tissue.

Several of the pro inflammatory signaling molecules known to be elevated in patients with Covid-19 can also impact skeletal muscle. IFN- γ , IL-1b, IL-6, IL-17, and TNF- α can directly induce muscle fiber proteolysis and decrease protein synthesis. IL-1b and IL-6 can induce muscle fibroblast activity and lead to fibrosis, which could impair muscle force production and increase injury susceptibility.¹⁰

Less is known about bone and joint involvement than skeletal muscle disorders in patients with Covid-19. Pain over different anatomical region was most frequently encountered feature among the patients in different studies. This study emphasized on the regional distribution of most common musculoskeletal feature which is pain among the respondents. Arthralgia were commonly reported in patients with Covid-19, but are often combined with myalgias,¹¹ making it challenging to specifically identify arthralgia prevalence. Arthralgia have also been reported in patients with Covid-19, as well as reduced bone mineral density (BMD).¹² The reduced BMD observed in patients with Covid-19 was largely thought to be dependent on the extent and duration of treatment with corticosteroids, which were a mainstay therapy that attempted to reduce inflammation during the initial infection and subsequent early rehabilitation and recovery period.¹⁰

The study was conducted to evaluate most commonly reported post Covid-19 musculoskeletal symptom which was pain and its regional distribution among respondents attending post Covid-19 follow up clinic of Bangabandhu Sheikh Mujib Medical University (BSMMU), Bangladesh.

The musculoskeletal manifestation of Covid-19 may include as myalgia, muscle weakness and arthralgia. Ironically, in some patients, some of these symptoms may precede the commonest symptoms of Covid-19. In addition, symptoms

such as myalgia, muscle weakness, and headache may render the patients unable to carry out activities of daily living (ADL) such as walking. In humans, the ability to carry out ADL is associated with good quality of life. Furthermore, symptoms such as muscle weakness can result in complications such as muscle atrophy and contracture in the long term. The decreased ability to carry out ADL leads to major rehabilitation problem.¹³ Pain over different anatomical region was the most frequent complaint of post Covid-19 patients. Regional distribution of this musculoskeletal feature not yet been studied. So, this study will help to identify major musculoskeletal problem which is pain and the common regional involvement area. Study result will guide in future for area to be looked after for proper rehabilitation. Furthermore, by searching Google Scholar, PubMed and BanglaJOL, it was found that small numbers of studies have been conducted regarding post-covid musculoskeletal features. To our knowledge, there is absence of any study regarding this topic in our country. Recently BSMMU has started an exclusive post-covid follow up clinic where symptoms like fatigue, cardio-respiratory, musculoskeletal and neurological disorders are included.¹⁴ Therefore, this study will address the most frequent musculoskeletal feature of post Covid-19 patients attending post-covid follow up clinic of BSMMU and can provide further information which will help to understand the musculoskeletal problem and the regional distribution of post Covid-19 patients and how to manage them. General objective of our study is to find out the musculoskeletal features of post Covid-19 patients attending in a tertiary academic hospital of Bangladesh. Specific objectives include exploring the musculoskeletal symptoms and finding out which part of musculoskeletal system is involved, assessing the socio-demographic characteristics of the patients and to assess the association between socio demographic characteristics with the presenting musculoskeletal symptoms.

Materials and Methods

This was a cross sectional observational study conducted among 207 subjects in the department of Physical Medicine and Rehabilitation, BSMMU, Dhaka. The study duration was 6 months; January, 2021 to June, 2021. Subjects were selected by purposive sampling. Post covid-19 patients who were previously Covid positive confirmed by reverse transcription polymerase chain reaction (RT-PCR) or by high-resolution computed tomography (HRCT) of chest, but became Covid-19 free during the time of inclusion in this study. Both male and female subjects age ranged 18 to 60 years were included. Oxygen saturation >95% in pulse-oximeter was also an inclusion criteria.

Respondents who had musculoskeletal symptoms prior to the diagnosis of Covid-19, immunocompromised patients, pregnant women and unwilling subjects were excluded from the study. Standard statistical analyses were preformed; chi-square test and independent student's t-test was performed for hypothesis testing.

