Faculty of Medicine

University of Dhaka

Scope of Rehabilitation for Patients attended for Neuro-Muscular Rehabilitation with Long COVID Symptoms in Bangladesh.

By

Md. Waliul Islam

Master of Science in Physiotherapy

Registration no: 5318

Roll no: 106

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We the undersigned certify that we have carefully read and recommended to the Faculty of Medicine, University of Dhaka, for acceptance of this thesis entitled,

"**Scope of Rehabilitation for Patients attended for Neuro-Muscular Rehabilitation with Long COVID Symptoms in Bangladesh."**

Submitted by **Md. Waliul Islam** for the partial fulfillment of the requirements for the degree of Master of Science in Physiotherapy.

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Declaration Form

- This work has not previously been accepted in substance for any degree and isn't concurrently submitted in candidature for any degree.
- This dissertation is being submitted in partial fulfillment of the requirements for the degree of MSc in Physiotherapy.
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Date: 22nd June, 2022

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List of Abbreviations

BHPI	Bangladesh Health Professions Institute
C-19	COVID-19
CRP	Centre for the Rehabilitation of the Paralysed
IRB	Institutional Review Board
PCS	Post-corona virus syndrome
YRS	Yorkshire rehabilitation scale

Abstract

Background: There is still a scarcity of evidence about the clinical severity of symptoms and functional disability in post coronavirus disease 2019 (COVID) Syndrome (PCS).

Aim: To assess the scope for rehabilitation of the parson with long-covid symptoms by using Yorkshire Rehabilitation scale.

Methodology: A cross-sectional study. A stratified sample of 452 participant were selected from divisional centers of Centre for the Rehabilitation of the Paralised.

Result: Among 452 participants, the prevalence of post-covid symptoms of fatigue, breathlessness, and pain was, respectively, 34.3%, 12.2%, and 20%. The correlation between symptom severity, functional disability, and overall health was explored. The mean age was 37.95 years, with 148 (32.7%) females. Symptoms and functional difficulties increased substantially when compared to before infection. Three distinct severity phenotypes of mild (n = 90), moderate (n = 186), and severe (n = 94) were identified. Symptom scores were strongly positively correlated with functional difficulty scores (0.889, $p < 0.001$) and negatively correlated with overall health (-0.658, $p < 0.001$).

Conclusion: Severity phenotypes can help stratify patients for targeted interventions and rehabilitation care planning.

Keywords: C19-YRS, Long COVID, Phenotypes, Post-COVID-19 condition, SARS CoV-2.

CHAPTER I INTRODUCTION

1.1 Background

The coronavirus disease (COVID-19) epidemic has posed a serious threat to worldwide public health. COVID-19 is the consequence of a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection that was initially isolated and identified in patients in December 2019 at a seafood market in Wuhan, Hubei Province, China. The findings of SARS-CoV and Middle East respiratory syndrome coronavirus (MERS-CoV) are similar (Zhu et al., 2020). Since the identification of the new coronavirus, SARS-CoV2, scientists have been discussing its origin (Andersen et al., 2020). SARS-CoV-2 is thought to be the consequence of laboratory experiments. However, genomic evidence suggests that SARS-CoV-2 did not originate from a previously known virus backbone (Almazán et al., 2014).

Coronaviruses are divided into four categories. There are six members of the coronavirus family, including the human illnesses Cov229E and CoV-HKU1. The coronavirus family includes the human diseases CoV-OC43, SARS-CoV, and MERS-CoV (Lefkowitz et al., 2018). The amino acid sequences in the seven conserved domains of the genomic open reading frame 1ab (ORF1ab) are 94.6 percent identical to the original SARS-CoV (Zhou et al., 2020) SARS-CoV-2 is spread by infected animal hosts and other people. The most likely first hosts of SARSCoV-2 are bats, with pangolins serving as intermediate hosts. Patients who are both sick and asymptomatic are contagious. However, how long virus shedding lasts and how transmissibility changes over the disease's natural history are unknown (Shi et al., 2020).

COVID-19 transmission is the spread of coronavirus illness 2019 from person to person. COVID-19 is mostly spread through the air by droplets and small airborne particles harboring the virus. People who are infected expel such particles while they breathe, talk, cough, sneeze, or sing. When people are physically near, transmission is more likely. Infection can, however, spread across longer distances, particularly indoors (Wang et al., 2021).

The SARS-CoV-2 virus can infect a wide range of cells and systems in the body. COVID 19 is well known for its effects on the upper respiratory system (sinuses, nose, and throat) and the lower respiratory tract (bronchitis, pneumonia, and bronchitis) (windpipe and lungs). Because COVID 19 accesses host cells through the receptor for the enzyme angiotensin-converting enzyme 2 (ACE2), which is most commonly found on the surface of type II alveolar cells, the lungs are the organs most affected. The virus penetrates the host cell by forming a unique surface glycoprotein called a "spike" that connects to the ACE2 receptor (Letko et al., 2020).

COVID 19 infects the ciliated epithelium of the naso-pharynx and upper airways after viral introduction (Marik et al., 2021). One typical symptom is loss of smell, which is caused by infection of the olfactory epithelium's support cells, which causes damage to the olfactory neurons. Many medical papers have reported on the involvement of both the central and peripheral nerve systems in COVID 19 (Guerrero et al., 2021). Because ACE2 is extensively expressed in the glandular cells of the gastric, duodenal, and rectal epithelium, as well as endothelial cells and enterocytes of the small intestine, the virus also affects these organs (Mönkemüller et al., 2020).

The virus can cause immediate myocardial injury as well as persistent cardiovascular disease. Acute cardiac injury was discovered in 12% of infected persons admitted to a hospital in Wuhan, China, and is more common in severe disease. The systemic inflammatory response and immune system problems during illness progression cause a high rate of cardiovascular symptoms, but acute myocardial damage may also be associated to ACE2 receptors in the heart. ACE2 receptors are abundant in the heart and play a role in cardiac function (Zheng et al., 2020).

People with COVID 19 infections who were admitted to intensive care units (ICU) showed a greater prevalence of thrombosis and venous thromboembolism, which could be associated to a poor prognosis. High D-dimer levels induced by blood clots are thought to play a role in mortality, and cases of clots leading to pulmonary embolisms and ischemic events within the brain have been described as complications leading to death in persons infected with SARS-CoV-2 (Wadman et al., 2020).

The SARS-CoV-2 virus mostly affects the respiratory system, although it can also impact other organ systems. The original case series from Wuhan, China, revealed indications of lower respiratory tract infection such as fever, dry cough, and dyspnea. There were other reports of headaches, dizziness, general weakness, vomiting, and diarrhea (Shi et al., 2020).

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. (Xu et al., 2020).

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 co-morbidities 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) (Eastin & Eastin, 2020).

Lymphopenia is common in COVID-19 individuals; the total white blood cell count is usually normal, slightly lower in mild instances but higher in severe or critically ill patients. Indicators of systemic inflammation, such as ferritin and C-reactive protein (CRP) levels in the blood, as well as erythrocyte sedimentation rate (ESR), can be enhanced in the presence of high amounts of circulating pro-inflammatory cytokines and chemokines (Shi et al., 2020).

It is now commonly acknowledged that COVID-19 respiratory symptoms are quite varied, ranging from mild symptoms to severe hypoxia with ARDS. According to the Wuhan research, the interval between the commencement of symptoms and the development of ARDS was as little as 9 days, implying that respiratory symptoms could escalate quickly (Huang et al., 2020). This disease has the potential to be fatal. A growing number of persons with severe ailments have died around the world. Epidemiological research have revealed that mortality rates are greater in the elderly population and significantly lower in children (Qiu et al., 2020).

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 (Eastin & Eastin, 2020).

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 (Shi et al., 2020).

Until now, a large number of studies have been reports based on China's experiences. During the early stages of the pandemic, COVID-19 cases were mostly found in the elderly. The number of infections among individuals 65 and older increased as the outbreak advanced, but there was also a surge among minors (aged 18). At first, there were more male patients, but as the number of cases grew, there was no significant gender difference. Incubation took an average of 5.2 days. The fatality rate was 2.3 percent overall (Wu & McGoogan, 2020).

Perego coined the word "long COVID" via social media to describe the persistence of symptoms weeks or months after initial SARS-CoV-2 infection, while Watson and Yong coined the term "long haulers" (Yong, 2022). "Long COVID" refers to the existence of numerous symptoms weeks or months after contracting SARS-CoV-2 infection, regardless of viral state. It is also known as "post-COVID syndrome." It might be continuous or intermittent in character (Nabavi, 2020).

There are numerous difficulties in diagnosing extended COVID. The period required for clinical recovery varies depending on the severity of the illness, and accompanying difficulties make defining the cut-off point for diagnosis problematic. A large proportion of SARS-CoV-2 infected people are asymptomatic, and many would not have had any tests to confirm SARS-CoV-2 infection. If these people acquire many symptoms later on, diagnosing protracted COVID without prior proof of SARS-CoV-2 infection is difficult. Varied nations have different testing policies, and it is typical practice during a pandemic to diagnose clinically based on symptoms without any confirmatory tests. As a result, the continuation of symptoms in persons who have never been tested for COVID is a challenge (Raveendran, 2021). SARS-CoV-2 has expanded globally since the epidemic in China. As of early April 2020, the United States has the highest reported number of COVID-19 patients, followed by Spain, Italy, Germany, France, and China. The Chinese pandemic had a tremendous impact on Italy. As in the Chinese series, the mortality rate was higher in the elderly population. The case-fatality rate in Italy was 7.2 percent, which was three times higher than the rate in China (Onder et al., 2020).

Within a month, the outbreak had a negative impact on the world economy and societies. Public healthcare is experiencing unprecedented challenges as a result of the global COVID-19 pandemic. The WHO urged Southeast Asia to take immediate and effective public health steps to curb the pandemic's escalating transmission rate. However, in the last two months, both COVID-19 infection and death rates have grown across the South Asian area, particularly in India, Pakistan, and Bangladesh (World Health Organization, 2020).

Following the early detection of COVID-19 in Wuhan, the Bangladeshi government began testing Chinese tourists on January 22, 2020 at Dhaka's Hazrat Shahjalal International Airport. On March 8, 2020, the first three coronavirus cases in Bangladesh were traced back to Italy. Bangladesh announced its first COVID-19 death of a person over 70 years old with additional morbidities on March 18, 2020 ("Institute of Epidemiology Disease Control and Research") [IEDCR]", 2020).

Surprisingly, while many developed countries, notably the United States, the United Kingdom, Italy, and Spain, suffered significantly during the COVID-19 epidemic while having very effective healthcare systems, many less developed countries with weak healthcare systems fared better. Where has the magic gone? Unfortunately, no magic exists. Rather, the reality beneath this intriguing façade presents a different story (Changoiwala, 2020).

According to an Italian study, 87 percent of persons who were recovered and discharged from hospitals still had at least one symptom after 60 days. In this group, 32% experienced one or two symptoms, whereas 55% had three or more. There was no fever or other signs of severe sickness in these patients. Fatigue (53.1 percent), decreased quality of life (44.1 percent), dyspnoea (43.4 percent), joint discomfort (27.3 percent), and chest pain were the most commonly reported issues (21.7 percent). Other symptoms included a cough, skin rashes, palpitations, headache, diarrhea, and a 'pins and needles' sensation. In addition to mental health difficulties such as anxiety, despair, and post-traumatic stress disorder, patients reported an inability to do regular everyday chores (Carfì, Bernabei and Landi, 2020).

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 co-morbidity, 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 (Tenforde et al., 2020).

1.2 Rational

Bangladesh is a densely populated country with limited healthcare resources; controlling COVID-19 will be impossible without public participation. COVID-19 expresses itself differently in each person. Inflammation of the lungs and airways is a common symptom that makes breathing difficult. These symptoms can occur when COVID-19 is mild, moderate, or severe. People who become really ill as a result of this viral infection are at risk of developing pneumonia. This causes the lungs to fill with fluid and mucus, making breathing and receiving enough oxygen even more difficult. Breathing exercises do not protect against COVID-19 and should not be used in place of using a mask, avoiding social situations, or getting vaccinated.

