Musculoskeletal Symptoms Among Post Covid-19 Patients in Selected Rehabilitation Centers in Mymensingh

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Abstract:

To assess the musculoskeletal symptoms among post COVID-19 patients in selected rehabilitation centers in Mymensingh. To determine the musculoskeletal symptoms among post COVID-19 patients in selected rehabilitation centers in Mymensingh. The study design was cross-sectional descriptive type of observational study. Total 413 samples were selected conveniently for the study from CRP Mymensingh-BAU Centre and Rebalance Physiotherapy, Mymensingh. Data were collected from participants though a structured questionnaire using face to face interview and assessed by the Visual Analogue Scale and Modified Chalder fatigue scale used for assessing physical and mental fatigue. The study was conducted by using quantitative descriptive analysis through using SPSS software 20 version. This study results revealed that among the participants 71.40% subjects were man and 28.60% were women, here mean age 40.09; SD: ±16.01. Most vulnerable age 31-40 years people affected COVID-19; 67.60% participate were from urban area and 32.4% from rural area. In the location of pain status, 92 complained of pain in the head and neck, 156 in the upper limb, 134 in the lower limb and 235 in the back. Besides, musculoskeletal symptoms faced by participate were 29.70% (n=277) Fatigue, 33.80% (n=315) Myalgia, 11.40% (n=106) Arthralgia, 17.60% (n=164) Back pain and 7.60% (n=71) Neck pain and 221 respondent complained memory decreased after COVID-19 and 166 did not have. A significant association found between gender and musculoskeletal pain after COVID-19 ($p < 0.047$) and Daily exercise after COVID-19 ($p < 0.002$). A very high percentage of respondents had done good management at home after confirming COVID-19 and ICU/HDU among the respondents was very poor percentage. Higher percentage of participants in our study had suffering from musculoskeletal symptoms and most of them were suffering from acute pain in different area of body part. There also significant association between musculoskeletal pain and Daily exercise after post COVID-19 of the respondents.

1. Introduction

In December 2019, a new coronavirus called the severe acute respiratory syndrome coronavirus (SARS-CoV-2) that causes the illness coronavirus disease 2019 (COVID-19) first appeared in China. It has been challenged as a global health issue due to its unanticipated pandemic and rapid global spread, which has had a significant influence on healthcare systems and practically every aspect of personal life. As of March 2021, there were approximately 114 million confirmed cases of COVID-19 worldwide, with more than 2.5 million fatalities.[1]

The symptoms of the novel coronavirus COVID-19 are widely known. Cough, fever, myalgia, headache, shortness of breath, sore throat, diarrhea, nausea/vomiting, loss of smell or taste, abdominal pain, and

runny nose were listed in descending order of frequency among 373,883 COVID-19 cases with known symptom status in a report. In addition, a meta-analysis of COVID-19's rheumatic manifestations indicated that myalgia and fatigue were both among the disease's early symptoms, with a combined estimate of 19 and 32 percent, respectively. [2]

Numerous studies have demonstrated that musculoskeletal problems can manifest in the early stages of illness, even before the typical respiratory symptoms (dry cough, nasal congestion, sore throat and dyspnoea). People who test positive for COVID-19 have described fatigue, arthralgia (joint pain), myalgia (muscle discomfort), and muscle weakness as initial and typical symptoms. [3] Long-COVID risk factors are not fully understood, although studies have shown that this illness is more common in female patients and those who are older, have a higher body mass index, have comorbidity conditions, have a lower functional status, and engage in less physical exercise. [4] A different researcher discovered that COVID-19 developed a number of symptoms, including fatigue, joint pain, muscle pain, neck pain, shoulder pain, elbow pain, wrist pain, hand pain, and finger pain, as well as some common terms/conditions (i.e. myalgia, spondylosis, radiculopathy, myelopathy, neck strain, lower back strain, sciatica, frozen shoulder, lateral epicondylitis, carpal tunnel, and trigger finger). For several specific diagnoses, such as herniated disc, bulging disc, spinal stenosis, spondylolisthesis, neck disc, and de-Quervain, a relative decrease in search volume was observed. [5] Muscle and joint discomfort is the primary musculoskeletal system symptom of COVID-19. Since the early stages of the illness, pain has been present. The percentage of COVID-19 patients who report having joint or muscular discomfort ranges from 10% to 69.2%. The pathophysiology of COVID-19-related alterations in the musculoskeletal system has primarily been attributed to two mechanisms. In COVID-19 patients, the prevalence of low back pain ranges from 3.3% to 33.1%. The handicap caused by low back discomfort in COVID-19 individuals has not yet been demonstrated, though. [6] Epidemiological data from the SARS pandemic have paved the way to identify the disease symptomatology such as muscle soreness, arthralgia, myalgia, myopathies, osteoporosis, and osteonecrosis and thereby plan a line of management. [19] The most common symptom of viral infections is myalgia, which is characterized by generalized inflammation and an immunological response (cytokine response). COVID-19 induced myalgia is more prolonged and severe than that caused by other viral infections. In hyperlactatemia, the tissue cell's ability to supply oxygen to the cell is reduced, causing the tissue to remain hypoxic. This musculoskeletal condition may cause ischemic muscle tissue and discomfort. Muscular discomfort may be made worse by high lactate levels, a low pH, and low oxygen levels. [14] The known causes of arthralgia range from destructive and degenerative processes, such osteoporosis and sports injuries, to inflammation of the connective tissue around the joints, like bursitis. Additionally, it is a significant clinical issue that many persons with viral infections, especially COVID-19 illness. According to the studies, arthralgia can occur in anywhere between 5.9% and 69.2% of people. [16] Additionally, vitamin D negatively affects how COVID-19 pneumonia develops. [17] In fact, the prevalence of musculoskeletal post-COVID-19 pain raised to rates ranging from 45% to 60% in studies focusing on or specifically investigating this symptom. [18] Another researcher identify by COVID-19 pandemic caused by SARS-CoV-2 increased mortality and morbidity in the adult population worldwide, affecting many facets of daily life. Despite being categorized as a respiratory disease, multiple studies have established the disease's extra-pulmonary symptoms, making it a major public health problem. COVID-19 has a 30% prevalence of musculoskeletal symptoms (MSK). MSK symptoms of COVID-19, and post-COVID-19 vaccination include arthralgia, myalgia, new-onset backache, fatigue, symmetrical or polyarticular

inflammatory arthritis, reactive arthritis, osteoporosis, osteonecrosis of the femoral head, neuropathies, myositis, and myopathies. Approximately 15% and 44% of post-COVID-19 patients had arthralgia and myalgia, respectively. Because of the availability of protective antibodies against COVID-19 viral particles, the severity of MSK manifestation before and after COVID-19 vaccination varied significantly. The severity of MSK symptoms in COVID-19 patients after vaccination was found to be mild. COVID-19 immunization efficacy and severity of infection decrease in the post-vaccination period the severity of COVID-19 infection, as well as the mortality of very ill COVID-19 patients, is high, with patients having co-morbid illnesses such as diabetes, hypertension, rheumatic disorders, and cardiovascular diseases.[20]

People of any age can become infected, including newborns and pregnant women. The majority of persons have mild to moderate symptoms. Fever, dry cough, and weariness are the most prevalent symptoms; upper respiratory tract symptoms can include pharynglgia, headaches, and myalgia. There has also been one case of gastrointestinal symptoms such as stomach pain and diarrhea in children and teenagers.[32]