Figure 1 shows that most common Covid-19 symptoms were found fever 86.5%, cough 56.0%, body ache 54.6%, respiratory distress 7.2%, back ache 1.9%, shoulder pain 1.4%, malaise 1.4%, neck ache 1.0%, anxiety 1.0%, diarrhea 0.5% and thigh pain 0.5%. 52(25.1%) patients had co-morbidities, among them 29(14.0%) had hypertension, 27(13.0%) had diabetes mellitus and 15(7.2%) had asthma.

Results

This was a cross sectional observational study conducted among 207 subjects in the department of Physical Medicine and Rehabilitation, BSMMU, Dhaka. The study duration was 6 months; January, 2021 to June, 2021. Subjects were selected by purposive sampling. Post covid-19 patients who were previously Covid positive confirmed by reverse transcription polymerase chain reaction (RT-PCR) or by high-resolution computed tomog-

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Figure 1: Bar diagram showing distribution of Covid-19 symptoms of the study patients (n=207)

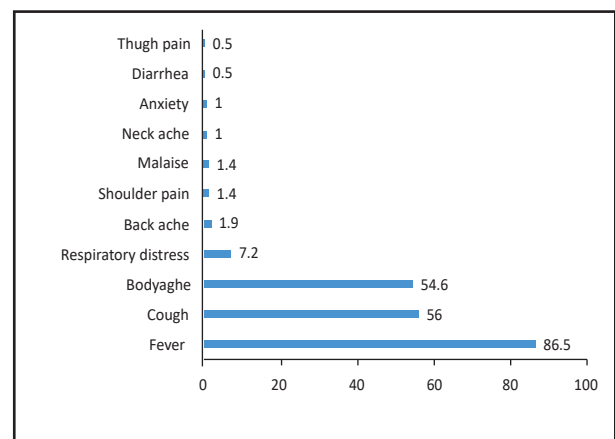


Figure 2: Bar diagram showing musculoskeletal feature (Pain) with regional distribution of the study patients (n=207)

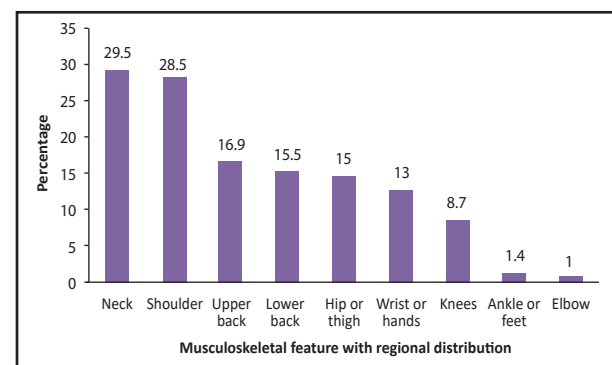


Figure 2 shows that most common musculoskeletal symptom was pain and its regional distribution were found in neck 29.5%, shoulder 28.5%, upper back 16.9%, lower back 15.5%, hip or thigh 15.0%, wrist or hands 13.0%, knees 8.7%, ankle or feet 1.4% and elbow 1.0%.

Table: I : Effect on work and leisure activity after becoming COVID negative (n=207)

Parameter	Number of patients	Percentage
Work activity		
Yes	207	100.0
No	0	0.0
Leisure activity		
Yes	207	100.0
No	0	0.0

Table 1 shows that work activity and leisure activity were hampered due to covid-19 in all patients even after becoming Covid-19 negative.

Table: II : Impedimental effect of post covid-19 patients in their normal work activities (n=207)

Normal work after becoming Covid-19 negative (days)	Number of patients	Percentage
0	1	0.5
1-7	52	25.1
8-30	153	73.9
>30	1	0.5

Table 2 shows that almost three fourth 153(73.9%) of patients had been able to do normal work activities within 8-30 days after becoming Covid-19 negative.