It is recognized that greater research on the type, prevalence, and length of extended COVID experienced by affected patients, as well as any associated risk factors, is urgently needed in order to improve overall therapeutic therapy. This is especially true in low-to middle-income countries like Bangladesh, where the majority of the population lives in rural areas outside of Dhaka, the capital city, which is extremely densely populated. As the COVID-19 pandemic countries, the health care system has been planning how to best meet the long-term rehabilitation needs of people who have suffered due to COVID, as well as those whose health and level of activity have declined during the COVID pandemic. We must ensure the services are available to function so that the outcome is not adversely affected by the essential pandemic response.

The Yorkshire rehabilitation scale was developed to identify the existing symptom severity during long-term COVID and with that, it is possible to correlate with rehabilitation needs for a person with COVID symptoms. Which is applicable for both diagnosed and undiagnosed people (Manoj et al., 2021). There is a need to understand how much rehabilitation service is essential for people with COVID symptoms regardless of whether they are positive or native cases within Bangladeshi society. For example, people who are seeking rehabilitation with COVID symptoms in this research study, we aim to explore the scope of rehabilitation for people with long-term COVID symptom.

1.3 Operational definition

COVID-19: Coronavirus disease, also known as COVID-19, is a viral infection caused by the SARS-CoV-2 virus. Most people who contract COVID-19 will have mild to moderate symptoms and will recover without further treatment. Some, though, will become very ill and require medical attention.

Long COVID: Long COVID is a condition marked by long-term repercussions that persist or develop after the standard COVID-19 convalescence phase. It is also referred to as post-COVID-19 syndrome, post-COVID-19 condition, post-acute COVID-19 sequelae (PASC), or chronic COVID syndrome (CCS).

Rehabilitation: Rehabilitation is a collection of actions meant to improve functioning and reduce disability in people with chronic illnesses who interact with their surroundings.

Neuro-Muscular Rehabilitation: Neuromuscular rehabilitation is the diagnosis and treatment of neurological problems, which include your brain, nerves, and spinal cord.

The COVID-19 Yorkshire rehabilitation scale (C19-YRS): An award-winning digital screening and monitoring tool for remotely managing people with COVID symptoms. C19-YRS is a clinically validated outcome measure developed during the first wave of the pandemic by clinical academics at The University of Leeds. The National Institute for Health Research has financed its continued development and delivery optimization.

1.4 Aim of the study

- To evaluate the scope of Rehabilitation for Patients attended for Neuro-Muscular Rehabilitation with Long COVID Symptoms in Bangladesh.

1.5 Objectives of the study

- Find out the existing symptoms.
- Screening the severity of symptom using COVID-19 Yorkshire rehabilitation scale
- To assess the scope rehabilitation for people with long COVID symptoms.
- To investigate association between socio-demographic information and YRS subscale.
- To find out correlation between C19-YRS subscales.

1.6 List of Variables

Dependent variable	Independent variable
Joint pain	Gender
Muscle spasm	Age
Muscle weakness	Sex
Headache	Level of education
Functional level	Co-morbidities
Mental status	Health status
Memory problem	Living area
Post-traumatic stress	Rehabilitation

Figure 1: Dependent and independent variable

CHAPTER II LITERATURE REVIEW

A four-week poll in the UK discovered that approximately 1 million persons, or 1.5 percent of the population, self-reported lengthy COVID symptoms. The poll also discovered that 18.5 percent of participants said that their everyday activities had been significantly impacted by the illness, demonstrating that extended COVID has a negative impact on day-to-day activities. Even many persons who had extended COVID claimed that they were unable to return to their prior levels of work and were constantly burdened by the symptoms, thus this should be treated seriously (Davis et al., 2021).

Recent research supports the creation of a new illness called as 'lasting COVID/post-COVID-19 syndrome,' a phrase used to describe a variety of symptoms that linger after a COVID-19 infection has been confirmed. According to current estimates, 10% of patients in the UK have chronic or worsening symptoms after the acute viral infection has resolved. According to Italian researchers, 60 days after the disease's inception, 87.1 percent of COVID-19 released patients still have at least one symptom, and 55 percent have three or more symptoms, such as dyspnea, chest discomfort, exhaustion, and decreased quality of life (Carfì, Bernabei, and Landi, 2020).

The general population's ICU admission rate was 9.3 percent, according to a new study by Rubio-Rivas et al. 2020. The abnormal persistence of signs and symptoms for more than four weeks after the resolution of SARS-CoV-2 infection has received little attention, and no studies in primary care, where the bulk of COVID-19 diagnoses are made, have been done.

According to the most recent UK estimates based on an unweight sample of 9063 people infected with COVID-19, 22% of those infected with COVID-19 still have symptoms 5 weeks after infection, and 10% have symptoms after 12 weeks. COVID patients have long struggled to be heard, and it is gratifying that the scientific and medical communities are finally paying attention (National Statistics, 2022).

Few Chinese research have focused on OD and GD in COVID19 patients. Only one study appears to have described these two symptoms. Mao et al. (2020) discovered that the most common peripheral nervous system symptoms of SARS-CoV-2 infection were hypogeusia and hyposmia in 5.6 percent of patients in their investigation of neurological symptoms of SARS-CoV-2 infection. These figures are far lower than those recorded in Europe and the United States. Long-term lung function impairment, persistent pulmonary parenchymal abnormalities, decreased physical ability, muscle mass loss, anxiety, depression, cognitive deficits, post-traumatic stress disorder, weariness, and poor health status will affect a considerable number of COVID-19 patients (van den Borst et al., 2020).

The COVID Symptom Study is a one-of-a-kind prospective population-based study that collects daily reports of symptoms from millions of people. The smartphone app provides a guided interface for reporting a variety of baseline demographic information and comorbidities [as previously reported] and was created by Zoe Global Limited with cooperation from physicians and scientists from King's College London and Massachusetts General Hospital. With continuous use, participants offer daily updates on symptoms, information on health care visits, COVID-19 testing results, and whether they are seeking medical assistance, including the level of intervention and related outcomes. Individuals infected with COVID-19 may present with a variety of symptoms, according to case reports. We expected that longitudinal symptoms reported during the disease would cluster into various categories with varying therapeutic needs (Li, 2019).

Twenty-three studies indicated some degree of Long COVID-related social and family-life impairment, with functional limits and some degree of disability affecting 12% to 50% of individuals affected. Sixteen studies revealed occupational and financial repercussions, long absence periods ranging from 9% to 59 percent (up to 7 months after acute disease), modified workloads ranging from 8% to 45 percent, and employment loss ranging from 11% to 14% of those afflicted (Auriemma and Iannaccone, 2020).

Covid-19 has had an unprecedented impact thus far, and long-term repercussions could be even more damaging. Recent evidence suggests that in many people who have had covid-19, a variety of symptoms can persist after the acute infection has cleared, a condition known as persistent covid. Long covid is defined by the National Institute for Health and Care Excellence (NICE) as symptoms that persist or develop after acute covid-19 infection and cannot be explained by another diagnosis. This phrase encompasses continuous symptomatic covid-19 from four to 12 weeks after infection, as well as post-covid-19 syndrome after 12 weeks (Overview | COVID-19 fast guideline: controlling COVID-19's long-term consequences. Guidance | NICE, 2022).

Over the previous few months, severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection has been verified in millions of people worldwide, resulting in thousands of hospitalizations. During the hospital stay, several symptoms such as fever, cough, exhaustion, dyspnoea, headache, diarrhoea, nausea, and vomiting were recorded. Only 13% of previously hospitalized COVID-19 patients were fully free of any COVID-19-related symptom 60 days after the onset of the first, whereas 32% had 1 or 2 symptoms and 55% had 3 or more (Carfì et al., 2020). However, it has been observed that 10–30% of COVID-19 survivors will acquire so-called extended COVID syndrome, characterized by ongoing disease symptoms such as fatigue, shortness of breath, "brain fog," fever, anxiety, melancholy, sleep disturbances, and gastrointestinal problems (Logue et al., 2021). In a systematic review and meta-analysis of the long-term effects of COVID-19, the five most prevalent symptoms were fatigue (58%) headache (44%), attention disturbance (27%), hair loss (25%), and dyspnea (25%). (24 percent). Even in nonhospitalized patients with modest illness in the acute period, these symptoms may take months to resolve (López-León et al., 2021). In a survey of 292 respondents in the United States, 94 percent (274) reported having one or more symptoms at the time of testing; 35 percent of these symptomatic respondents reported not having returned to their usual state of health by the date of the interview (median = 16 days from the testing date), including 26 percent among those aged 18–34 years, 32 percent among those aged 35–49 years, and 47 percent among those aged 50 years. Among those who reported coughing, exhaustion, or shortness of breath during testing, 43 percent, 35 percent, and 29 percent, respectively, continued to experience these symptoms during the interview.

These data suggest that COVID-19 can cause protracted sickness even in people with milder outpatient illnesses, such as young adults. Effective public health message aimed towards these populations (Tenforde et al., 2020). Inpatients were older, Hispanic, and more likely to report dyspnea than outpatients among 350 questioned patients (271 [77 percent] outpatients versus 79 [23 percent] inpatients). At 14–21 days, fewer inpatients (39 percent, 20 of 51) reported a return to baseline health than outpatients (64 percent, 150 of 233) ($p = 0.001$). In all, roughly half (46%) of patients had known close contact with someone infected with COVID-19 in the previous two weeks. This was most usually a family member (45%) or a coworker (34 percent). Approximately two-thirds of participants (64 percent, 212 of 333) were employed; just 35 of 209 (17 percent) were allowed to telework. These findings underline the importance of screening, case investigation, contact tracing, and isolation of affected people in order to control SARS-CoV-2 spread (Garg et al., 2020).

Although there has been a considerable body of research on the short-term results of COVID-19 inpatients, the literature is devoid of data on the long-term outcomes of patients who survive the acute phase of the disease. It can be predicted that the majority of survivors with a mildly symptomatic presentation (80%) will not have long-term effects and will eventually recover completely. There have been no reports of mid-term consequences in patients with fairly severe clinical presentations who required hospitalization but not mechanical ventilation. Patients with severe clinical presentation requiring mechanical ventilation, on the other hand, may be predicted to have long-term problems and incomplete recovery (e.g., reduced exercise capacity) (Kim et al., 2020).

Long-term follow-up studies on discharged patients' persisting symptoms, lung function, physical, and psychological difficulties are critically needed. Only a few studies with small sample sizes have been published, with the longest follow-up period being three months after hospital discharge. Some patients reported persistent symptoms such as fatigue and dyspnea, reduced pulmonary function, and chest imaging abnormalities after hospital discharge, although the entire range of post-discharge characteristics is still unclear. Furthermore, no studies have yet reported extra pulmonary organ symptoms that may persist after acute injury or be novel after discharge (Huang et al., 2020).

Despite the fact that the literature on post-COVID symptoms is still in its early stages, "longhaulers" report a wide range of symptoms affecting various systems: neurocognitive post-COVID (brain fog, dizziness, loss of attention, confusion), autonomic post-COVID (chest pain, tachycardia, palpitations), gastrointestinal post-COVID (diarrhea, abdominal pain, vomiting), respiratory post-COVID (ageusia, anosmia, parosmia, skin rashes). Indeed, the bulk of published studies on post-COVID symptoms to date have found that 50–70% of hospitalized patients had several post-COVID symptoms up to 3 months after release. The data from COVID-19 patients who were not hospitalized is sparse, but it shows that 50–75 percent of them are symptom-free one month after starting treatment. Post-COVID symptoms are expected to be minor (Stavem et al., 2020). It appears that once the acute phase of the infection has passed, 80 percent of COVID-19 survivors may experience post-COVID symptoms. According to a recent meta-analysis released as a preprint, the top three post-COVID symptoms are fatigue, headache, and concentration difficulties. However, the variability in how these symptoms manifest underlines the importance of better phenotype and characterizing post-COVID (Carson, 2021). So far, just a few studies have looked into COVID-19's psychological effects, and the bulk of them lack a control group. According to studies, up to a quarter of SARS-CoV-2 patients develop neurological and psychosocial sequel such as depression and anxiety. The mechanisms underlying SARS-CoV-2 infection and its effects on the nervous system must be investigated in order to identify the interplay between neurological symptoms, including those manifesting as psychological symptoms, the virus, and the immune response. In the current pandemic situation, case-control studies with matched control groups are critically needed. 2021) (Carson). Impaired DLCO was found in 39 percent of patients discharged from the hospital after COVID-19, but it was twice as common in severe cases as it was in non-severe cases, according to a comprehensive examination of pulmonary functions in patients discharged from the hospital following COVID-19. Despite the fact that these data come from a small number of investigations and cases with short-term follow-up, Wu and colleagues found that the prevalence of defective DLCO reduces over time. In addition, the comprehensive review discovered restrictive spirometer patterns in 15% of patients and obstructive spirometer patterns in 7% of patients (Torres-Castro et al., 2020).