ARDS, respiratory failure, liver injury, acute myocardial infarction, acute renal injury, septic shock, and even multiple organ failure are all possible COVID-19 consequences. According to preliminary studies, people who are older, male, or have underlying comorbidities are more likely to acquire severe disease. A study of 1099 validated COVID-19 patients discovered that nearly 23% had one or more underlying illnesses, such as chronic obstructive pulmonary disease (1.1%), hypertension (14.9%), diabetes (7.4%), coronary atherosclerotic heart disease (2.5%), and hepatitis B and liver cirrhosis (2.3 percent). Patients with underlying co-morbidities (such as hypertension, diabetes, pre-existing respiratory infection, cardiovascular illness, and cancer) are more prone to succumb and advance to the more severe forms of COVID-19, as well as to suffer sequel.[33] Chest computed tomography (CT) findings are common, reaching almost 100% in early studies and more than 80% in a recent cohort of patients outside Wuhan. Several important locations in the lung parenchyma and interstitial tissue have been identified, which are directly related to the disease's phases and severity.[34] According to one study, 35% of those who became COVID positive and did not return to work 14–21 days later did not return to work. It is more common in older age groups (26 percent in 18–34 years, 32 percent in 35–49 years, and 47 percent in 50 years and more), as well as in people who have co morbidities (28 percent with nil or one comorbidity, 46 percent with two and 57 percent with three or more co morbidities). Obesity (BMI > 30) and the presence of mental illnesses (anxiety disorder, depression, PTSD, paranoia, obsessive-compulsive disorder, and schizophrenia) are connected to a more than two-fold increase in the chance of not returning to work 14–21 days after a positive result.[35]

Study Objective: To find out the musculoskeletal symptoms among post COVID-19 patients in selected rehabilitation centers in Mymensingh

Specific Objectives: To identify the contribute to the occurrence, different types, severity and socio-demographic characteristics musculoskeletal symptoms after developing COVID-19 among patients.

List of variables Socio demographic variables**,** Different types of musculoskeletal symptoms**:** Fatigue, Arthralgia, And Myalgia, Muscle weakness, Spinal pain: i. Back Pain; ii Neck pain; Severity of Musculoskeletal symptoms**:**

Myalgia Localization	Arthralgia Localization
Widespread	Widespread
Local	Joint pain (Wrist, Elbow, Shoulder, Hip, Knee,

	Ankle)

Factors contributing to symptoms:

Comorbidities	Personal Habit	Physical Activity	Medication
Hypertension, Diabetes, Cardiovascular disease, Kidney disease, Lung disease, Liver disease, Obesity, Hypothyroidism	Smoking, Alcohol, Leaf	Daily Exercise before COVID-19, Daily Exercise after COVID-19	No medicine used, Medicine used no effect, Medicine used side effect

2 Literature Review

Myalgia and joint discomfort are additional prevalent COVID-19 symptoms. In 25 to 50% of individuals, the pain manifests during the acute stage of the illness. It has been shown that myalgia at the beginning of SARS-CoV-2 infection is linked to a higher risk of post COVID-19 syndrome development and the existence of post COVID-19 musculoskeletal symptoms. In the latter scenario, the pain from the acute phase persists and plays a significant role in the development of long COVID-19. Several long-term studies in Turkey, France, and Italy followed COVID-19 patients 6 months after discharge. After 6 months, approximately 60% of patients still had at least one SARS-CoV-2-related symptom. Fatigue, myalgia, and joint pain were the most common, with average prevalence of 30%, 20%, and 15%, respectively. Long COVID-19 pain has been shown to be associated with fatigue and is more common in women.[9]

According to a different researcher, the American Thoracic Society (ATS) standards for community-acquired pneumonia were used to determine the COVID-19 severity (severe vs. no-severe) at the time of data collection. Localizations of myalgia and arthralgia were closely examined, and a numerical rating scale was used to determine the severity of myalgia. Given that fatigue is a multidimensional phenomenon, we employed the visual analog scale (VAS) to evaluate both physical and mental exhaustion separately. The majority of the patients (41.3%) experienced extensive myalgia, and 33 patients (22.0%) had back pain regardless of myalgia, according to the distribution of musculoskeletal symptoms. Joint discomfort was most prevalent in the wrist (16.7%), ankle (16.0%), and knee (15.3%) areas.[10]

Patients with COVID-19 experience pain symptoms brought on by musculoskeletal changes, which seem to be the same everywhere. The patient's discharge from the intensive care unit (ICU) may be delayed by prolonged immobilization and mechanical ventilation (MV), as well as the restoration of respiratory and physical functions, which was lower their quality of life. This is among the most severe effects of prolonged immobility, leading to a delayed transition off of mechanical ventilation (MV) and an extended hospital stay. Patients with COVID-19 infections who were hospitalized reported mild to moderate widespread pain that mimicked the pattern of musculoskeletal pain, according to reports (myalgias or COVID-19-induced muscle pain). Therefore, researchers and doctors should make figuring out the existence and cause of potential sequelae encountered by post COVID-19 patients a top priority. It is quite likely that the development of chronic pain is one of the potential post COVID-19 consequences based on these underlying mechanisms of COVID-19 infection.[11]

Chronic pain, with its high burden and prevalence in the general population, represents another pandemic crisis in modern society. Among other comorbidities, COVID-19 has a clear functional impairment.[12] It is crucial for physical therapists to continue learning about the functional effects of

COVID-19 in order to choose the right treatment plan for each patient, especially in the COVID-19 pandemic age. Physical therapists are crucial in helping hospitalized patients breathe easier and move around actively.[13] According to the World Health Organization, musculoskeletal disorders are issues that impact the locomotors system, specifically the bones, muscles, joints, tendons, and ligaments (WHO).[15] Generalized pain (myalgia) is a common symptom experienced by patients with the coronavirus 2, 2019 disease (COVID-19) during the acute phase with an estimated prevalence ranging from 15% to 20%. Owing to the worldwide COVID-19 outbreak.[18] The incidence of musculoskeletal pain would be expected to raise by 3 different ways: (1) by the increasing number of people developing de novo musculoskeletal pain as a post-COVID sequelae; (2) by exacerbating pain in infected individuals with preexisting conditions; and in addition, (3) by increasing pain symptoms in no infected people with musculoskeletal pain conditions due to COVID-19 surrounding factors (e.g. lockdown, isolation, or stress). In fact, current literature supports that patients with chronic pain (but not infected) reported an increase in their symptoms and their pain interference during the main lockdown.[21] According to various meta-analyses, about 60% of COVID-19 survivors were develop post-COVID-19 symptoms (i.e. extended COVID-19) in the months following the infection.[22]

One of the nations in the globe most impacted by COVID-19 is Bangladesh. Targeting 1.9 million Bangladeshi people who tested positive for COVID-19 in labs, the sample size was calculated.[23] With regard to population density, Bangladesh ranks seventh in the world, and Musculoskeletal Health Complaint (MHC) and associated impairments have increased alarmingly. According to a prior study, Dhaka is where 57.2% of bank employees with MHC work and sedentary office workers with LBP are more likely to have 36.6% prevalence rates. Unexpectedly, a recent case-control study from Bangladesh indicates that the prevalence of Musculoskeletal Health Complaint (MCH) among Bangladeshi COVID-19 survivors is more than twice that of their healthy counterparts.[24] Another researcher find out the effects of COVID-19 on the nervous and musculoskeletal systems may manifest as anosmia, olfactory function impairment, myalgia, muscle weakness, and Guillian Barre Syndrome.[25]