Figure 3: Pie chart showing musculo-skeletal trouble (according to Nordic Musculoskeletal Questionnaire) during the last 7 days of data collection (n=207)

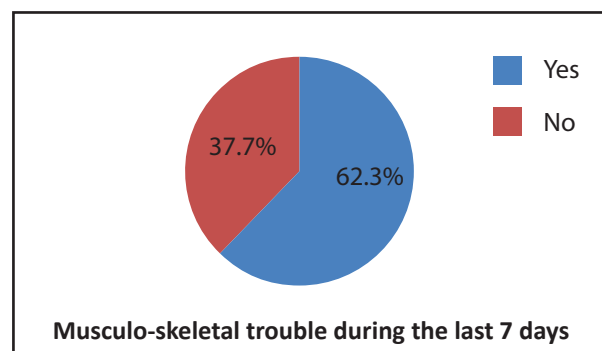


Figure 3 shows that during the last 7 days of data collection 129(62.3%) of participants had musculo-skeletal trouble, which was pain. It represents that after complete recovery musculoskeletal symptoms can be relapsed.

Table 3 shows that lower back pain was significantly higher in age group 51-60 years (37.5%). Also ankle or feet pain was significantly higher in age group 41-50 years (50.0%). However, pain over neck, shoulder, upper back, hip or thigh, wrist or hands, knee and elbow were not significantly associated with age group ($p>0.05$).

Table: III : Association between musculoskeletal symptom (pain) with age (n=207)

Age (years)	Neck (n=61)		Shoulder (n=59)		Upper back (n=35)		Lower back (n=32)		Hip or thigh (n=31)		Wrist or hands (n=27)		Knees (n=18)		Ankle or feet (n=3)		Elbow (n=2)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	N	%
≤20	0	0.0	0	0.0	1	2.9	1	3.1	2	6.5	1	3.7	0	0.0	1	33.3	0	0.0
21- 30	5	8.2	10	16.9	6	17.1	6	18.8	6	19.4	7	25.9	1	5.6	0	0.0	0	0.0
31- 40	27	44.3	25	42.4	17	48.6	9	28.1	10	32.3	10	37.0	6	33.3	0	0.0	1	50.0
41- 50	19	31.1	12	20.3	8	22.9	4	12.5	4	12.9	5	18.5	9	50.0	2	66.7	0	0.0
51- 60	10	16.4	12	20.3	2	5.7	12	37.5	9	29.0	4	14.8	2	11.1	0	0.0	1	50.0
>60	0	0.0	0	0.0	1	2.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
p value	0.410 ^{ns}		0.532 ^{ns}		0.092 ^{ns}		0.014 ^s		0.052 ^{ns}		0.364 ^{ns}		0.222 ^{ns}		0.001 ^s		0.837 ^{ns}	

s = significant, ns = not significant, p value reached from chi square test

Shoulder pain was significantly higher in male patients (81.4%), upper back pain was significantly higher in female patients (51.4%). However, pain over neck, lower back, hip or thigh, wrist or hands, knee, ankle and elbow were not significantly associated with sex (p>0.05).

Table 4 shows that there was no significant association between musculoskeletal symptom (pain) with occupational status (p>0.05).

Table IV: Association between musculoskeletal symptom (pain) with occupational status (n=207)

Occupational status	Neck (n=61)		Shoulder (n=59)		Upper back (n=35)		Lower back (n=32)		Hip or thigh (n=31)		Wrist or hands (n=27)		Knees (n=18)		Ankle or feet (n=3)		Elbow (n=2)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Service holder	37	60.7	35	59.3	14	40.0	11	34.4	15	48.4	10	37.0	8	44.4	0	0.0	1	50.0
Housewife	14	23.0	9	15.3	11	31.4	7	21.9	5	16.1	6	22.2	5	27.8	1	33.3	1	50.0
Businessman	9	14.8	13	22.0	5	14.3	11	34.4	7	22.6	6	22.2	3	16.7	1	33.3	0	0.0
Student	1	1.6	2	3.4	4	11.4	3	9.4	4	12.9	5	18.5	1	5.6	1	33.3	0	0.0
Day laborer	0	0.0	0	0.0	1	2.9	0	0.0	0	0.0	0	0.0	1	5.6	0	0.0	0	0.0
P value	0.156 ^{ns}		0.385 ^{ns}		0.112 ^{ns}		0.143 ^{ns}		0.486 ^{ns}		0.059 ^{ns}		0.276 ^{ns}		0.228 ^{ns}		0.846 ^{ns}	