A total of 734 instances were analyzed by the researcher. Around 80.11 percent of those without diabetes and 19.89 percent of those with diabetes were involved in his study. Long-term COVID patient complications varied significantly by age group in both diabetic and non-diabetic patients. According to the researcher, nearly all COVID patients had cardiovascular disease (24%), respiratory disease (11%), and a history of heart attack (10 percent). 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 (Akter et al., 2020).

Though the actual date differs according to reports, it's largely thought that the outbreak began in Wuhan around December 12, 2019, when a few patients presented with similar medical symptoms such as fever, cough, dyspnea, and atypical pneumonia. On December 29, four cases of pneumonia of unknown cause were publicly reported by local hospitals using a surveillance method set up after the 2002-2003 SARS epidemic with the purpose of allowing early identification of novel infections. All four of these scenarios were designed to have a connection to a neighboring seafood market that provided non-aquatic wild creatures for stay. Three Broncho alveolar lavage fluid samples from one patient were used to try to identify the causal bacterium. Whole genome sequencing and bioinformatics analyses found out that the virus functions had been usual of the beta-coronavirus 2B lineage of the coronavirus. Additionally, the genome of the radical virus became located to be 96% same to the bat. A bat coronavirus detected in Rhinolophus affine from Yunnan province. On December 31, the Chinese government alerted the World Health Organization (WHO) of those instances (Chams et al., 2020).

A recent meta-analysis of long-COVID in children showed the vital need of incorporating a control group in research on this area, as the frequency of SPS was similar when comparing COVID-19 kids to non-COVID-19 patients. As a result, in order to create cohort studies that add significant information to the existing literature, a non-exposed cohort of patients without COVID-19 must be included (Behnood et al., 2022).

A total of 1325 people were evaluated in a study (PH: 547, 41.3 percent; PED: 212, 16 percent; NH: 566, 42.7 percent). The NH group was younger than the PH and PED groups. All groups had comparable rates of onward specialist referral (NH 18.7 percent, PH 16.1 percent, and PED 18.9 percent, p=0.452), but were more likely to seek assistance with dyspnea (23.7 percent, 5.5 percent, and 15.1 percent) and weariness (17.8 percent, 4.8 percent and 8.0 percent). Patients who were hospitalized had a greater prevalence of pulmonary emboli, persistent lung interstitial abnormalities, and other organ damage. 716 (54.0%) people reported having less than 75 percent ideal health (median 70 percent, IQR 55 percent – 85 percent). At first assessment, less than half of employed people could return to work full-time. In PH and NH patients, post-COVID-19 symptoms were substantial, with significant ongoing healthcare demands and utilization (Heightman et al., 2021).

Data from a meta-analysis of 47,910 individuals with long-COVID and a protracted course of COVID 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 (Shavlovskaya, Bokova and Shavlovskiy, 2022). 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).

Patients with new-onset pain during COVID had lower quality of life indicators and a negative link with the intensity of the pain syndrome, which was significant (Shavlovskaya, Bokova and Shavlovskiy, 2022).

A total of 55 recovered patients took part in the trial. SARS-CoV-2 infection symptoms were observed in 35 of them, and 39 patients had varying degrees of radiological abnormalities. The occurrence of CT abnormalities was linked with urea nitrogen content at admission (P = 0.046, OR 7.149, 95 percent CI 1.038 to 49.216). Lung function issues were found in 14 patients, and D-dimer levels measured at admission may be beneficial for predicting impaired diffusion defect (P = 0.031, OR 1.066, 95 percent CI 1.006 to 1.129). In all, 47 of 55 patients tested positive for SARS-CoV-2 IgG in serum, with female patients producing more IgG antibodies than male patients during the infection recovery phase (Zhao et al., 2020).

In the absence of prospective trials, the long-term recovery rate of chemo sensitive function has yet to be determined. Despite the fact that many articles claim that most patients recover completely after a few weeks, psychophysical tests have showed that roughly 25% of those assessed 30 days after the therapeutic start of Covid-19 have serious chemo sensitive difficulties (i.e., anosmia, ageusia, severe hyposmia or severe hypogeusia). Clearly, there is still the possibility of delayed recovery, but the combination of frequent, chronic severe chemo sensitive dysfunction and the high prevalence of infection suggests that a significant number of patients will have potentially long-term morbidity (Spinato et al., 2020).

At 12 weeks, the prevalence of long COVID symptoms was 16.1 percent in a study of 2198 patients conducted in Bangladesh. The most common long-term COVID symptoms were fatigue, pain, dyspnea, cough, anosmia, appetite loss, headache, and chest pain. Over a 21.85.2-week period, people living with and affected by long COVID experienced 1 to 8 long COVID symptoms. The length of protracted COVID was anticipated to be connected with younger age, female gender, rural habitation, prior functional limitation, and smoking by structural equation modeling (Hossain et al., 2021).

Yorkshire Rehabilitation Screening (C19-YRS) can be used for screening various types' persistence symptoms or Complication Long Covid-19. This Scale followed or covered all components of ICF Framework. This scale also helps to find out functional disability in individuals with Long Covid or post Covid syndrome. This scale had contained 0-10 Scale items which helps to identified or enables monitoring of problems across different time points of the conditions with captured or snap shoot which intervention or management taken initially (Sivan et al., 2020)

For capturing patients' symptoms, functional impairment, and overall sense of health, the C-19 YRS scale proved to be the most effective and clinically useful measure. C19YRS performed well (Cronbach's coefficient = 0.891). Individual subscales showed a high level of consistency. Many complications as a result of such Long Covid were included in the study by the researcher. The most common symptom was weariness, which was reported by 97.3 percent of patients in varied degrees, followed by the onset of discomfort, which was not present before COVID-19 infection (94.3 percent). 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. (O'Connor and colleagues, 2021). The C19-YRS (COVID-19 Yorkshire Rehabilitation Scale) is the most effective for measuring the persistence of lengthy COVID symptoms or the treatment result. The self-reported version of the C19-YRS provided information on the intensity of symptoms, functional impairment, and overall health. Yorkshire Rehabilitation Scale, COVID-19, 2022). With the rising number of PCS cases, it's more important than ever to identify symptom clusters, symptom intensity, and daily functioning impairment. Appropriate actions and treatment regimens can be recommended. The goal of this study was to see if there were any phenotypes of symptom severity in a community PCS cohort with a substantial proportion of non-hospitalized patients, and to figure out what the link was between symptom severity, functional impairment, and overall health in PCS.

CHAPTER III METHODOLOGY

3.1 Study design

It was a quantitative type of research study, and the study design was cross-sectional. According to Hicks (1999), quantitative research was used because the data was collected from a number of participants. A cross-sectional study can be thought of as providing a snapshot of the frequency and characteristics of a disease in a population at a particular point in time. A cross-sectional study design was used for a large number of participants to collect data (Etikan et al., 2016).

3.1.1 Important characteristics of a cross-sectional study:

Researchers can conduct a cross-sectional study over a given period of time using the same set of variables. Similar studies may look at the same variable of interest, but each study looks at a different group of people. Unlike longitudinal studies, where variables might change over time, cross-sectional analysis evaluates issues in a single instance with a clear start and stop point. Cross-sectional studies allow the researcher to look at one independent variable and one or more dependent variables as the subject of the investigation.

3.2 Study Area

Data was collected from all divisional center and headquarter of Centre for the Rehabilitation of Paralysed (CRP). CRP focuses on physical, emotional, social, psychological, and economic elements of medical treatment, rehabilitation, and support services. It encourages the country's development of trained professionals in health care and rehabilitation. CRP has established centers in many parts of the country in conjunction with other organizations to expand services for the disabled. It supports handicapped people's empowerment through community-based services, campaigning and networking on disability issues, and disabled girls and women's empowerment. CRP also fosters disability awareness on a national, regional, and international level.

3.3 Study population

The persons with long COVID symptoms attending Rehabilitation center for neuro-muscular rehabilitation.

3.4 Study Duration

Study period was from 1st August 2021 to March 2022.

3.5 Sample Size

The sample size has been calculated as the estimation of sampling scientifically and will be selected as the standard number of the sample as a calculation guide. It is also checked with EPI info software by the CDC.

Mathematical Tools:

N = number of samples

p = sample proportion /percentage of incidence & prevalence =1.5

P is calculated according to total literature (Hossain et al., 2021) and population of Bangladesh 16, 62, 31,089.

q =1-p

z =1.96 (constant)

e=margin of error 5%=.05

The equation of sample size calculation is given below-

$$n = \frac{z^2 pq}{e^2}$$

$$= \frac{(1.96)^2 \times 0.5 \times (1-0.5)}{(0.05)^2}$$

$$= \frac{3.8416 \times 0.5 \times 0.5}{0.0025}$$

$$= \frac{0.9406}{0.0025}$$

$$= 384$$

3.6 Sampling scheme

Sampling is the process of determining the number and type of participants who take part in a study. A stratified random sampling technique was used for this study. Stratified random sampling is a sampling method in which a population is divided into smaller sub-groups called strata. Strata are produced in stratified random sampling, or stratification, depending on shared features or characteristics among individuals, such as geographical area (Wang & Cheng, 2020). In the current study, a rehabilitation center from each division was selected as strata. Within each stratum, all participants who meet the inclusion criteria are chosen for an interview. There was a specific time frame for drawing samples. A sample is collected until it meets the requirements (sample size).

3.6.1 The advantages and disadvantages of stratified random sampling.

Stratified sampling provides several advantages over random sampling. A stratified sample of the same size can be more precise than a random sample of the same size. Because a stratified sample provides higher precision, it sometimes needs a smaller sample size, which saves money. With a stratified sample, an "unrepresentative" sample can be prevented (e.g., an all-male sample from a mixed-gender population). We can ensure that we have enough sample points for each subgroup to be analyzed separately. When compared to simple random sampling, stratified sampling has two primary limitations. It's probable that it'll take more time and effort to administer than a basic random sample. In addition, the analysis is more computationally challenging.

3.7 Inclusion Criteria

- The people with covid symptom attending for neuro-muscular rehabilitation.
- Age 18 and above

3.8 Exclusion Criteria

- Patients who are not willing to communicate or participate.
- Significant physical and mental illness.

3.9 Outcome Measurement tools

1. A semi-structured questioner

   Including

   a. Socio-demographic information
   b. Symptom checklist
   c. COVID-19 Yorkshire rehabilitation scale (C-YRS)

3.9.1 C19-YRS

The On C19-YRS, researchers collected demographic data, medical history, and 16 key symptoms of PCS (including breathlessness, persistent cough, fatigue, pain or discomfort, cognitive problems, anxiety, depression, symptoms of posttraumatic stress disorder [PTSD], palpitations, dizziness, weakness, and sleep problems) as well as their impact on five daily functions (communication, mobility, personal care, wider activities of daily living, and social functions) and their impact on five daily functions (communication, mobility, personal care, wider activities of daily living (Sivan et al., 2021). The respondent rates each symptom or functional ability on a scale of 0 to 10 for each (0 being no presence of symptom and 10 being most severe and life disturbing). A 0–10 numerical rating scale (NRS) is also used to assess overall health. Respondents are also asked to rate their pre-illness, which is unique to the C19- YRS and this study. In a group of Italian hospitalized patients, the C19-YRS was a useful patient-reported outcome for screening, measuring severity, and monitoring the persistence of symptoms after 12 and 26 weeks post SARSCoV2 infection. When compared to other existing scales, the selected single items of the scale revealed strong construct validity, indicating that the scale can be used to thoroughly capture the multisystem state. The measure also assisted in identifying multifaceted rehabilitation needs (physical and psychological). Through a full bio-psychosocial examination, which can inform individualized intervention. With a bigger sample size, more study on construct validity and responsiveness is required. In both hospitalized and non-hospitalized patients, a sample was taken. Furthermore, the Italian version of the C19-YRS requires a cross-cultural translation.