Some of investigator showed that the prevalence of neurological and musculoskeletal manifestations of COVID-19 was 35% for smell impairment, 33% for taste impairment, 19% for myalgia, 12% for headache, 10% for back pain, 3% for acute cerebrovascular disease, and 2% for impaired consciousness. Similarly, symptoms such as muscle weakness, myalgia, vision impairment, and arthralgia can interfere with patients' ability to carry out activities of daily living (ADL). When people are able to carry out ADL, they tend to have better quality of life.[26] In addition, two of the most important factors about COVID-19 are that it is highly contagious and most of the people infected may not present with any notable symptoms such as fever and cough.[27] SARS-CoV-2, the virus causing COVID-19, has changed the world in the last 2 years. After the worldwide outbreak leading to millions of acute cases and thousands of deaths, another important development is the occurrence or persistence of symptoms after the acute phase of SARS-CoV-2 infection (i.e. long COVID or post–COVID-19). This hypothesis is supported by a recent meta-analysis reporting a pooled prevalence of post–COVID-19 symptoms of 54% (95% CI, 44%-63%) among hospitalized patients and of 34% (95% CI, 25%-46%) among non-hospitalized patients.[28] A total of 734 instances were analyzed by the researcher. Around 80.11 % of those without diabetes and 19.89% of those with diabetes were involved in his study. Long-term COVID-19 patient complications varied significantly by age group in both diabetic and non-diabetic patients. According to the researcher, nearly all COVID-19 patients had cardiovascular disease (24%), respiratory disease (11%), and a history of heart attack (10%). In COVID-19 diabetes patients, this was

statistically significant. The researcher also stated that COVID-19 was polluted by a variety of people, either directly or indirectly. According to the findings, (49.6%) of COVID patients had direct interaction, 57.4% had indirect contact, and (39%) had contact with returnees. Breathing problems, such as shortness of breath and fast breathing, were also shown to be considerably more common in COVID-19 individuals. Chills, chest pain, cough, aches and pains, sore throat, running nose, weariness, vomiting, conjunctivitis, diarrhea, loss of smell, loss of taste, and hair loss were not observed to be significantly different between COVID-19 individuals with and without diabetes.[29] Data from a meta-analysis of 47,910 individuals with long-COVID and a protracted course of COVID-19 show that 19% of them reported pain in joints of varied locations. SARS-direct CoV-2's cytopathogenic action, as well as the systemic immunological inflammation that develops in response to infection, cause joint tissue destruction. According to survey results, 92.3 percent of COVID-19 patients reported musculoskeletal issues at the time of admission. One month following hospitalization, 56.3 percent of patients had pain syndrome. Myalgia was observed in 40.55 percent of subjects three months after COVID-19, joint pain in 39.18 percent, back pain in 31.62 percent, and lower back pain in 24.74 percent. After 6 months, 18.59 percent of patients still have joint pain, 15.09 percent have myalgia, 14.39 percent have back pain, and 11.23 percent have lower back pain. Patients reported new-onset pain in 50.8 percent of instances, with 38.5 percent having pain of moderate severity (3 points on the visual analog scale.[30] Muscle pain was the most prevalent new pain, affecting 70% of patients, followed by headaches (67%), chest discomfort (64%), and joint pain (64%). (59 percent). A third of the patients reported new pain in their abdomen or other areas. There have been allegations of mental illness. Mental health issues were reported by 41% of patients, with respiratory or cardiac comorbidity recorded by 17% of these individuals. 37 percent of patients said they had respiratory or cardiac problems, or both. Only a few people said they had trouble swallowing, incontinence, a skin rash, or a fever.[31]

3. Materials and Methods

Study Design: This study was conducted as cross-sectional study design.

Study Area: The study was conducted in selected CRP- Mymensingh, BAU Centre and Rebalance Physiotherapy Centre.

Sample Size: Sampling procedure for cross sectional study done by following equation $n = \frac{z^2 pq}{d^2}$ Here, z =1.96, which correspond to 95% confidence level, A study showed proportion Prevalence post covid-19 musculoskeletal symptoms 56.3%.[8], p= 0.56 (from 56.3% prevalence), q =1-p =1- 0.56= 0.437, d= degree of accuracy desire, usually set at 0.05% So, sample size, n= $\frac{(1.96)^2 \times 0.563 \times 0.437}{(0.05)^2}$ = 378.0610 ~ 378

Non response 10% error was added ; Hence, final sample size was =378+10%=378+37.8=415.8 ~ 420

Ref. Karaarslan et. al in a study of Turkey in 2021 found that 56.3% Prevalence post COVID-19 musculoskeletal Symptoms.

Inclusion Criteria: Both male and female patients aged more than 18 years suffered from COVID-19 disease confirmed by RT-PCR test. Patients having musculoskeletal problems

Exclusion criteria: Severely ill patients

Data collection Instruments and Methods: A semi-structured questionnaire was prepared on the basis of the objectives of the study. For data collection used (Socio demographic profile, Musculoskeletal Symptoms, Comorbidity). To find out musculoskeletal symptoms used visual analog scale (VAS) and Modified Chalder fatigue scale. Data was collected by face to face interview.

Data Management Corrected data (n=413) was entered into the computer. **Data Analysis** The data was analyzed by using the SPSS version 20. Statistical significant was set at 95% confidence interval (CI). Chi-square test was performed to test the hypothesis (severity of weakness, musculoskeletal pain and daily exercise after COVID-19). Data was presented using frequency table, graph and chart.
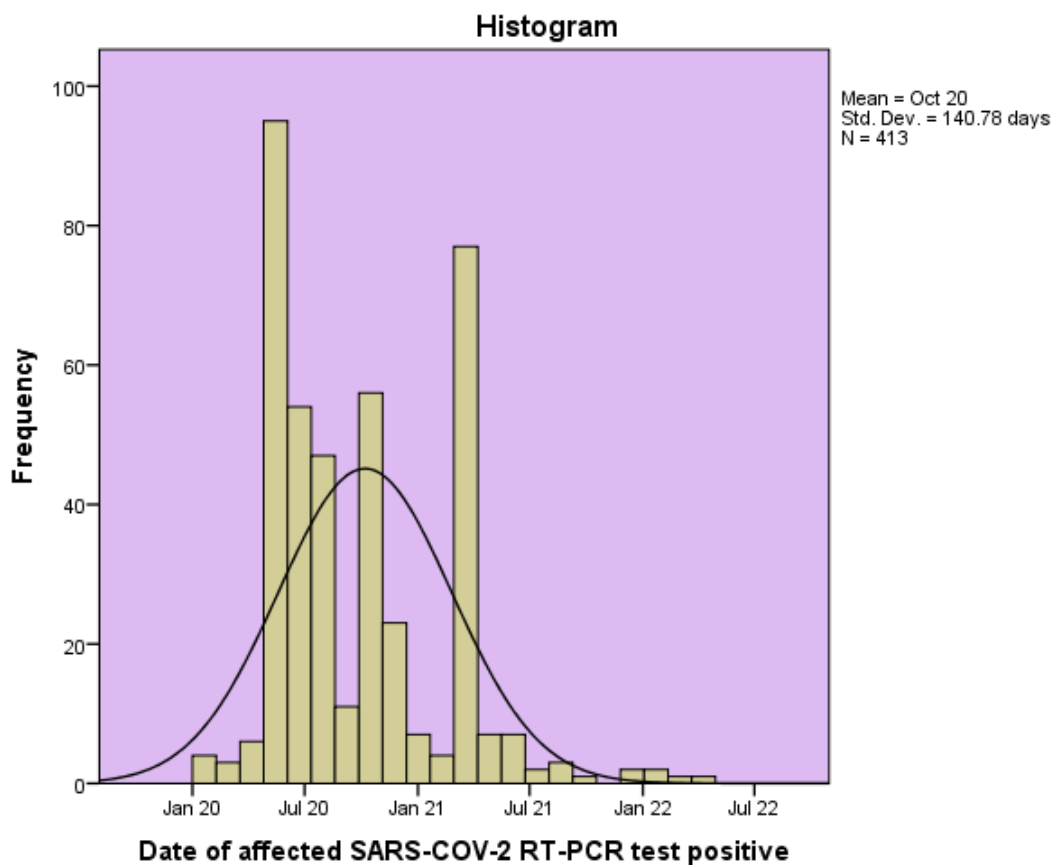
4. RESULTS