ns = not significant; p value reached from chi square test

Discussion

This cross sectional study was carried out to find out the musculoskeletal features of post Covid-19 patients attending in a tertiary academic hospital of Bangladesh. A total number of 207 post Covid-19 participants attending post covid follow up clinics of BSMMU, Dhaka from January 2021 to June 2021 were enrolled in this study.

Regarding age distribution it was observed that 87(42.0%) patients belonged to age group 31-40 years. The mean (\pm SD) age was 40.3 ± 9.6 years with age range from 18 to 60 years. In a study conducted by Bakilan et al.¹⁵ where they found mean (\pm SD) age was 47.45 ± 13.92 years. In a Bangladeshi study conducted by Numan¹⁶ reported the mean age of the participants was 45.43 years with the age range was 35 to 66 years. One retrospective study was conducted in China having 99 post covid participants with the mean (\pm SD) age (49.40 ± 18.45) years.¹⁷ Another study conducted in Bangladesh by Khasru et al.¹⁸ where they showed majority (70%) of the participants were aged 50 years or younger, and respondents older than 50 were 30%. Ahmed et al.¹⁹ also found most of the participants were from the age group of 18–29 (73.5%) years. These findings were almost similar in the present study.

This study showed male patients were predominant 143(69.1%) with male female ratio was 2.2:1. Bakilan et al.¹⁵ reported that total of 280 post Covid-19 patients, 183(65.4%) women and 97(34.6%) men. In another study in Turkey, phone interviews were conducted with 300 Covid-19 patients (60% male).²⁰ In a Bangladeshi study by Numan¹⁶ described that 90 participants were selected with 70% (n=63) male and 30% were female (n=27). One retrospective study was conducted in China having 99 post Covid-19 participants with 51 (51.51%) were male and 48 (48.49%) were female participants.¹⁷ Ahmed et al.¹⁹ demonstrated that a total number of 230 volun-

teers both male and female participated (the number of male participants were greater than female 79.1% vs 20.9%). Another study in our country by Khasru et al.¹⁸ showed among 380 participants, majority were males (65.53%) infected with Covid-19. The enhancing mortality rate from Covid-19 for males found (2.4 times) higher than females also found by another study.²¹ The explanations for the sex differences in Covid-19 are perhaps multifaceted including variations in immune response, higher incidence of pre-existing disease, biological differences between the sexes such as high levels of androgens in men, differences in lifestyle such as smoking habits as well as differences in underlying comorbidities.^{22,23}

Present study showed majority 83(40.1%) patients completed above SSC education level followed by 72(34.8%) completed up to SSC level, 17(8.2%) up to primary and 35(16.9%) were illiterate. Numan¹⁶ reported that educational status showed that 50 (55.55%) completed secondary level, 33 (36.66%) found to be graduate and only 07 (7.77%) post-graduate. Another study done by Saeed et al.²⁴ found about 567 (62.4%) were holding a bachelor's degree, while 234 (25.7%), 108 (11.9%) were holding postgraduates and diploma or below, respectively.

Regarding occupational status in this study it was observed that more than half (51.7%) patients were service holder, 43(20.8%) housewife, 42(20.3%) businessman, 13(6.3%) student and 2(1.0%) day labor. In a Bangladeshi study conducted by Numan¹⁶ found occupation of the participants showed that 35 (38.88%) were service holder followed by 20 (22.22%) housewife, 03 (3.33%) student, 15 (16.7%) banker and 02 (2.22%) retired person. Khasru et al.¹⁸ had observed that among all respondents, 18.42% were homemaker, 16.84% retired personnel, 15% businessman, 13.95% healthcare workers, 12.37% students, 10.53% bankers, 5.26% administrative workers, 3.18% garments workers, 2.37% members of

law-enforcing agencies, and others were 1.31%. Another study done in our country by Ahmed et al.¹⁹ where they described majority (50.0%) patients were student followed by 31.3% were in private service, 9.1% were in government service, 3.5% were unemployed, 3.0% were businessman, 3.0% were housewife. Saeed et al.²⁴ also found almost 585 (64.4%) were employed, while a smaller number of participants, 198 (21.8%) and 126 (13.9%), were unemployed and students, respectively.