3.9.2 Mapping of tool to the ICF framework

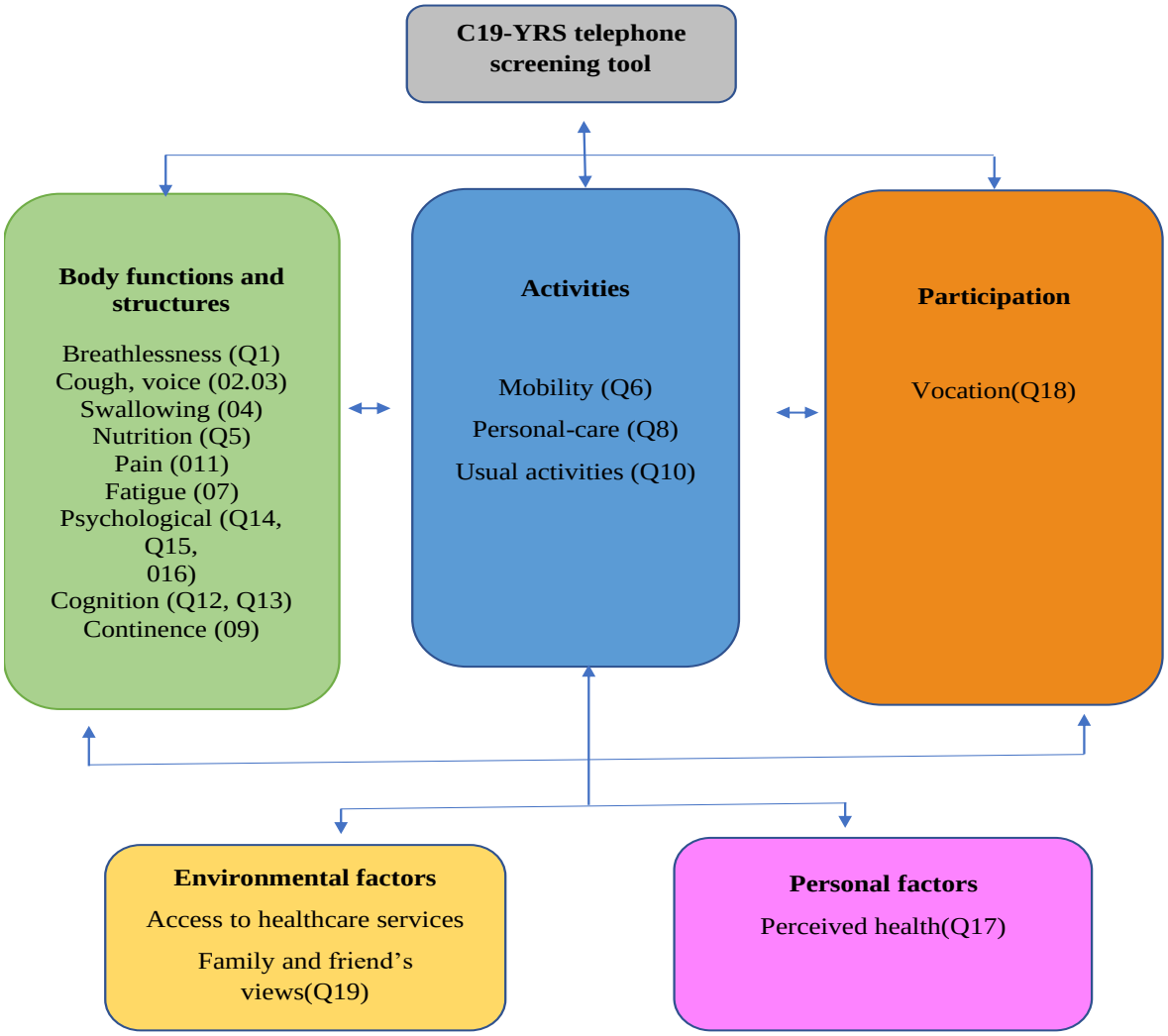

Figure 2: Mapping of the C19-YRS tool onto ICF framework.

The International Classification of Functioning, Disability, and Health (ICF) of the World Health Organization (WHO) provides us with a framework for understanding the relationship between different components of any health condition (Kostanjsek, 2011). When the domains covered by the C19-YRS tool are mapped to the ICF components (Figure 2), it is clear that all of the components (body functions and structures, activities, participation, environmental factors, and personal factors) are adequately captured, making it suitable for a comprehensive bio-psychosocial assessment.

3.10 Procedure of data collection

At the outset, the researcher said that the participant had the right to refuse to answer any question while filling out the questionnaire. They have the option to leave the study at any time. The purpose of the study was also explained to all participants by the researcher. Participants were assured that none of their personal information would be made public. A written consent form was used to obtain permission from each volunteer participant. Following the participants' agreement, a standard questionnaire was utilized to identify the complaint and collect demographic data. The Bengali format was used to ask the questions.

The researcher did a face-to-face interview and asked questions during the interview. The physical environment was closely considered. To ensure proper focus during the interview, distracting stimuli were removed. Google forms was used as data collection instrument. Interviewees were asked questions alone as much as possible with their cooperation, as close relations might sometimes guide their answers. During the interview, the researcher established rapport and clarified questions. Face-to-face interviews were the most effective method of obtaining complete participation from survey participants (Fraenkel and Wallen, 2012). Face-to-face interviews were also useful for describing population characteristics. During the conversation, a face-to-face interview was conducted to gather particular data that identifies the population descriptively. According to the participants‟ understanding level, sometimes the questions were described in the native language so that the patients can understand the questions perfectly and answer accurately. All the data were collected by the researcher own to avoid the errors.

3.11 Data analysis

After completing the initial data collection, each questionnaire was double-checked for any errors or ambiguous information. SPSS version 20 was used to analyze the data. In a list, the variables were labeled in sequence. The researcher named the variables and established the types, values, decimal, label alignment, and measurement level of data in SPSS' variable view. The data was then double-checked to ensure that all of the information from the questionnaire had been sent. The raw data is now ready for SPSS analysis.

3.12 Determination of the nature of data

The variables were determined as nominal, ordinal, interval, and ratio data and considered their parametric or non-parametric properties based on data type, normality test, and standard procedure (Hicks, 2009). A Chi-square test was performed for overall age and one sample Kolmogorov Smirnov test was performed for symptom severity score, functional disability score, and overall health score.

Table 1: Data category and normality test of data.

Variable	Description	Data type	Normality test	Data distribution
Age overall	18-83 year	Ratio	$P<0.001^{a}$	Parametric
Age category	≤45 >45	Ordinal	-	Non-parametric
Gender	Male Female	Nominal	-	Non-parametric
Residential area	Rural, Semi-urban Urban	Nominal	-	Non-parametric
Categories of symptom severity	Mild Moderate Severe	Nominal	-	Non-parametric
The score of symptom severity	0-100 (percentage)	Ratio	$P<0.001^{b}$	Parametric
The score of functional disability	0-50 (percentage)	Ratio	$P<0.001^{b}$	Parametric
The score of Overall health	0-10 (percentage)	Ratio	$P<0.001^{b}$	Parametric

a=One sample chi-square test b= One sample Kolmogorov Smirnov test

Data was examined using descriptive statistics, percentages were generated, and tables were used to display the results. To adorn the data, Microsoft Office Excel 2013 was used. A lot of data was gathered as a result of this investigation. The mean symptom score was used to determine the overall intensity of the 12 most commonly reported symptoms, with a score of 6 or more being considered "severe," 3 to 5.9 "moderate," and less than 3 "light." The demographic information as well as a brief clinical history were summed up in general and by symptom intensity. On the same 0–10 scale, functional abilities were recorded. Independent t-test and One-way ANOVA tests were used to determine the significant impact of socio-demographic characteristics, and Pearson correlation test was used to determine the correlation between subscales.

3.13 Ethical consideration

The proposal was submitted to the Institutional Review Board (IRB) of the Bangladesh Health Profession Institute (BHPI) and after the defense, the research proposal approval was taken from the IRB (CRP/BHPI/ IRB/11/ 2021 I 512). Written consent was taken from each participant before collecting the data. The World Health Organization (WHO) guidelines were always followed to conduct the study. This study is also registered under WHO trial registry (CTRI/2021/11/038158-India). Informed consent was used to take permission from all participants. Participants' rights and privileges were ensured. All the participants were aware of the aim and objectives of the study. Findings of the study were disseminated with the approval of regarding authority.

3.14 The research rigor of the study

A rigorous manner was maintained to conduct the study. The study was conducted cleanly and systemically. During the data collection, it was ensured that participants were not influenced by experience. The answer was accepted, whether they were of a negative or positive impression. No leading questions were asked or important questions were avoided. The participant's information was coded accurately and checked by the supervisor to eliminate any possible errors. The entire information was handled with confidentiality. In the result section, the outcome was not influenced by showing any personal interpretation. Every section of the study was checked and rechecked by the research supervisors who strictly maintained the confidentiality regarding the participant's condition.

CHAPTER IV RESULTS

4.1 Socio-demographic information

In this study, out of 452 participants, 67.3 percent were male and only 32.7 percent were female. Only 185 people out of 452 were admitted to hospital or received consultation due to long-term COVID symptoms since the declaration of the pandemic. About three-fourths of participants (328) responded that there is a history of COVID in their family.

Table 2: Socio-demographic information at glance.

Categorical data		**Number**	**Percentage (%)**
Gender	Male	304	67.3
	Female	148	32.7
Hospitalization	Hospitalized	185	40.9
	Not hospitalized	267	59.1
Covid in community	Yes	328	72.6
	No	124	27.4
Living area	Urban	47	10.4
	Rural	169	37.4
	Semi urban	236	52.2
Age (group)	Below 30 years	163	36.1
	31-50 years	206	45.6
	Above 51years	83	18.4
Scale data	**Mean**	**SD**	**Skewness**
Age (years)	37.95 Years	±14.07	0.582

The mean age of the participants was 37.95 years (SD 14.07). Only 10.4% of the total samples were from urban areas, and most of the people, 52.2%, were from semi urban areas. Besides that, more than 37% of people are from rural areas. All socio-demographic information is presented in table 1.

4.2 Categorization of participants according to age

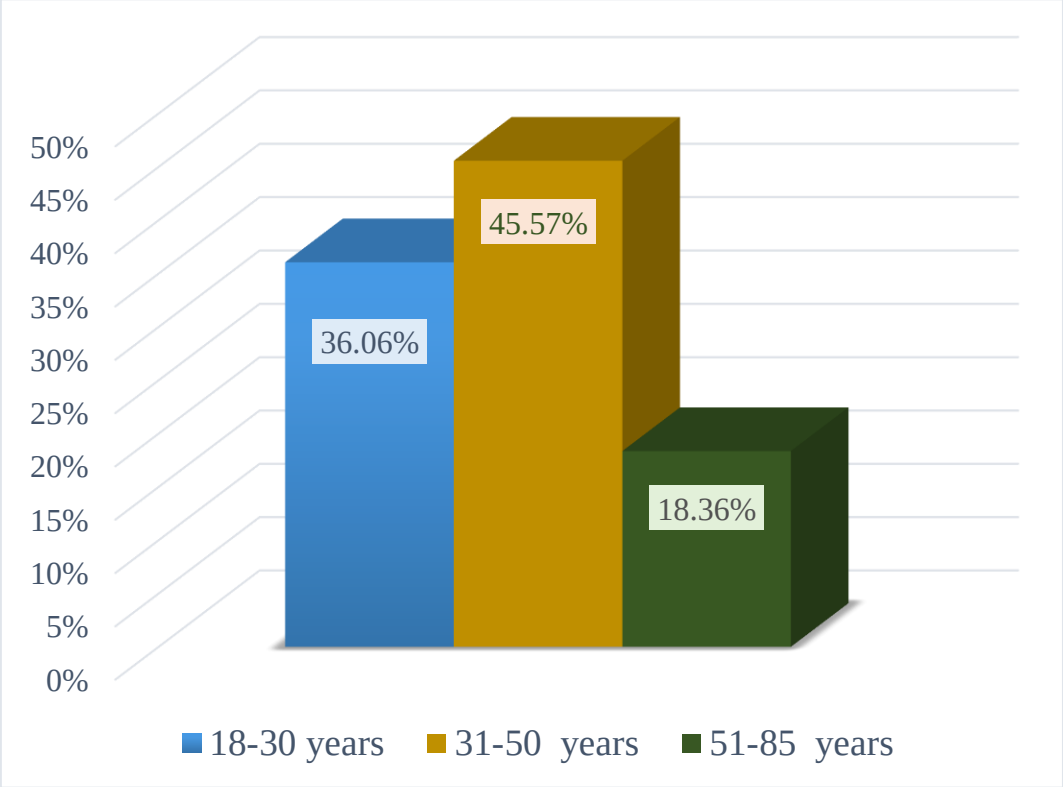

Figure 3: Categorization of participants according to age

According to the methodology, the minimum age for the population is 18 years. In this section, participants are categorized into three groups. The maximum number of participants were in the age group between 31 and 50 years old. That's 45.6%, and only 83 participants fell into the age group of 51 years or more. Besides that, 163 participants, which is 36.1% of the total sample, were in the age group ranging from 31 years to 50 years. Categorization is displayed in Figure 3 by histogram.