Socio-demographic variable

Distribution of the respondents by age (n=413) Among the 413 participants mean ± SD=40.09±16.01, min= 10 years and max= 79 years of age. The study showed that the 413 participants 118 (28.60%) were female and 295 (71.40%) were male. In percentage 32.40% participants were rural area and 67.60% were urban area.

Table-1: Distribution of the respondents by Management of COVID-19 (n=413)

Variable	Frequency (n)	Percentage (%)
Healthcare at home	237	57.4%
Hospitalized Cabin / Ward	149	36.1%
ICU/HDU	24	5.8%
Others	3	0.7%
Total	413	100%

Histogram — Date of affected SARS-COV-2 RT-PCR test positive. Mean = Oct 20, Std. Dev. = 140.78 days, N = 413

This study was performed in 413 patients (295[71.40%] male and 118[28.60%] female) with minimum Jan' 20 and maximum April' 22 affected COVID-19. In this study found (n=85[20.6%]) Jun'20 most

affected COVID-19.

Health related information Post COVID-19 patients.

Table-2: Distribution of the respondents by Comorbidities before COVID-19 (n=129)

Variable	Frequency (n)	Percentage (%)
Hypertension	19	14.7%
Diabetes	63	48.9%
Cardiovascular disease	7	5.4%
Lung disease	6	4.6%
Liver disease	20	15.5%
Obesity	2	1.6%
Hyperthyroidism	5	3.9%
Others	7	5.4%
Total	129	100%

*Multiple Responses

Table-3: Distribution of the respondents by Comorbidities after COVID-19 (n=284)

Variable	Frequency (n)	Percentage (%)
Hypertension	44	15.5%
Diabetes	56	19.7%
Cardiovascular disease	24	8.5%
Lung disease	16	5.6%
Liver disease	118	41.5%
Obesity	10	3.5%
Hyperthyroidism	12	4.3%
Others	4	1.4%
Total	284	100%

*Multiple Responses

Table-4: Distribution of the respondents by typical symptoms of COVID-19 (n=413)

Typical Symptoms	Frequency (n)	Percentage (%)
Fever	345	23.2%
Cough	269	18.1%
Loss of Appetite	94	6.3%
Fatigue	129	8.7%
Shortness of breath	116	7.8%
Diarrhea	35	2.4%
Sore Throat	76	5.1%
Loss of taste	156	10.5%
Loss of smell	179	12%
Dyspnea	70	4.7%

*Multiple Responses

Table-5: Distribution of the respondents by medication taken after COVID-19 (n=413)

Medication	Frequency (n)	Percentage (%)
No medicine used	75	18.2%
Medicine taken no effect	305	73.8%
Medicine taken side effect	33	8.0%
Total	413	100%

Table-6: Distribution of the respondents by newly affected after Post COVID-19 diseases (n=413)

Variable	Frequency (n)	Percentage (%)
Respiratory disease	114	27.6%
Musculoskeletal symptoms	230	55.7%
Neurological disease	7	1.7%
Cardiovascular disease	19	4.6%
Others	43	10.4%
Total	413	100%

Musculoskeletal symptom of Post COVID-19 patients in terms of Diseases Severity

Table-7: Distribution of the respondents by musculoskeletal Pain after Post COVID-19 diseases (n=413)

Variable	Frequency (n)	Percentage (%)
Acute pain	269	65.1%
Chronic pain	123	29.8%
Not at all	21	5.1%
Total	413	100%

Table-8: Distribution of the respondents by musculoskeletal pain after post COVID-19 diseases in different area of body part

Variable	Frequency (Percentage %)	
	N	Percent
Upper limb	156	25.3%
Lower limb	134	21.7%
Back	235	38.1%
Head and Neck	92	14.9%
Total	617	100.0%

*Multiple Responses

Table-9: Distribution of the respondents by musculoskeletal pains

Distribution of musculoskeletal pain		
	Total (N=413)	
	N	(Percentage %)
Myalgia Localization		

Widespread	155	37.5
Local	197	47.7
Arthralgia Localization		
Wrist	31	7.5
Elbow	8	1.9
Shoulder	35	8.5
Chest wall	6	1.5
Hip joint	5	1.2
Knee	71	17.2
Ankle	15	3.6
Foot	5	1.2
Widespread	116	28.1

*Multiple Responses

Table-10: Distribution of the respondents by musculoskeletal symptoms (n=413)

Musculoskeletal Symptoms	Frequency (n)	Percentage (%)
Fatigue	277	29.70%
Myalgia	315	33.80%
Arthralgia	106	11.40%
Back pain	164	17.60%
Neck pain	71	7.60%

*Multiple Responses

Fatigue and other factor related information among post COVID-19 Patients

Table-11: Distribution of respondents by perform exercise before COVID-19 (n=413)

Variable	Frequency (n)	Percentage (%)
Do not Perform Exercise regularly	342	82.8%
Performed Exercise regularly	71	17.2%
Total	413	100%

Table-12: Distribution of respondents by perform exercise after COVID-19 (n=413)

Variable	Frequency (n)	Percentage (%)
Do not Perform Exercise regularly	191	46.2%
Performed Exercise regularly	222	53.8%
Total	413	100%

Table-13: Distribution of respondents by weakness after COVID-19 (n=413)

Severity of weakness	Frequency	Percentage (%)
Mild	267	64.6%
Moderate	99	24.0%
Severe	64	11.4%

Total	n=413	100%

Table-14: Distribution of respondents by Memory changed after COVID-19 (n=413)

Memory changed after COVID-19	Frequency	Percentage (%)
Decreased	221	53.5%
Increased	26	6.3%
Same as before	166	40.2%
Total	413	100%

Table-15: Association between Gender and Severity of weakness (n=413)

Gender	Severity of weakness			Total
	Mild	Moderate	Severe	
Male	196 (66.44%)	67 (22.71%)	32 (10.85%)	295 (100%)
Female	71(60.17%)	32 (27 12%)	15 (12.71%)	118 (100%)
Total	267 (64.65%)	99(23.97%)	47 (11.38%)	413 (100%)
X^2 (df) = 1.453 (2); p=0.484				

Table-15 found the association between Gender and Severity of weakness. Among the 295 male respondents 66.44% have mild weakness, 22.71% have moderate weakness and 10.85% have severe weakness. Among the 118 female respondents 60.17% have mild weakness, 27 12% have moderate weakness and 12.71% have severe weakness. Severe weakness is more in female 12.71% then male 10.85%. Here Chi-Square value is 1.453 and p-value is 0.484. Since p-value is >0.05. So, cannot reject null hypothesis. This means there is no association between Gender and severity of weakness at 95% confidence interval.