Current study showed that majority 118(57.0%) patients came from lower-middle income group, 85(41.15%) came from upper middle income group and 4(1.9%) came from high income group. In our country a study conducted by Khasru et al.¹⁸ where they demonstrated majority of the respondents (50.26%) were from upper-middle income family, 26.84% from lower-middle income family, 17.37% from high income family, and only 5.53% were from low income family.

Present study observed that majority 143(69.1%) patients had duration of Covid-19, 15-21 days. The mean (\pm SD) duration of Covid-19 was found 16.1 ± 4.1 days. Leon et al.²⁵ reported that the mean (\pm SD) duration of rheumatic and musculoskeletal diseases (RMD) was 8.9 ± 8.2 years and the mean (\pm SD) duration of admission due to Covid-19 was 15.38 ± 14.42 days. Liang et al.¹¹ had observed that an incubation period was elicited from 12 patients (57.1%), ranging from 2 to 10 days with a median of 6.5 days.

In this study we found that most common Covid-19 symptoms were fever 86.5%, cough 56.0%, body ache 54.6%, respiratory distress 15(1.9%), back ache 1.9%, shoulder pain 1.4%, malaise 1.4%, neck ache 1.0%, anxiety 1.0%, diarrhea 0.5% and thigh pain 0.5%. In a study done by Bakilan et al.¹⁵ showed the frequency of dyspnea was 30%, cough 18.5% and chest pain 10.7%. In a Bangladeshi study conducted by Khasru et al.¹⁸ where they

found most frequent symptoms were respiratory clusters symptoms including fever, cough, rhinorrhea and breathlessness (76.05%) followed by musculoskeletal pain (48.42%), headache (16.05%) and abdominal pain in 0.5% of cases. Another literature reported the clinical symptoms at the onset of illness in patients with Covid-19, in which fever was the most common symptom (98%), followed by cough (76%), dyspnea (55%), muscle pain or fatigue (44%), and headache (8%),¹⁷ which is similar to this study finding. Liang et al.¹¹ also observed that on presentation, most patients (85.7%) had fever with a mean body temperature of 37.8oC. Cough (42.9%), expectoration (33.3%), fatigue (57.1%), headache or dizziness (38.1%) was common symptoms. Other symptoms included shortness of breath, myalgia or arthralgia, sore throat, nasal symptoms and diarrhea.

Regarding co-morbidities in this study it was observed that 52(25.1%) patients had co-morbidities, among them 29(14.0%) had hypertension, 27(13.0%) had diabetes mellitus and 15(7.2%) had asthma. Saeed et al.²⁴ reported that the most common chronic diseases were diabetes 6%, followed by asthma in 3.30%. Another study conducted by Leon et al.²⁵ described 46.15% of the patients had at least one comorbid condition.

Present study showed the most common post-acute Covid-19 musculoskeletal symptom was pain over neck in 29.5%, shoulder 28.5%, upper back 16.9%, lower back 15.5%, hip or thigh 15.0%, wrist or hands 13.0%, knees 8.7%, ankle or feet 1.4% and elbow 1.0%. In a study done by Bakilan et al.¹⁵ showed that most of the patients have fatigue (71.8%), spine pain (70.7%) and widespread myalgia (60.7%). The most common site of spine pain was the back (30.4%). Other symptoms included radicular low back pain 4 (1.4%), hand/wrist pain 4 (1.4%), hip pain 4 (1.4%), foot/ankle pain 4 (1.4%), elbow pain 3 (1.1%), cramp 2 (0.7%), vertigo 2 (0.7%), tremor 1 (0.4%) and headache 1 (0.4%). The common result from