4.3 Pre and post covid symptoms

As table 2 suggests, out of 452 people, only 15 people responded that they had breathlessness (3.3%) before the COVID pandemic and after the pandemic, the response rate was 12.2%. The frequency of patient with was only 7 out of 452 and after COVID, the percentage was 24.1%. The percentage of symptoms like change in voice, noisy breathing, and swallowing difficulty was subsequently 0.5%, 0.7%, and 0.9%, but after COVID, it increased to 24.1%, 0.7%, and 2%. Cough is the most noticeable symptom among these, as it is strongly linked to long COVID. As it is presented in Figure 4, fatigue is the most prevalent symptom in post-COVID scenarios. The pre-covid response rate was only 8.4%, which increased to 34.3% after covid. Another significant symptom on that list is pain, especially joint pain. The frequency of joint pain is 96 in the pre-covid scenario. Besides that, the response for muscle pain and headache was 20.6% and 23.2%. Mental health-related problems like laziness in concentration and short-term memory were reported and the response rate was 1.8% and 1.8% in pre-covid symptom response and during the post-covid response, it was 8.4% and 14.2%. Post-traumatic stress disorder was reported by 14 participants, and the rate is 3.1%. Pre-covid mobility problems were 2%, and post-covid mobility problems were 4.2%. 19 respondents faced a barrier in communication, and the response rate was 4.2%. Pre-covid symptom frequency of depression was 16 and post-covid was 78. All the data is presented in table 2 and illustrated in figure 4. According to this study, the most notable symptom is fatigue, which is illustrated in the bar diagram. Symptoms are also illustrated in the radar plot. It also indicates the direction that fatigue is the most commonly reported symptom by the respondents. Due to limitations in the software, it was not possible to illustrate the severity of each symptom, but the total score is presented in the latter section according to the Yorkshire rehabilitation scale. Symptoms are also categorized into three categories according to their severity, such as mild, moderate, and severe. 30.5% of respondents showed mild symptoms, 55.3% showed moderate symptoms, and only 14.2% showed severe symptoms on the Yorkshire rehabilitation scale (YRS).

Table 3: Frequency distribution of pre-covid and post-covid symptoms.

Pre-covid symptom		Post-covid symptom	
Breathlessness	3.3% (15)	Breathlessness	12.2% (55)
Cough	1.5% (7)	Cough	24.1% (109)
Voice change	0.4% (2)	Voice change	0.7% (3)
Noisy breathing	0.9% (4)	Noisy breathing	1.5% (7)
Swallowing	0.2% (1)	Swallowing	2% (9)
Fatigue	8.4% (38)	Fatigue	34.3% (155)
Bowel control	0.7% (3)	Bowel control	0.7% (3)
Bladder control	1.1% (5)	Bladder control	1.3% (6)
Chest pain	0.9% (4)	Chest pain	10.6% (48)
Joint pain	2.7% (12)	Joint pain	21.2% (96)
Muscle pain	2.4% (11)	Muscle pain	20.6%(93)
Headache	0.7% (3)	Headache	23.2% (105)
Concentration	1.8% (8)	Concentration	8.4% (38)
Short term memory	1.8% (8)	Short term memory	14.2% (64)
Planning	0.9% (4)	Planning	2% (9)
Anxiety	3.1% (14)	Anxiety	13.9% (63)
Depression	3.5% (16)	Depression	17.3% (78)
Post traumatic Stress disorder	0.9% (4)	Post traumatic Stress disorder	3.1% (14)
Communication	1.8% (8)	Communication	4.2% (19)
Mobility	2% (9)	Mobility	8.6% (39)
Personal care	1.3% (6)	Personal care	7.1% (32)

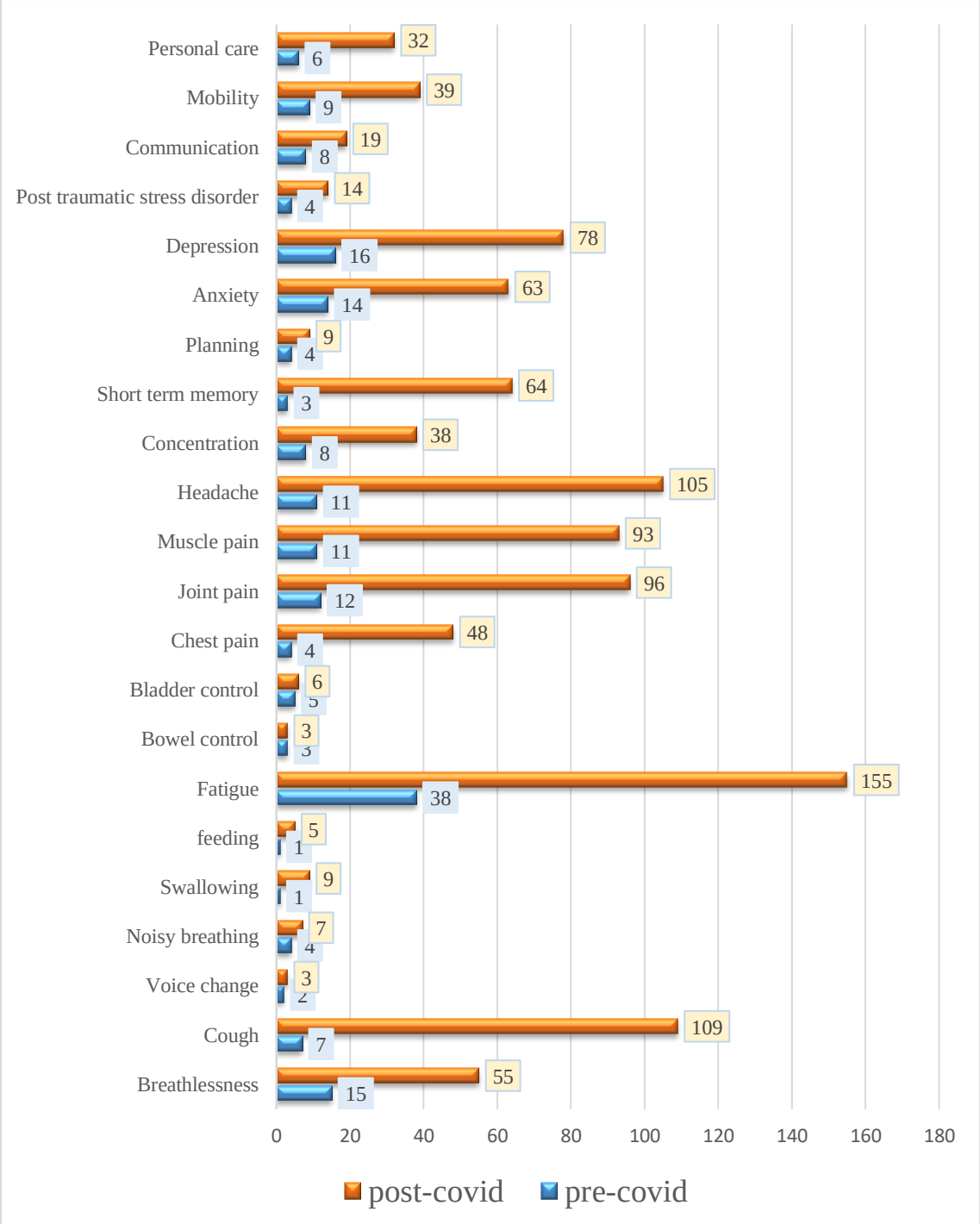

Figure 4: Comparison of pre-covid and post-covid symptoms.

Pre-covid and post-covid symptom severity is illustrated on above figure with frequency distribution. Where longest block represents the symptom fatigue followed by cough.

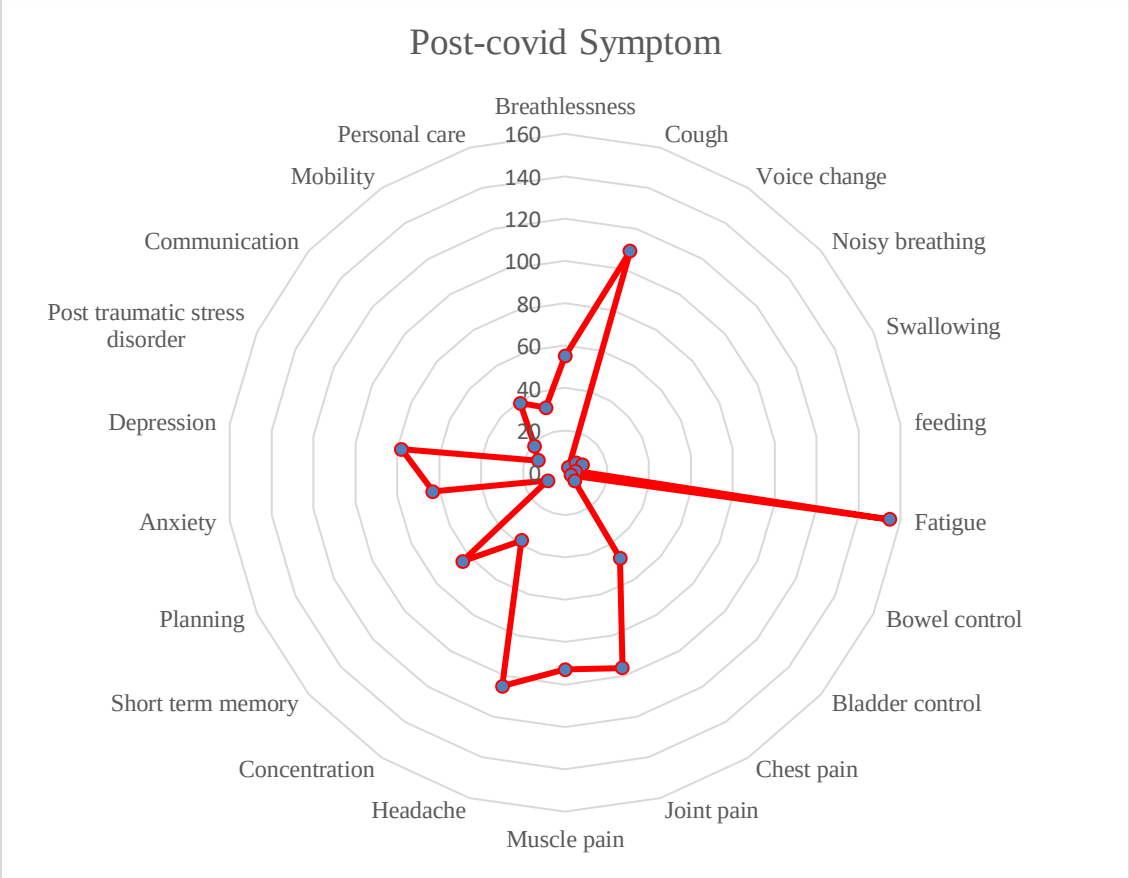

Figure 5: Presentation of Post-Covid Symptoms Severity

The radar plot shows that fatigue was the mostly responded symptom by the participant followed by cough. There also a noticeable participant responded with that they have mental problem lime depression, anxiety and laps in concentration.

4.4 Findings from Yorkshire rehabilitation scale

The mean of the post-covid symptom severity score was 39.46 (SD 16.67) out of 100, where the lowest score was 10 and the highest score was 79. According to YRS, the mean functional disability score was 18.43 (SD 9.23) out of 60, where the score range was 0 to 46. Overall health is calculated on a 10-point scale, with 10 representing good health and 0 representing poor health. In the current study, the mean score was 5.17. The scores range from O to 10. The skewness of all three scores is calculated to see the consistency of the data. Which is then 0.385, 0.339, and 0.208. All the data is described in table 3 and illustrated in figure 6.