Table-16: Association between Gender and suffering musculoskeletal pain after Post COVID-19 (n=413)

Suffering pain after COVID-19					
Gender	No pain	Mild pain	Moderate pain	Severe pain	Total
Male	19 (6.44%)	160 (54.24%)	105 (35.59%)	11 (3.73%)	295 (100%)
Female	10 (8.47%)	54 (45.76%)	42 (35.59%)	12 (10.17%)	118 (100%)
Total	29 (7.02%)	214 (51.82%)	147(35.59%)	23 (5.57%)	413 (100%)
X^2 (df) = 7.943 (3); p=0.047					

Table-16 showed that the association between Gender and suffering musculoskeletal pain after Post COVID-19. Among the 295 male respondents 6.44% have no pain, 54.24% have mild pain, 35.59% have moderate pain and 3.73% have severe pain suffering. Among the 118 female respondents 8.47% have no pain, 45.76% have mild pain, 35.59% have moderate pain and 10.17% have severe pain suffering. Severe pain is more in female 12 (10.17%) then male 11 (3.73%). Here Chi-Square value is 7.943 and p-value is 0.047. Since p-value is < 0.05. So, can reject null hypothesis. This means there is

significant association between Gender and suffering musculoskeletal pain after Post COVID-19 at 95% confidence interval.

Table-17: Association between Gender and daily exercise after COVID-19 (n=413)

Gender	performing daily exercise after COVID-19		Total
	Do not perform exercise regularly	Performed exercise regularly	
Male	122 (41.36%)	173 (58.64%)	295 (100%)
Female	69 (58.47%)	49 (41.53%)	118 (100%)
Total	191 (46.25%)	222 (53.75%)	413 (100%)
X^2 (df) = 9.936 (1); p=.002			

Table-17 investigated that the association between Gender and performing daily exercise after COVID-19. Among the 295 male respondents 41.36% have do not perform exercise regularly and 58.64% have Performed exercise regularly. Among the 118 female respondents 58.47% have do not perform exercise regularly and 41.53% have Performed exercise regularly. Here Chi-Square value is 9.936 and p-value is 0.002. Since p-value is < 0.05. So, can reject null hypothesis. This means there is significant association between Gender and performing daily exercise after COVID-19 at 95% confidence interval.

DISCUSSION

In this Study stated that among the 413 participants, 28.60% (n=118) were female and 71.40% (n=295) were male and the mean age of the participants was 40.09 (±SD: 16.01), age range of the participates less than 20 years to 70 years or more. Another study showed that among the 90 participants, 70% (n=63) males and the mean age of the participants was 45.43 years with the age range was 35 to 66 years.[36] The main similarity between these studies was the highest number of male participants and more or less similar mean age group. Residence showed 134 (28.60%) were from rural, 279 (71.40%) were from urban area. Given that study conducted by Huang and colleagues was in the city of Wuhan, China but the current study participants were from different areas i.e. rural and urban.[37] The study found that 413 participants there 116 (28.1%) participants were Job, 78 (18.9%) participants were businessman, 33 (8%) participants were teacher, 36 (8.7%) participants were housewife, 29 (7%) participants was doctor, 82 (19.9%) participants were student, 30 (7.3%) participants was Farmer and 09 (2.2%) participants others profession. Another researcher found that 60% (n=159; SD ± 6.51) Participants belonged to affected post-COVID various professional different types of job.[38] The main similarity between these studies was the highest number of participants was job holder.

This study identify that (n=85[20.6%]) Jun'20 most affected COVID-19. Two of study found that on 8 March 2020, Bangladesh reported its first confirmed case of COVID-19, first death from COVID-19 on 18th March[39] and Consequently, Bangladesh reported more than 1.19 million infected cases, with 19,779 deaths, as of 27 July 2021.[40] The main similarity between the studies was time period of COVID-19 affected.

More than half 57.4% (n=237) of the participants taking health care at home; 36.1% (n=149) of the participants admitted hospitalized cabin/ ward; 5.8% (n=24) of the participants taking support ICU/HDU and 0.7% (n=3) of the participants taking others management. Another study showed that among the 367

participants 51.0% (n=187) those admitted a ward and 49% (n=180) were treated at home and 5% had sever disease at the time of illness.[41] Another researcher also investigated that 100 patients were evaluated approximately 48 days after discharge from the hospital; in their study 72% of those who were in the ICU and 60.3% of those admitted to a ward reporting.[42] The main similarity between those studies was the most of number highest participants taken medication; majority treatment at home and lowest number of participant taken ICU/HDU Management. Jamil et al. in his study found that 94.3% have taken medication and 51.9% of respondents' musculoskeletal problems who were 31-40 years old.[49]

Pre and post existing Comorbidities of this study investigated that 19% (n=18), 14.71% (n=51) Hypertension; 38.7% (n=77), 27.6% (n=96) Diabetes; 3.5 % (n=7), 7.5% (n=26) Cardiovascular diseases; 3% (n=6), 1.7% (n=6) Pre-existing lung disease; 1% (n=2); 39.7% (n=138) Liver disease; 4% (n=8), 2% (n=7) Obesity; 4% (n=8), 1.7% (n=6) Hyperthyroidism; 2.3% (n=8), 1% (n=2) others. Karaarslan et al. surveyed 300 patients, 65% had at least one comorbidity and found that 97% hypertension, 85% diabetes mellitus the main similarity between these studies was the highest number of comorbidities.[2]

Table-4 Showed that typical Symptoms of COVID-19 suffering 23.2% (n=345) Fever, 18.1% (n=269) Cough ($p<0.05$), 6.3% (n=94) Loss of appetite, 8.7% (n=129) Fatigue ($p<0.05$), 7.8% (n=116) Shortness of breath, 2.4% (n=35) Diarrhea, 5.1% (n=76) Sore Throat, 10.5% (n=156) loss of taste, 12% (n=179) Loss of smell, 4.7% (n=70%) Dyspnea, 1.1% (n=17) Arthritis ($p<0.05$). Another Prospective and cross-sectional study conducted by Bargi G et al. they found his study symptoms of Post COVID-19 similarity between (55.6%), Cough, (37.8%) Fever, (73.3%) fatigue and (11.1%) shortness of breath.[6] Similarity of both researchers were found second highest numbers of fatigue symptoms present.

In the newly affected after Post COVID-19 Disease 27.6% (n=114) Respiratory diseases, 55.7% (n=230) Musculoskeletal symptoms, 1.7% (n=7) Neurological disease, 4.6% (n=19) Cardiovascular disease, 10.4% (n=43) others different types of disease (Mean 2.15; SD ±1.182). Another researcher found that 1969 participate cohort study post COVID-19 patients 45.1% highest number of musculoskeletal symptoms similar in this research.[43] Three small cohort studies providing prevalence rates of musculoskeletal post-COVID pain up to 60%.[44] In a study of 738 patients hospitalized for COVID-19, patients with myalgia at admission (n = 369) were more likely to experience persistent musculoskeletal pain (42.5%) compared with patients without myalgia (34.5%) at 7 months post-infection.[45]

Table-7 indicated that suffering after Post COVID-19 musculoskeletal 65.1%% (n=269) acute pain; 29.8% (n=123) Chronic pain and 5.1% (n=21) not felling any kind of pain (Mean 1.40; SD ±.585). One of the largest surveys, of 25,482 Japanese participants conducted in August 2020, observed that 10.4% of patients reported persistent pain during the pandemic, while only 6.3% of participants had pre-existing chronic pain. Loneliness and a perception of increased social isolation during the COVID-19 pandemic were associated with increased prevalence and incidence of all types of pain and pain intensity.[46] Similarity of this study was similarity number of participants suffering acute pain and chronic pain. The FAIR Health database of over 34 billion private healthcare claim records involving 1,959,982 COVID-19 patients, noted persistent pain in 5.1% of patients and was one of the five most common symptoms lasting 30 days or more after initial diagnosis.[47]

In the location of pain status (Table -8), 156 (25.3%) upper limb, 134 (21.7%) lower limb, 235 (38.1%) back and 92 (14.9%) head and neck. A similar study conducted in the two Spanish universities to find out the musculoskeletal pain among the 1198 students during the lockdown period. In this 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.[48] The main similarity between the studies was the regions of musculoskeletal complaint were almost in a similar location.