previous studies about post-Covid-19 symptoms was that the majority of patients have at least one symptom.^{26,27} Consistent with these studies, 88.2% of our patients have at least one symptom, while 85.7% of our patients have at least one musculoskeletal symptom. Most of the previous studies have focused on whole body symptoms^{26,27} after Covid-19. Different from these studies, the present study focused on musculoskeletal symptoms. The most common musculoskeletal symptoms were fatigue, spine pain and myalgia. The frequency of respiratory tract symptoms was lower than that of musculoskeletal symptoms, and the most common respiratory tract symptom was dyspnea. A rehabilitation center in Bangladesh reported that the frequency of head and neck pain was 27%, pain in the lower limb 34%, back pain 24% and pain in the upper limb 13% in 90 post Covid-19 patients.¹⁶ In the study, the most common region of pain was the back (30%) and back pain was also the most frequent symptom on admission to the Physical Medicine and Rehabilitation (PM&R) outpatient clinic. Furthermore, back pain in acute Covid-19 was found to be related to post-acute Covid-19 musculoskeletal symptoms. 72% of these patients have at least one symptom, while most complaints regarding the musculoskeletal system were fatigue (44%), back pain (22.7%), arthralgia (22%), myalgia (21%) and lower back pain (16%) after 1 month.²⁰

In a Bangladeshi study conducted by Numan¹⁶ where they described in the location of pain status, 25 (27.77 %) complained of pain in the head and neck, 12 (13.33%) in the upper limb, 31 (34.45%) in the lower limb and 22 (24.45 %) in the back. A similar study conducted in the two Spanish universities to find out the musculoskeletal pain among the 1198 students during the lockdown period. In the study, participants 837 (69.86%) complained of neck pain, 162 (13.52%) shoulder pain, 57 (4.75%) elbow pain, 20 (1.66%) hip joint pain and 22 (1.84) knee joint pain.²⁸ The main similarity between the studies were the regions of

musculoskeletal complaint were almost in a similar location. In contrast, this study participant was from different professionals but the study conducted by Leiros-Rodriguez only focused on the only one group of participants that were university students.²⁸

Another study in our country by Khasru et al.¹⁸ had observed pain varied widely in hip, neck, leg and calf muscles, back and spine, shoulder, arms and hand, and other parts of the body among confirmed Covid-19 study respondents. Among musculoskeletal system, the most frequent involved joint was hip joint (20.53%). Among all cases, 15.26% had moderate and 5% had severe hip pain. Neck pain was found in 9.21% of cases and moderate pain was reported in 6.84%, and severe pain 2.10% of cases. Moreover, 5.26% cases had leg and calf muscle pain, 5% back and spine pain, 1.58% shoulder, 1.05% arms and hands, and 5.78% had pain in others region. Among all respondents, 16.05% had headache of which majority had mild to moderate headache (7.63%, and 6.57% respectively, and 1.84% had severe headache). Additionally, 1.58% had pain in the eyes. Hoong et al.²⁹ also found of the 88 patients with musculoskeletal symptoms, 37.5% had myalgia, 5.7% arthralgia, 6.8% new-onset backache and 50% generalized body ache.

This study showed lower back pain was significantly higher in age group 51-60 years (37.5%). Also ankle or feet pain was significantly higher in age group 41-50 years (50.0%). However, neck, shoulder, upper back, hip or thigh, wrist or hands, knee and elbow were not significantly associated with age group ($p>0.05$). In a study of Numan¹⁶ showed musculoskeletal symptoms and Covid-19 showed a significant association between age of the participants and severity of Covid-19 ($p<0.002$). In contrast, significant associations ($p>0.05$) were not found between age of participants and pain after Covid, living area and pain after Covid, age of participants and global weakness after Covid.