4.5 C19-YRS Sub-scale scores

The post-covid symptom severity mean score was 39.46 (SD 16.67) and the mean functional disability score was 18.43. The overall health score mean was 5.17 on the C19-YRS sub-scale. Whereby the Skewness was 0.385, 0.339, and 0.208.

Table 4: Tabulation of YRS score.

POST-COVID YRS SCORES				
Subscales (Scale Rang)	Mean	SD	Score Rang	Skewness
Symptom severity (0-100)	39.46	16.67	10-79	0.385
Functional disability (0-50)	18.43	9.23	0-46	0.339
Overall health 0-10 (0-10)	5.17	2.08	0-10	0.208

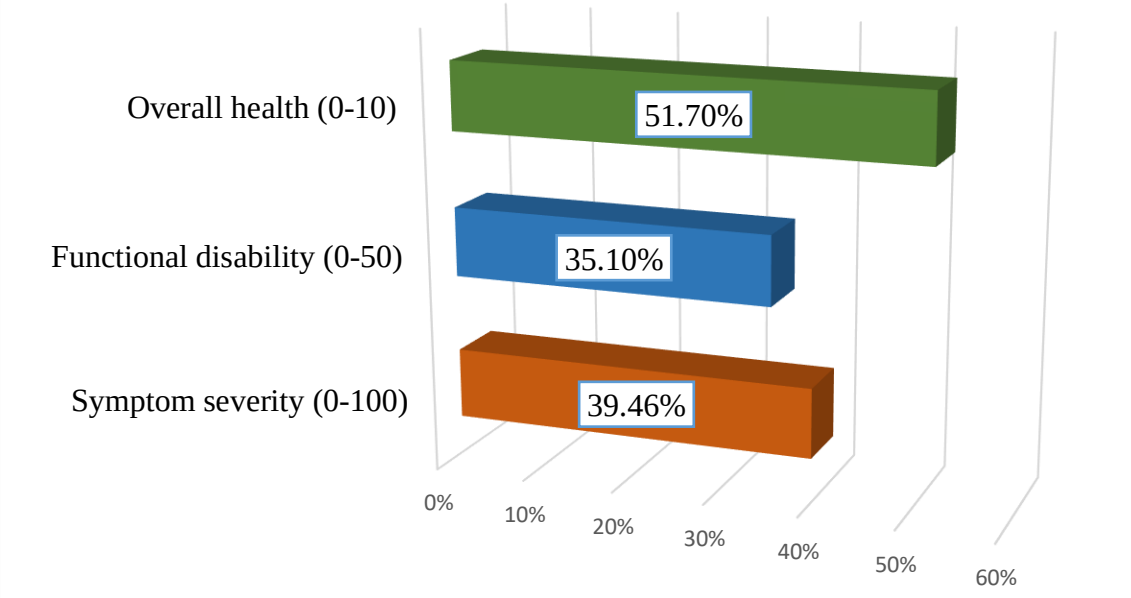

Figure 6: Presentation of C19-YRS after converting into percentage.

In Figure 6, all the scores are converted into percentages whereby the overall symptom severity percentage is 39.46% compared to the highest possible score of 100 (100%). On the other hand, the functional disability score was 35.10% compared to the maximum score of 50 (100%).

4.6 Classification of symptom severity

In the current study, 30.55 percent of participants were presented with mild symptom severity according to the C19-YRS score, and more than half of the participants (240) were presented with moderate symptom severity. In addition, only 64 participants out of 452 participants showed mild symptom severity.

Table 5 : Frequency distribution of symptom severity

Symptom severity	Frequency	Percentage
Mild	138	30.5%
Moderate	250	55.3%
Severe	64	14.2%

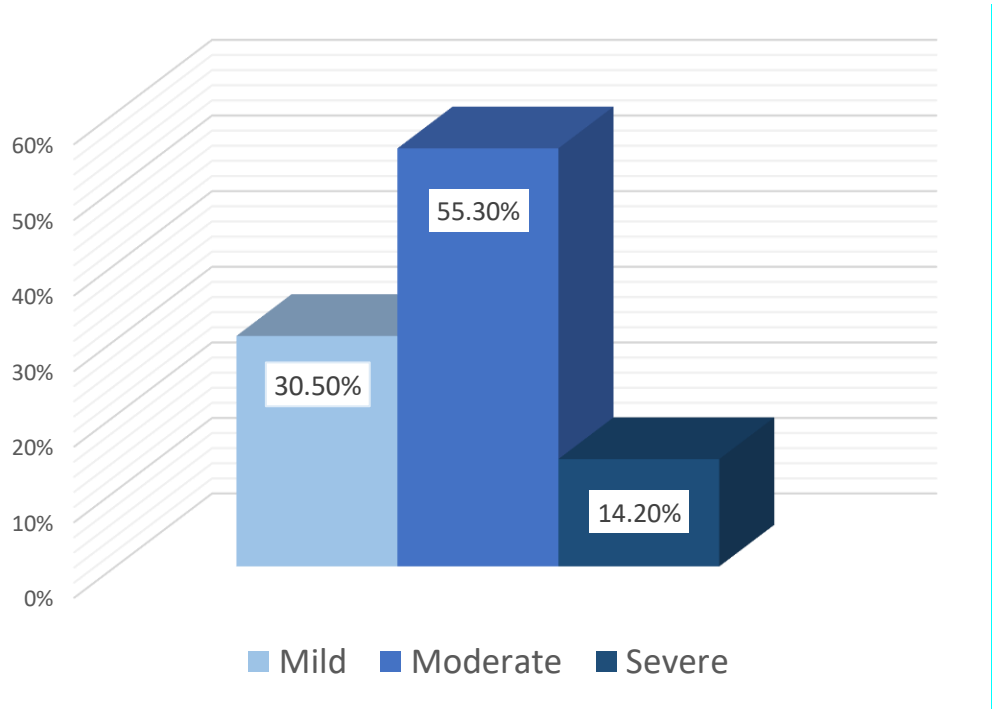

Figure 7: Classification of symptom severity

The histogram (figure 7) illustrates that more than half of the participants were affected by a moderate level of symptom severity. That's 55.3% of the total sample.

4.7 Socio-demographic distribution according to symptom severity

In the current study, after categorization, the maximum number of male participants (173 out of 452) fell into the moderate severity group according to C19-YRS symptom severity. In that group, the percentage of people aged more than 45 years was 53.82% for males and 58.69% for females. 58.88% of participants from urban areas were also categorized into the same group. 58.78% of participants who had COVID in the family and 53.65% of participants who had COVID in the community also belonged to moderate severity groups. All the breakdowns are presented in table 5.

Table 6: Socio-demographic distribution according to symptom severity

Demographic information	Symptoms Severity			
	Total 452	**Mild 138 (30.5%)**	**Moderate 250 (55.3%)**	**Severe 64 (14.2%)**
Male	304	91 (29.93%)	173 (58.88%)	40 (13.16%)
Female	148	47 (31.76%)	77 (52.03%)	24 (16.21%)
< 45 Years	314	101 (32.16%)	169 (53.82%)	44 (14.01%)
≥ 45 Years	138	37 (26.81%)	81 (58.69%)	20 (14.5%)
Rural	47	16 (34.04%)	20 (42.55%)	11 (23.4%)
Semi-urban	169	45 (26.63%)	90 (53.25)	34 (20.11)
Urban	236	77 (32.62%)	140 (59.32%)	19 (8.05%)
Covid in family	185	55 (29.72%)	108 (58.78%)	22 (11.89%)
Covid in community	328	104 (31.17%)	176 (53.65%)	48 (14.63%)

4.8 Comparison of socio-demographic factors with C19-YRS subscale

The comparison shows that the living area of a participant has a significant impact on their functional disability score. Where the p value is 0.015 (p 0.05). All the socio-demographic factors are presented in table 6.

Table 7: Median and mean scores of socio-demographic factors with C19-YRS subscales.

Demographic factor		Mean	Median	p
Patient Symptom severity score on the C19-YRS subscale according to demographic distribution				
Age	≤ 45 Years	39.55	37.00	0.765[a]
	> 45 Years	39.21	41.00	
Gender	Male	39.23	37.50	0.860[a]
	Female	39.92	42.00	
Living area	Urban	39.47	37.00	0.069[b]
	Semi-urban	41.89	42.00	
	Rural	37.72	39.00	
Patient Functional disability score on the C19-YRS subscale according to demographic distribution				
Age	≤ 45	18.25	19.00	0.510[a]
	> 45	18.90	19.00	
Gender	Male	18.16	18.00	0.317[a]
	Female	18.98	19.00	
Living area	Urban	17.31	18.00	0.015[b]
	Semi-urban	19.92	20.00	
	Rural	18.68	16.00	
Patient Overall health score on the C19-YRS subscale according to demographic distribution				
Age	≤ 45	5.20	5.00	0.995[a]
	> 45	5.09	5.00	
Gender	Male	5.22	5.00	0.407[a]
	Female	5.06	5.00	
Living area	Urban	5.28	5.00	0.140[b]
	Semi-urban	5.16	5.00	
	Rural	4.68	5.00	

*a= Unpaired t-test *b = One-way ANOVA

4.9 Correlation between C19-YRS subscales

In the association test using Pearson correlation between C19-YRS subscales and overall health score and it was revealed that there have positive association between symptom severity and functional disability and also there have moderately negative association between symptom severity and overall health and found negative association between overall health and functional disability. Pearson correlation is demonstrated on table 7.

Table 8: Correlation of the C19-YRS sub-scale with the overall health scale

Pearson correlation (significance) across sub-scale			
	Symptom severity	**Functional disability**	**Overall health**
Symptom severity	1		
Functional disability	0.889** (<0.001)	1	
Overall health	-0.658**(<0.001)	-0.648** (<0.001)	1

**Correlation is significant at the 0.01 level (2-tailed).

*Overall health is reverse score compered to symptom severity because an overall score 10 interprets best possible health on the other hand symptom severity score 10 reflects worst possible symptoms.

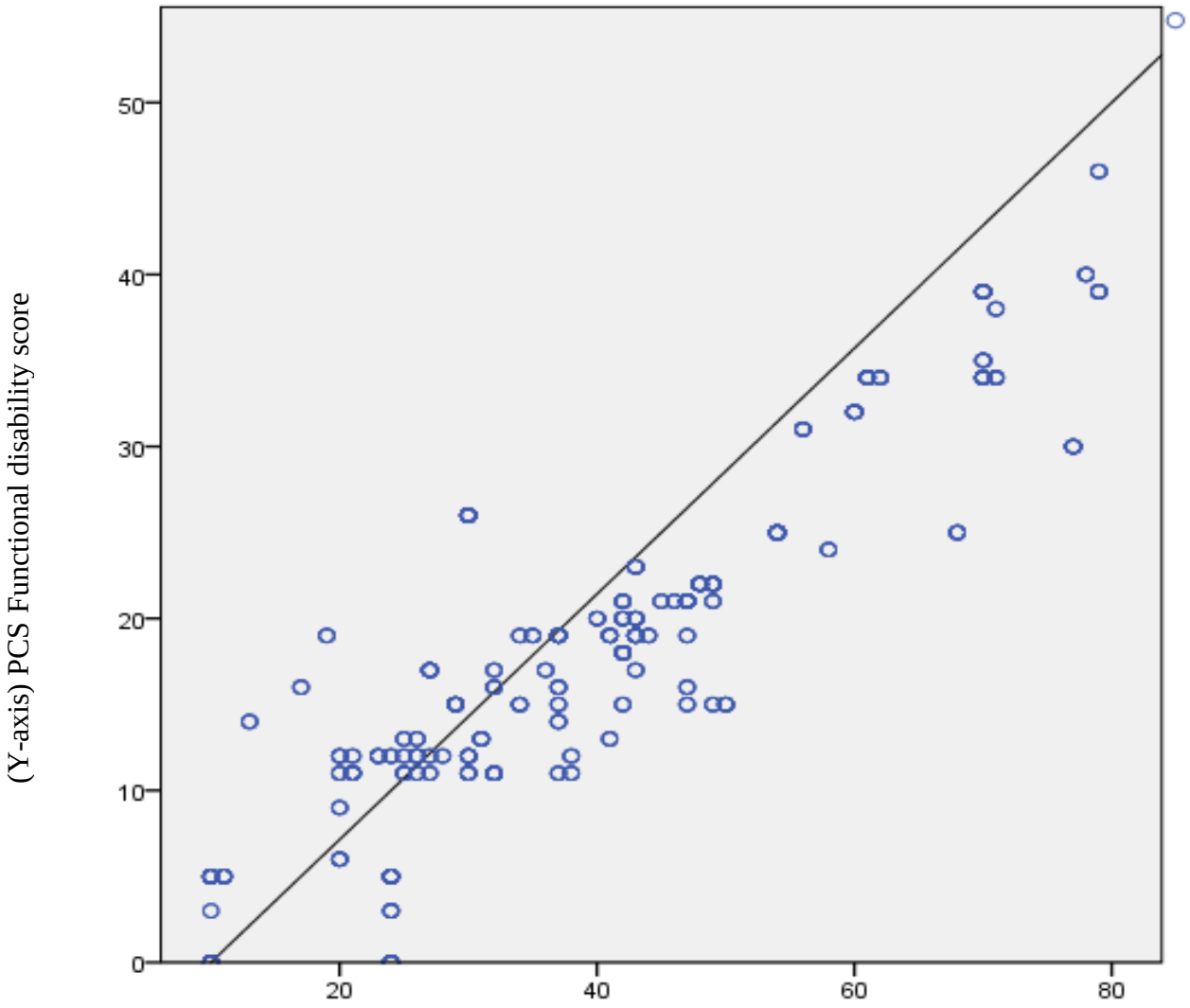

Figure 8: Correlation between Functional disability and Symptom severity score

The scatter plot illustrating the three is a partial positive relationship between functional disabilities and symptom severity. In the above figure, the Y-axis represents the functional disability and the X-axis represents the symptom severity.