There was distribution of musculoskeletal pain (Table-9) Myalgia localization 37.5% (n=155), 47.7% (n=197) Widespread and Local Post COVID-19 musculoskeletal symptoms. Arthralgia localization 7.5% (n=31) wrist joint, 1.9% (n=8) elbow joint, 8.5 % (n=35) shoulder joint, 1.5% (n=6) Chest wall, 1.2% (n=5) hip joint, 17.2% (n=71) knee joint, 3.6% (n=15) ankle joint, 1.2% (n=5) Foot, 28.1% (n=116) widespread. Another study 250 respondents 82.4% of weaves have musculoskeletal pain. In this study also found that shoulder pain 48%, elbow pain 24%, knee pain 46%, wrist pain 34%, and ankle pain 25%.[49] The main similarity between the studies was the regions of musculoskeletal complaint were almost in a similar.

Figure-10 showed that major musculoskeletal symptoms faced by patients were 29.70% (n=277) Fatigue, 33.80% (n=315) Myalgia, 11.40% (n=106) Arthralgia, 17.60% (n=164) Back pain and 7.60% (n=71) Neck pain. Gulzar et al. showed that a quite large percentage of the enrolled patient suffered from fatigue 55%, myalgia 39%, and arthralgia 25%.[41] The main similarity of this study highest number of participant was fatigue. Another researcher also found that highest number of musculoskeletal symptoms was fatigue 44.3%.[2]

This study demonstrated that 342 (82.8%) participate did not perform a regular exercise before COVID-19 and 71 (17.2%) perform exercise regularly. In contrast, 192 did not perform a regular exercise after recovery from COVID-19 and 221 (53.5%) perform a regular exercise after recovery from COVID-19. Another investigator find out that 64 (71.11 %) participants did not perform a regular exercise before COVID-19 and 26 (28.89%) performed exercise regularly. In contrast, 60 (66.66%) did not perform exercise regularly after recovery from COVID-19 and 30 (33.34 %) exercise regularly after recovery from COVID-19.[36] The main similarity between the studies was the regions of exercise before and after COVID-19 were almost in a similar. The study conducted by Ambrose and colleagues aimed to find outpatient and caregiver guide to managing COVID-19 patients at home.[50] This study demonstrated a dose based exercise programs including exercises for chest, limbs and trunk with specific durations. From the best knowledge of the researcher any studies yet to find the exercise status of COVID-19 patients. Therefore, the current research helped to find a level of exercise importance at the individual level of COVID-19 patients. The current study focused that majority of individuals did not perform exercise regularly; whereas, Ambrose and colleagues focused on the importance of dose based regular exercise. The main similarity between the studies is the role of exercise for post-COVID-19 patients.

This study showed that medications taken of the respondent after COVID-19 were as 75 (18.2%) does take any kind of medicine, 305 (73.8%) taken medicine but no side effect, 33 (8.0%) taken medicine suffering different kind of side effect. Another study also found that only 3% of the participants needed to see a doctor due to the side effects of the vaccines, and 1% admitted to the hospital.[55] Similarity of this study was fewer side effects due taken medication.

The Severity of weakness showed 267 (64.6%) mild, 99 (24.0%) moderate and 64 (11.4%) severe weakness (Table-8). Another study find out severity of weakness showed 19 (21.11%) had mild, 50 (55.55%) moderate and 21 (27.76%) severe weakness.[36] The main similarity between the studies is the highest number of mild severity of weakness and component was similar.

The memory changed of post COVID-19 showed 221 (53.5%) decreased, 26 (6.3%) increased and 166 (40.2%) same as before memory. Another research showed that mental health and psychological consideration post COVID-19 outbreak 200 participants had 55% depression, 44% Nervousness,

moderate level of confusion & memory loss about 73%.[51] The main similarity between the studies is the highest number of memory loss.

This study also found a significant association between gender and musculoskeletal pain after COVID-19 ($p < 0.047$) and Daily exercise after COVID-19 ($p < 0.002$). Studies conducted by different researchers found a similar significant association ($p < 0.05$) between exercise and musculoskeletal symptoms [52] and duration and severity of COVID ($p < 0.05$).[53] In contrast, no significant association ($p > 0.05$) were found between gender and severity of weakness ($p > 0.484$). Furthermore, researchers from all over the world examined the relationship between COVID-19 and musculoskeletal symptoms, most notably low back pain. Sagat and colleagues found no significant association between home quarantine and musculoskeletal complaints such as low back pain, neck discomfort, shoulder pain, and overall weakness ($p > 0.05$).[54] The similarity between the current study and this study was the assessment of musculoskeletal symptoms and quite the opposite.

CONCLUSION

The study concluded that: This study results revealed the socio-demographic feature, current situation of Post COVID-19 Musculoskeletal symptoms in Mymensingh. A very high percentage of respondents had done good management at home after confirming COVID-19 and ICU/HDU among the respondents was very poor percentage. Higher percentage of participants in our study had suffering from musculoskeletal symptoms and most of them were suffering from acute pain in different area of body part. As a result, most of respondent was suffering from musculoskeletal pain like as back pain or low back pain, on the other hand; also find out most respondent suffering from myalgia and arthralgia pain and very poor percentage was arthralgia foot pain. Participant in our study was highest number of mild weakness and they have decreased memory after COVID-19 affected. There also significant association between musculoskeletal pain and Daily exercise after post COVID-19 of the respondents. To get a more accurate and precise result, the study needs to include the data of the different types of neurological, respiratory symptoms among Post COVID-19. It was help to get a comparative result of the musculoskeletal symptoms among post COVID-19 patients.

References

1. Kardeş S, Kuzu AS, Raiker R, Pakhchanian H, Karagülle M. Public interest in rheumatic diseases and rheumatologist in the United States during the COVID-19 pandemic: evidence from Google Trends. Rheumatology international. 2021 Feb; 41(2):329-34.

2. Karaarslan F, Demircioğlu Güneri F, Kardeş S. Postdischarge rheumatic and musculoskeletal symptoms following hospitalization for COVID-19: prospective follow-up by phone interviews. Rheumatology international. 2021 Jul; 41(7):1263-71.

3. Baj J, Karakuła-Juchnowicz H, Teresiński G, Buszewicz G, Ciesielka M, Sitarz R, Forma A, Karakuła K, Flieger W, Portincasa P, Maciejewski R. COVID-19: specific and non-specific clinical manifestations and symptoms: the current state of knowledge. Journal of clinical medicine. 2020 Jun; 9(6):1753.

4. Yelin D, Margalit I, Yahav D, Runold M, Bruchfeld J. Long COVID-19—it's not over until?. Clinical Microbiology and Infection. 2021 Apr 1; 27(4):506-8.