Studies conducted by different researchers found a similar significant association ($p < 0.05$) between exercise and musculoskeletal symptoms³⁰ age and duration of Covid and severity of Covid ($p < 0.05$).³¹ Khasru et al.¹⁸ reported that among respondents of younger age group (aged ≤ 50 years), 37.59% had moderate pain, 6.77% had severe pain, 13.91% had mild pain, and 41.17% had no pain. On the other hand, among older respondents (aged > 50 years), 47.37% had moderate pain, 25.44% had severe pain, 13.15% had mild pain, and 14.03% had no pain. The differences between two groups was statistically significant ($p < 0.05$).

In our study shoulder pain was significantly higher in male patients (81.4%), upper back pain was significantly higher in female patients (51.4%). However, pain over neck, lower back, hip or thigh, wrist or hands, knee, ankle and elbow were not significantly associated with sex ($p > 0.05$). Effect on neck region were more in our study may be due to cervical spine movement is more in daily activities even in resting position like sitting or lying in one side, moreover sedentary lifestyle plays an important role to create impact over neck region. Bakilan et al.¹⁵ demonstrate that a total of 240 (85.7%) of the 280 patients have at least one or more musculoskeletal symptoms, which began with or were aggravated by their Covid-19 infection, while the musculoskeletal problems of 40 (14.3%) of the 280 patients did not change after being infected with Covid-19. Also in these 240 patients, no difference was found according to gender ($P = .343$). In our country a study done by Khasru et al.¹⁸ showed among 249 males, 43.77% had moderate, 13.25% mild, 10.44% had severe pain, and 32.53% had no pain. Similarly, among 131 females, 35.11% had moderate, 16.03% had severe, 13.74% had mild pain, and 35.19% had no pain. The differences between two groups were not significant ($p > 0.05$). Among different types of pain, their study reveals that joint pain found among 22.63% males and 13.15% females. Rest complained of bone pain or

pain in the muscles. Majority of the male and female respondents suffered from headache (22.89%) followed by hip pain (21.84%). According to another study,³² patients with SARS Cov-2 also reported myalgia (49.3–60.9%), headache (35.4–55.8%), sore throat (12.5–23.2%), chest pain (10.4%), and abdominal pain (3.5%). Similar result found in a literature review,¹³ the most common musculoskeletal manifestation found by them was myalgia (48 studies; 80%).

Present study found -no significant association between musculoskeletal symptom with occupational status ($p > 0.05$). Lower back pain was significantly higher in above SSC education level that was 62.5%. However, pain over neck, shoulder, upper back, hip or thigh, wrist or hands, knee, ankle and elbow were not significantly associated with education ($p > 0.05$).

Limitations of the Study

The study population was selected from one selected hospital in Dhaka city, so that the results of the study may not reflect the exact picture of the country. The study was small and single centered. Therefore, a large population based multicenter prospective study is needed to understand the true picture and magnitude of the disease in Bangladesh. Despite these limitations, by using pre-fixed exclusion and inclusion criteria, the ascertainment bias eliminated. Selection bias was eliminated by using simple random sampling method. The results might have drawn attention to the scientific community to conduct more research on musculoskeletal symptoms and post Covid-19 survivors.

Conclusion

The result of this study concludes that the most common post Covid-19 musculoskeletal symptom was pain over neck, shoulder, upper back, lower back, hip or thigh, wrist or hands. Among the participants, older age group significantly suffered

with pain in lower back and ankle or feet. Shoulder pain was significantly more in male patients however upper back pain was significantly more in female patients. To address this issue pain rehabilitation intervention should be designed for Covid-19 infected patients. Additionally, post Covid follow up research is recommended. The musculoskeletal pain might be short term initially, but may possibly develop into a long-term problem and may be burden if proper measures are not taken. The result of this study concludes that the most common post Covid-19 musculoskeletal symptom was pain over neck, shoulder, upper back, lower back, hip or thigh, wrist or hands. Among the participants, older age group significantly suffered with pain in lower back and ankle or feet. Shoulder pain was significantly more in male patients however upper back pain was significantly more in female patients. To address this issue pain rehabilitation intervention should be designed for Covid-19 infected patients. Additionally, post Covid follow up research is recommended. The musculoskeletal pain might be short term initially, but may possibly develop into a long-term problem and may be burden if proper measures are not taken.

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