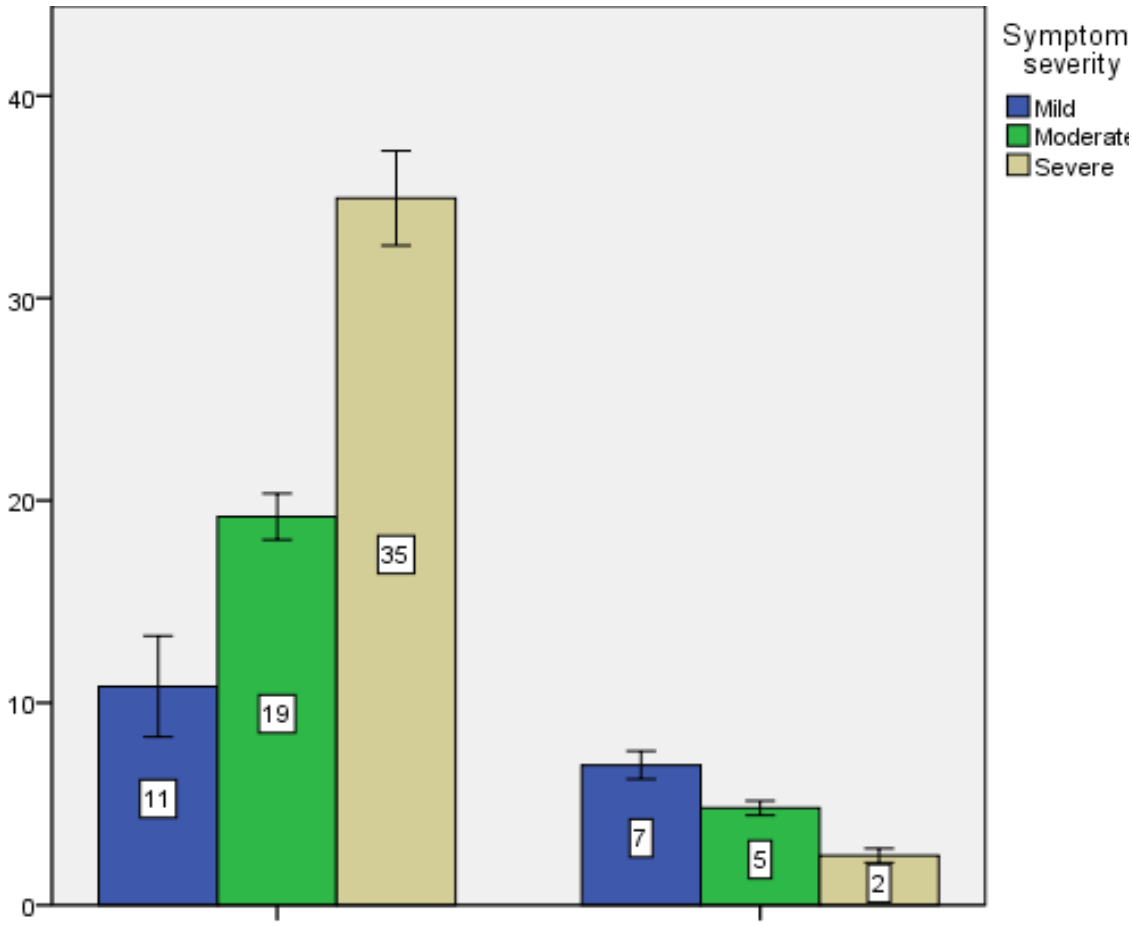

Figure 9: Comparison functional disability and overall health across symptom severity level

The bar chart illustrated an association between symptom severity categories and mean score of functional disability and overall health. Mean score of functional disability was 11 for percipient who are exist in mild severity group. Subsequently mean score was 19 and 35 for following groups. There was a revers relationship with overall health as mean of overall health was 7 for the participant of mild severity group. The mean scores declines in following group. For the moderate severity group mean score was 5 and mild severity group mean is 2.

CHAPTER V DISCUSION

The goal of this study was to use the COVID-19 Yorkshire Rehabilitation Scale to estimate the scope of rehabilitation for persons with long-term COVID symptoms (C19-YRS). The C19-YRS screening test identifies the main long-term clinical issues that COVID-19 survivors may have (Sivan et al., 2021). We discovered that the severity of a variety of distinct symptoms was related to the underlying severe condition utilizing this scale. The severity of the symptoms was clearly divided into mild, moderate, and severe phenotypes. The severity of symptoms within each category was similar, with the Pearson correlation test revealing a highly positive correlation (0.889) between symptom severity and functional difficulty and a moderately negative correlation (-0.648) between symptom severity and overall health status. The mean score with the severity categories also suggested a similar correlation between symptom severity and functional disability. The mean functional disability score for the mild category was 11, the moderate category was 19, and the severe category was 35.

The consistent severity of individual symptoms within each group could point to a common underlying pathophysiological mechanism in Post-Covid Syndrome symptoms. We have some evidence in the literature that vascular damage (hypercoagulability) (Nalbandian et al., 2021), immunological dysregulation (Phetsouphanh et al., 2021), and dysautonomia are all prevalent processes in PCS (Dani et al., 2021). Future research should look into the reasons for such a wide range of symptom presentations in individuals.

The World Health Organization (WHO)'s International Classification of Functioning, Disability, and Health (ICF) provides us with a framework to understand the relationship between different aspects of any health condition (WHO 2001). The domains covered by the C19-YRS tool when mapped to the components of ICF show that there is satisfactory capture of all the components (body functions and impairment, activities, participation, environmental aspects, and individual factors), making it appropriate for a comprehensive bio-psychosocial assessment.

Domains of body function and structure are covered by breathlessness (12.2%), cough (24.1%), swallowing (2%), pain (10%, 21%.20%), fatigue (34.3%), and concentration (8.4%). Other findings such as mobility (8.6%), personal-care (7.1%), and usual activities (7.3%) cover the domain of activity limitation. The study also suggested there is a significant impact (p value 0.015, p 0.05) of participant living area on functional disability score. The findings also suggested changes in occupation between before and after COVID. A recent study suggested a similar burden of post-COVID syndrome according to ICF (Taquet, Dercon, & Harrison 2021). A total of 273,618 patients with COVID-19 were identified in that cohort study.

Many post-covid symptoms, such as weariness, anxiety, or mood disorders, are thought to be present in much of the general population prior to infection, but the symptom severity score suggests that the severity is substantially higher in the post-covid period. This study, on the other hand, was able to show that a considerable number of symptoms were not present prior to infection, despite the fact that they were documented retrospectively. This supports the notion that the symptoms are new-onset due to the long-term presence of COVID symptoms. Even though there is likely to be some recollection bias, the data collected in this study suggests that the C19YRS scale can be utilized to detect pre-illness symptoms. So, there is an opportunity for the rehabilitation sector to utilize this information to strengthen the rehabilitation system by including updated intervention for those findings.

A variety of symptom severity levels are observed in this study, and there is variation in the symptom severity. Some personal triggers, such as physical, cognitive, and emotional factors, may have an impact on symptom severity. So, therefore, to avoid worsening of the symptoms and functional impacts, it is important to consider those factors. So there is a recommendation for complex, multifaceted rehabilitation interventions to manage the symptom severity seen in Post-covid syndrome (PCS).

Given the growing number of people affected by long-term COVID symptoms in Bangladesh (Hossain et al., 2021), the findings of severity phenotypes can be utilized for the provision and resourcing of service to people who are living with long-term COVID symptoms. The stratification based on the severity of cases could support national and local providers in planning services and interventions that might be directed towards these classifications.

Mild cases may be invested in primary care service and offered recourse such as the WHO booklet (WHO 2020). A moderate case may be referred to special therapy. Service. But severe case need specialized multidisciplinary (MDT) attention. Should be invested and intervention should be provided by MDT approach (Parkin et al., 2021).

CHAPTER VI LIMITATION

Limitations

- There is an element of recall bias in reporting pre-illness scores as the pre-illness data is collected retrospectively.
- Symptoms and their severity were self-reported, so there could be a degree of subjectivity in their recording that they tend to grade severity similarly across the symptoms.
- In that study, only the participant's total symptom severity score and functional disability score were compared, but individual symptom scores were not taken into consideration due to limitations in the software.

Recommendation

A follow-up country-wide cohort study will assist in identifying more facts and figures in the long run, which will facilitate the rehabilitation of people with long-term COVID symptoms.

CHAPTER VII CONCLUSION

The C19-YRS covers the multiple body systems affected by COVID-19 and covers all domains of the ICF (WHO) framework. This study's findings indicate a strong link between long-term symptoms and functional disability. By using the C19-YRS screening tools, symptom severity can be classified. The classification of symptom severity can be an ideal resource for policy makers and health systems to decide upon rehabilitation intervention. Further research is needed to understand the common mechanisms and pathophysiological basis of post-COVID symptoms.

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APPENDIX 1

(CONSENT FROM)

Research Title:

Scope of Rehabilitation for Patients attended for Neuro-Muscular Rehabilitation with Long COVID Symptoms in Bangladesh.

Name of Researcher:

Name of participant: …….

Date of informed consent process: ……..

Participant Identification Number for this research: ☐

Please ask the participant the following questions: If answer is YES – write YES in the box and If the answer is NO – write NO in the box.

1. Are you sure you have been adequately explained in this study? And you have the opportunity to consider the information, ask questions, and answer satisfactorily.
2. Do you understand that your participation is voluntary and that you can withdraw from this study at any time without giving any reason?
3. Do you understand that your personal data responses will be anonymised before analysis? Did you give permission for the researcher to have access to your anonymised responses? Do you understand that any direct quotes if selected for publication will be anonymised?
4. Do you agree to take part in this study?
5. Do you agree to the interview and this interview will be recorded. All data will be collected so that it is stored in Kegel data set and stored securely by researchers from Bangladesh Health Professionals Institute (BHPI), CRP.

Consent taken verbally by the researcher in person.