5. Ziadé N, Hmamouchi I, El Kibbi L, Abdulateef N, Halabi H, Abutiban F, Hamdi W, El Rakawi M, Eissa M, Masri B. The impact of COVID-19 pandemic on rheumatology practice: a cross-sectional

multinational study. Clinical rheumatology. 2020 Nov; 39(11):3205-13.

6. BARĞI G, ÖZONAY K. Assessment of neck pain, low back pain and disability in patients isolated at home due to mild-COVID-19: a cross-sectional study. Journal of Basic and Clinical Health Sciences. 2022 Jan 1; 6(1):155-63.

7. World Health Organization. Clinical management of severe acute respiratory infection when Novel coronavirus (nCoV) infection is suspected: interim guidance. January 2020. Accessed February 5, 2022. https://www.who.int/internal-publications- detail/clinical-management-of-severe-acute-respiratoryinfection-when-novel-coronavirus-(ncov)-infection-is-suspected

8. Karaarslan F, Demircioğlu Güneri F, Kardeş S. Postdischarge rheumatic and musculoskeletal symptoms following hospitalization for COVID-19: prospective follow-up by phone interviews. Rheumatology International. 2021 Jul; 41(7):1263-71.

9. Tosato M, Carfì A, Martis I, Pais C, Ciciarello F, Rota E, Tritto M, Salerno A, Zazzara MB, Martone AM, Paglionico A. Prevalence and predictors of persistence of COVID-19 symptoms in older adults: A single-center study. Journal of the American Medical Directors Association. 2021 Sep 1; 22(9):1840-4

10. Kardeş S, Erdem A, Gürdal H. Public interest in musculoskeletal symptoms and disorders during the COVID-19 pandemic. Zeitschrift für Rheumatologie. 2022 Apr; 81(3):247-52.

11. Romero EA, Carnero JF, Pérez JL, Rolando LM, Villafañe JH. Addressing post-COVID-19 musculoskeletal symptoms through telemedicine: a study protocol. F1000Research. 2022 Aug 4; 11(898):898.

12. Pancera S, Bianchi LN, Porta R, Galeri S, Carrozza MC, Villafañe JH. Feasibility of subacute rehabilitation for mechanically ventilated patients with COVID-19 disease: A retrospective case series. International Journal of Rehabilitation Research. 2021 Mar 1; 44(1):77-81.

13. Puspita DN, Achadi A, Syafitri PK. Physical Therapy Intervention for the Hospitalized Covid-19 Patient. Syntax Literate; Jurnal Ilmiah Indonesia. 2022 Feb 24; 7(2):2710-27.

14. Tharani SA, Borkar P. Prevalence of Musculoskeletal Disorders in Post-COVID-19 Patients-A Systematic Review. Intentional Journal of Health Science and Research. 2022 Mar; 12(3):374-80.

15. Patel NP, Sheth MS. Comparison of Musculoskeletal Disorders in School Going Children Before and After COVID-19. International Journal of Health Sciences and Research. 2021; 11(5):67-73.

16. Disser N P, De Micheli A J, Schonk MM, Konnaris M A, Piacentini A N, Edon D L, Toresdahl B G, Rodeo S A, Casey E K, Mendias C L. Musculoskeletal consequences of COVID-19. The Journal of bone and joint surgery. American volume. 2020 Jul 7; 102(14):1197.

17. Demirel E, Şahin A, Mustafa UT, Çepni Ş, Veizi E, Veizi BG. A relationship between musculoskeletal pain and prognosis in hospitalized COVID-19 patients. Journal of Health Sciences and Medicine. 2021; 4(3):300-5.

18. Fernández-de-Las-Peñas C, Cancela-Cilleruelo I, Moro-López-Menchero P, Rodríguez-Jiménez J, Gómez-Mayordomo V, Torres-Macho J, Pellicer-Valero OJ, Martín-Guerrero JD, Hernández-Barrera V, Arendt-Nielsen L. Prevalence of Musculoskeletal Post-COVID Pain in Hospitalized COVID-19 Survivors Depending on Infection with the Historical, Alpha or Delta SARS-CoV-2 Variant. Biomedicines. 2022 Aug 11; 10(8):1951.

19. Peeri NC, Shrestha N, Rahman MS, Zaki R, Tan Z, Bibi S, Baghbanzadeh M, Aghamohammadi N, Zhang W, Haque U. The SARS, MERS and novel coronavirus (COVID-19) epidemics, the newest

and biggest global health threats: what lessons have we learned? International journal of epidemiology. 2020 Jun 1; 49(3):717-26.

20. 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.

21. Ciaffi J, Meliconi R, Ruscitti P, Berardicurti O, Giacomelli R, Ursini F. Rheumatic manifestations of COVID-19: a systematic review and meta-analysis. BMC rheumatology. 2020 Dec; 4(1):1-5.

22. Aiyegbusi OL, Hughes SE, Turner G, Rivera SC, McMullan C, Chandan JS, Haroon S, Price G, Davies EH, Nirantharakumar K, Sapey E. Symptoms, complications and management of long COVID: a review. Journal of the Royal Society of Medicine. 2021 Sep; 114(9):428-42.

23. World Health Organization. WHO Coronavirus (COVID-19) Dashboard. WHO Coronavirus (COVID-19) Dashboard with Vaccination Data. WHO; 2021:1-5. Accessed November 8, 2022. https://covid19.who.int/

24. Ali M, Bonna AS, Sarkar AS, Islam A. Is coronavirus infection associated with musculoskeletal health complaints? Results from a comprehensive case-control study. Journal of Primary Care & Community Health. 2022 Jul; 13:21501319221114259.

25. Adhikari SP, Meng S, Wu YJ, Mao YP, Ye RX, Wang QZ, Sun C, Sylvia S, Rozelle S, Raat H, Zhou H. Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: a scoping review. Infectious diseases of poverty. 2020 Dec; 9(1):1-2.

26. Abdullahi A, Candan SA, Abba MA, Bello AH, Alshehri MA, Afamefuna Victor E, Umar NA, Kundakci B. Neurological and musculoskeletal features of COVID-19: a systematic review and meta-analysis. Frontiers in neurology. 2020:687.

27. Bai Y, Yao L, Wei T, Tian F, Jin DY, Chen L, Wang M. Presumed asymptomatic carrier transmission of COVID-19. Jama. 2020 Apr 14; 323(14):1406-7.

28. Fernández-de-Las-Peñas C, Rodríguez-Jiménez J, Cancela-Cilleruelo I, Guerrero-Peral A, Martín-Guerrero JD, García-Azorín D, Cornejo-Mazzuchelli A, Hernández-Barrera V, Pellicer-Valero OJ. Post–COVID-19 Symptoms 2 Years after SARS-CoV-2 Infection among Hospitalized vs Nonhospitalized Patients. JAMA Network Open. 2022 Nov 1;5(11):e224210

29. Akter F, Mannan A, Mehedi HH, Rob MA, Ahmed S, Salauddin A, Hossain MS, Hasan MM. Clinical characteristics and short term outcomes after recovery from COVID-19 in patients with and without diabetes in Bangladesh. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2020 Nov 1; 14(6):2031-8.

30. Shavlovskaya OA, Bokova IA, Shavlovskiy NI. Post-COVID pain syndrome: a review of international observations. Neurology, Neuropsychiatry, Psychosomatics. 2022 Apr 18; 14(2):91-7.

31. Halpin SJ, McIvor C, Whyatt G, Adams A, Harvey O, McLean L, Walshaw C, Kemp S, Corrado J, Singh R, Collins T. Postdischarge symptoms and rehabilitation needs in survivors of COVID-19 infection: a cross-sectional evaluation. Journal of medical virology. 2021 Feb; 93(2):1013-22.

32. Xu Z, Shi L, Wang Y, Zhang J, Huang L, Zhang C, Liu S, Zhao P, Liu H, Zhu L, Tai Y. Pathological findings of COVID-19 associated with acute respiratory distress syndrome. The Lancet respiratory medicine. 2020 Apr 1; 8(4):420-2.

33. Eastin C, Eastin T. Clinical characteristics of coronavirus disease 2019 in China: Guan W, Ni Z, Hu Y, et al. N Engl J Med. 2020 Feb 28 [Online ahead of print. Journal of Emergency Medicine. 2020 Apr 1; 58(4):711-2.

34. Shi H, Han X, Jiang N, Cao Y, Alwalid O, Gu J, Fan Y, Zheng C. Radiological findings from 81 patients with COVID-19 pneumonia in Wuhan, China: a descriptive study. The Lancet infectious diseases. 2020 Apr 1; 20(4):425-34.

35. East M, America N, America S, Platform GD, Platform AD, Platform AD, Platform AD, Map GD. Symptom Duration and Risk Factors for Delayed Return to Usual Health Among Outpatients with COVID-19 in a Multistate Health Care Systems Network—United States, March–June 2020.

36. Numan SM. Musculoskeletal symptoms and its associated factors among post-COVID-19 patients attended in a rehabilitation centre. Int J Med Sci Clin Invent. 2021; 8(3):5251-7.

37. Huang Y, Tu M, Wang S, Chen S, Zhou W, Chen D, Zhou L, Wang M, Zhao Y, Zeng W, Huang Q. Clinical characteristics of laboratory confirmed positive cases of SARS-CoV-2 infection in Wuhan, China: A retrospective single center analysis. Travel medicine and infectious disease. 2020 Jul; 36:101606.

38. Shammi M, Bodrud-Doza M, Islam AR, Rahman MM. Strategic assessment of COVID-19 pandemic in Bangladesh: comparative lockdown scenario analysis, public perception, and management for sustainability. Environment, Development and Sustainability. 2021 Apr; 23:6148-91.

39. Patwary MM, Bardhan M, Disha AS, Kabir MP, Hossain MR, Alam MA, Haque MZ, Billah SM, Browning MH, Kabir R, Swed S. Mental health status of university students and working professionals during the early stage of COVID-19 in Bangladesh. International Journal of Environmental Research and Public Health. 2022 Jun 2; 19(11):6834.

40. Anwar S, Nasrullah M, Hosen MJ. COVID-19 and Bangladesh: challenges and how to address them. Frontiers in public health. 2020 Apr 30; 8:154.

41. 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).

42. Moreno-Pérez O, Merino E, Leon-Ramirez JM, Andres M, Ramos JM, Arenas-Jiménez J, Asensio S, Sanchez R, Ruiz-Torregrosa P, Galan I, Scholz A. Post-acute COVID-19 syndrome. Incidence and risk factors: A Mediterranean cohort study. Journal of Infection. 2021 Mar 1;82(3):378-83.

43. Fernández-de-Las-Peñas C, de-la-Llave-Rincón AI, Ortega-Santiago R, Ambite-Quesada S, Gómez-Mayordomo V, Cuadrado ML, Arias-Navalón JA, Hernández-Barrera V, Martín-Guerrero JD, Pellicer-Valero OJ, Arendt-Nielsen L. Prevalence and risk factors of musculoskeletal pain symptoms as long-term post-COVID sequelae in hospitalized COVID-19 survivors: A multicenter study. Pain. 2022 Sep 1; 163(9):e989-96.

44. Bakılan F, Gökmen İG, Ortanca B, Uçan A, Eker Güvenç Ş, Şahin Mutlu F, Gökmen HM, Ekim A. Musculoskeletal symptoms and related factors in postacute COVID-19 patients. International journal of clinical practice. 2021 Nov; 75(11):e14734.

45. Fernández-de-Las-Peñas C, Rodríguez-Jiménez J, Fuensalida-Novo S, Palacios-Ceña M, Gómez-Mayordomo V, Florencio LL, Hernández-Barrera V, Arendt-Nielsen L. Myalgia as a symptom at hospital admission by severe acute respiratory syndrome coronavirus 2 infection is associated with persistent musculoskeletal pain as long-term post-COVID sequelae: a case-control study. Pain. 2021 Dec 1; 162(12):2832-40.

46. Yamada K, Wakaizumi K, Kubota Y, Murayama H, Tabuchi T. Loneliness, social isolation, and pain following the COVID-19 outbreak: data from a nationwide internet survey in Japan. Scientific reports. 2021 Sep 20; 11(1):18643.

47. FAIR Health. A detailed study of patients with long-haul COVID. An analysis of private healthcare claims, 2021.

48. Leirós-Rodríguez R, Rodríguez-Nogueira Ó, Pinto-Carral A, Álvarez-Álvarez MJ, Galán-Martín MÁ, Montero-Cuadrado F, Benítez-Andrades JA. Musculoskeletal pain and non-classroom teaching in times of the COVID-19 pandemic: Analysis of the impact on students from two Spanish universities. Journal of Clinical Medicine. 2020 Dec 15;9(12):4053.

49. Jamil S, Mukul ME, Bari QI, Akhter A, Hasan M, Islam MM, Saha T, Hossain MJ. Prevalence and factors associated with musculoskeletal pain among rural handloom weavers in Sirajganj, Bangladesh. Bangladesh Pharmaceutical Journal. 2022 Jul 30; 25(2):188-98.

50. Ambrose AF, Bartels MN, Verghese TC, Verghese J. Patient and caregiver guide to managing COVID-19 patients at home. Journal of the International Society of Physical and Rehabilitation Medicine. 2020 Mar; 3(2):53-68.

51. Jawad MJ, Abbas MM, Jawad MJ, Hassan SM, Hadi NR. Mental Health and psychosocial considerations post covid-19 outbreak. Wiad Lek. 2021 Jan 1; 74(12):3156-9.

52. Wackerhage H, Everett R, Krüger K, Murgia M, Simon P, Gehlert S, Neuberger E, Baumert P, Schönfelder M. Sport, exercise and COVID-19, the disease caused by the SARS-CoV-2 coronavirus. Deutsche Zeitschrift für Sportmedizin. 2020 May 1; 71(5):E1-2.

53. Qi M, Li P, Moyle W, Weeks B, Jones C. Physical activity, health-related quality of life, and stress among the Chinese adult population during the COVID-19 pandemic. International journal of environmental research and public health. 2020 Sep; 17(18):6494.

54. Šagát P, Bartík P, Prieto González P, Tohănean DI, Knjaz D. Impact of COVID-19quarantine on low back pain intensity, prevalence, and associated risk factors among adult citizens residing in riyadh (Saudi Arabia): A cross-sectional study. International journal of environmental research and public health. 2020 Oct; 17(19):7302.

55. Alhazmi A, Alamer E, Daws D, Hakami M, Darraj M, Abdelwahab S, Maghfuri A, Algaissi A. Evaluation of side effects associated with COVID-19 vaccines in Saudi Arabia. Vaccines. 2021 Jun 18; 9(6):674.

56. Evcik D. Musculoskeletal involvement: COVID-19 and post COVID 19. Turkish Journal of Physical Medicine and Rehabilitation. 2023 Mar; 69(1):1.