(CONSENT FROM-BANGLA)

সম্মতি পত্র (অংশগ্রহণকারীকে পড়ে শুনাতে হবে)

আসসালামু আলাইকুম, আমি মোঃ ওয়ালিউল ইসলাম, পার্ট-২, মাস্টার অব সাইন্স ইন ফিজিওথেরাপি ছাত্র, বিএইচপিআই, সিআরপি, সাভার, ঢাকা-১৩৪৩। আমার গবেষণার শিরোনাম হলো "বাংলাদেশে দীর্ঘ কোভিড উপসর্গসহ নিউরো-মাসকুলার পুনর্বাসনের জন্য অংশগ্রহণকারী রোগীদের পুনর্বাসনের সুযোগ"। গবেষণার উদ্দেশ্য হলো বাংলাদেশে দীর্ঘ কোভিড উপসর্গসহ নিউরো-মাসকুলার পুনর্বাসনের জন্য অংশগ্রহণকারী রোগীদের পুনর্বাসনের সুযোগের মূল্যায়ন করা। আমি আপনাকে এ সম্পর্কে কিছু প্রশ্ন করতে চাই, এতে আনুমানিক ২০-৩০ মিনিট সময় লাগবে।

সাক্ষাৎকারের সময় যদি আপনি কোন মানসিক বিপর্যয়, সামাজিক ও অর্থনৈতিক ঝুঁকি এবং অন্য কোন অস্বস্তিকর শারীরিক ঝুঁকিতে পড়ে থাকেন তবে আমাকে বলবেন, আমি অবিলম্বে সাক্ষাৎকারটি বন্ধ করব। আমি প্রতিশ্রুতিবদ্ধ যে গবেষণাটি আপনার জন্য ক্ষতিকর বা ঝুঁকিপূর্ণ হবে না। গবেষণায় অংশগ্রহণের জন্য কোনও পেমেন্ট নেই। আপনার দ্বারা প্রদত্ত সমস্ত তথ্য গোপনীয় হিসাবে গন্য হবে।

এই গবেষণায় আপনার অংশগ্রহণ হবে স্বেচ্ছাকৃত এবং আপনি কোন নেতিবাচক ফলাফল ছাড়া এই গবেষণার সময় যে কোন সময়ে নিজেকে প্রত্যাহার করতে পারবেন এ ছাড়া আপনি পছন্দ করেননা এমন নির্দিষ্ট প্রশ্নের উত্তর না দেওয়ার অধিকার আপনার আছে। যদি আপনার আরো কিছু জানার আগ্রহ থাকে তবে আমি আমাকে অথবা আমার সুপারভাইজার এহসানুর রহমান, সহযোগী অধ্যাপক, কোর্স কো-অর্ডিনেটর, এমএসসি ইন পিটি, বিএইচপিআই, সিআরপি, সাভার, ঢাকায় যোগাযোগ করতে পারেন। শুরু করার পূর্বে আপনার কোনো প্রশ্ন থাকলে আপনি করতে পারেন।

আপনি সম্মতি থাকলে আমি কি আপনার সাক্ষাৎকার আরম্ভ করতে পারি?

হ্যা ☐ না ☐

তদন্তকারীর স্বাক্ষর এবং তারিখঃ.....

অংশগ্রহণকারীর স্বাক্ষর এবং তারিখঃ.....

সাক্ষীর স্বাক্ষর এবং তারিখঃ.....

APPENDIX 2

Questionnaire

Part-1

ID no	Age
Sex	Contact no
Address	Living area
Covid in family	Covid in community

Part -2

Do you have any experiences of COVID-19 like symptoms till March, 2020 to now?

yes □ no □

('Long COVID'' is the condition whereby affected individuals do not recover for several weeks or months following the onset of symptoms suggestive of COVID-19, whether tested or not).

(Symptoms are listed below)

a) Fever or feeling feverish (such as chills, sweating) b) Cough c) Mild or moderate difficulty breathing (breathing slightly faster than normal, feeling like you can't inhale or exhale, or wheezing, especially during exhaling or breathing out) d) Sore throat e) Muscle aches or body aches f) Unusual fatigue	g) Headache h) New loss of taste or smell i) Congestion or runny nose j) Nausea or vomiting k) Diarrhea

Part -3 (C19-YRS)

COVID-19 Yorkshire Rehabilitation Screening (C19-YRS)

Date: Time:

Opening questions:

Have you had any medical problems related to COVID-19 that needed hospital admission? **Yes** ☐ **No** ☐ Details:
Have you used any other health services to manage COVID-19 symptoms (e.g., your GP?) **Yes** ☐ **No** ☐ Details:

Please respond to the below questions to the best of your knowledge. *'Now' refers to how you feel now/this week.* *" Pre-COVID" refers to how you were feeling prior to contracting the illness.* *If you are unable to recall this, just state 'dont know'*			
1. Breathlessness	On a scale of 0-10, with 0 being not breathless at all, and 10 being extremely breathless, how breathless are you: (n/a if you do not perform this activity)	Now	Pre-Covid
	2. At rest?	0-10: ____	0-10: ____
	3. On dressing yourself?	0-10: ____ n/a ☐	0-10: ____ n/a ☐
	4. On walking up a flight of stairs?	0-10: ____ n/a ☐	0-10: ____ n/a ☐

2. Cough/ throat sensitivity/ voice change	Have you got any of the below symptoms that is new since contracting the illness? • cough/ throat sensitivity **Yes ☐ No ☐** • voice change **Yes ☐ No ☐** • noisy breathing **Yes ☐ No ☐** Which of these three is the worst symptom - Rate the severity of this problem (0 being not present, 10 being severe and life disturbing) Now: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Pre-Covid: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**
3. Swallowing/ nutrition	Are you having difficulties eating, drinking or swallowing such as coughing, choking or avoiding any food or drinks? **Yes ☐ No ☐** Rate the severity of swallowing problem (0 being no symptom, 10 being severe and life disturbing) Now: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Pre-Covid: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Are you or your family concerned that you have ongoing weight loss or any ongoing nutritional concerns as a result of Covid-19? **Yes ☐ No ☐**
4. Fatigue	Do you become fatigued more easily compared to before your illness? **Yes ☐ No ☐** Rate the severity of fatigue (0 being not present, 10 being severe and life disturbing) Now: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Pre-Covid: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**

5. Continence	Since your illness are you having any <u>new</u> problems with: • controlling your bowel **Yes ☐ No ☐** • controlling your bladder **Yes ☐ No ☐** Which of these two is the worst symptom - Rate the severity of this problem (0 being not present, 10 being severe and life disturbing) Now: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Pre-Covid: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**
6. Pain/ discomfort	Have you got any pain that is new since contracting the illness? **Yes ☐ No ☐** If Yes, • chest pain **Yes ☐ No ☐** • joint pain **Yes ☐ No ☐** • muscle pain **Yes ☐ No ☐** • headache **Yes ☐ No ☐** • abdominal pain **Yes ☐ No ☐** • other pain **Yes ☐ No ☐** Within the last week, which of the these was the worst problem – Rate the severity of this problem (0 being no pain or discomfort, 10 being severe and life disturbing pain) Now: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Pre-Covid: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**
7. Cognition	Since your illness have you had new or worsened difficulty with: • Concentrating? **Yes ☐ No ☐** • Short term memory? **Yes ☐ No ☐** • Planning? **Yes ☐ No ☐**

	Which of these three is the worst symptom – Rate the severity of this problem (0 being not present, 10 being severe and life disturbing) Now: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Pre-Covid: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**
8. Anxiety	On a 0-10 scale, how severe is any anxiety you are experiencing? 0 means I am not anxious, 10 means I am extremely anxious. Now: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Pre-Covid: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**
9. Depression	On a 0-10 scale, how severe is any depression you are experiencing? 0 means I am not depressed, 10 means I have extreme depression. Now: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Pre-Covid: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Are you currently having thoughts about harming yourself in any way? **Yes ☐ No ☐**
10. PTSD screen	a) Have you had any unwanted memories of your illness or hospital admission whilst you were awake, so not counting dreams? **Yes ☐ No ☐** b) Have you had any unpleasant dreams about your illness or hospital admission? **Yes☐ No☐** c) Have you tried to avoid thoughts or feelings about your illness or hospital admission? **Yes ☐ No ☐** Rate the severity of these stress problems (0 being not present, 10 being severe and life disturbing) Now: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Pre-Covid: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**

11. Communication.	Since your illness have you had new or worsened difficulty with communication/word finding difficulty/ understanding others? **Yes ☐ No ☐** Rate the severity of communication problem (0 being not present, 10 being severe and life disturbing) Now: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Pre-Covid: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**
12. Mobility	On a 0-10 scale, how severe are any problems you have in walking about? *Or moving about if you normally walk using aids* 0 means no problems, 10 means severe or completely unable to walk about. Now: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Pre-Covid: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**
13. Personal-Care.	On a 0-10 scale, how severe are any problems you have in personal cares such as using the toilet, washing and dressing yourself? 0 means no problems, 10 means completely unable to do or fully dependent on others to help. Now: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Pre-Covid: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**
14. Other Activities of Daily Living	On a 0-10 scale, how severe are any problems you have in doing your usual activities, such as your household work, leisure activities, work, study or shopping? 0 means no problems, 10 means completely unable to do or fully dependent on others to help. Now: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Pre-Covid: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**
15. Social role	On a 0-10 scale, how severe are any problems you have in caring for family members and/or your interaction with friends that are related to your illness (and not due to the social distancing/lockdown measures)? 0 means no problems, 10 means completely unable to do Now: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐** Pre-Covid: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**

What is your employment situation and has your illness affected your ability to do your usual work?

Occupation: _____

Employment status before Covid-19 Lockdown: _____

Employment status before you became ill: _____

Employment status now: _____

Do you think your family or caregiver would have anything to add from their perspective?

Are you experiencing any other new problems since your illness we haven't mentioned? Rate the severity of the problem (0 being not present, 10 being severe and life disturbing)

Palpitations: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**

Dizziness/ falls: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**

Weakness: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**

Sleep problems: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**

Fever: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**

Skin rash: **0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐**

Other symptoms – free text

How good or bad is your health overall?

For this question, a score of 10 means the BEST health you can imagine. 0 means the WORST health you can imagine.

a) Now: WORST HEALTH 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ BEST HEALTH

b) Pre-Covid: WORST HEALTH 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ BEST HEALTH

APPENDIX 3

(Ethical Permission)

বাংলাদেশ হেল্‌থ প্রফেশন্স ইনস্টিটিউট (বিএইচপিআই)
Bangladesh Health Professions Institute (BHPI)
(The Academic Institute of CRP)

Ref: CRP/BHPI/IRB/11/2021/512

Date: 04/11/2021

To
MD. Waliul Islam
Part II M.Sc. in Physiotherapy
Session: 2019-2020, Student ID: 111190070
BHPI, CRP, Savar, Dhaka- 1343, Bangladesh

Subject: Approval of the thesis proposal**"Scope of Rehabilitation for persons with long COVID symptoms attended for Neuro-Muscular Rehabilitation in Bangladesh."** by ethics committee.

Dear MD. Waliul Islam,
Congratulations,
The Institutional Review Board (IRB) of BHPI has reviewed and discussed your application to conduct the above mentioned dissertation, with yourself, as the principal investigator and Ehsanur Rahman as thesis supervisor. The Following documents have been reviewed and approved:

Sr. No.	Name of the Documents
1	Dissertation/thesis/research Proposal
2	Questionnaire (English & / or Bengali version)
3	Information sheet & consent form.

The purpose of the study is assessing the scope of Rehabilitation for long COVID survivors in Bangladesh according to the Yorkshire Rehabilitation Screening scale (COVID-19 YRS). The study involves face to face interview by using questionnaire which will take only 20 minutes and have no likelihood of any harm to the participants and have possibility of benefit of patients on pressure sore prevention strategies. Data collectors will receive informed consents from all participants. Any data collected will be kept confidential. The members of the Ethics committee have approved the study to be conducted in the presented form at the meeting held at 09:00 AM on March 30, 2021 at BHPI (27th IRB Meeting extended).

The institutional Ethics committee expects to be informed about the progress of the study, any changes occurring in the course of the study, any revision in the protocol and patient information or informed consent and ask to be provided a copy of the final report. This Ethics committee is working accordance to Nuremberg Code 1947, World Medical Association Declaration of Helsinki, 1964 - 2013 and other applicable regulation.

Best regards,

Muhammad Millat Hossain
Assistant Professor, Dept. of Rehabilitation Science
Member Secretary, Institutional Review Board (IRB)
BHPI, CRP, Savar, Dhaka-1343, Bangladesh

CRP-Chapain, Savar, Dhaka-1343, Tel : 7745464-5, 7741404
E-mail : principal-bhpi@crp-bangladesh.org, Web: bhpi.edu.bd, www.crp-bangladesh.org

Trial Registration

CLINICAL TRIALS REGISTRY - INDIA
ICMR - National Institute of Medical Statistics

PDF of Trial
CTRI Website URL - http://ctri.nic.in

Clinical Trial Details (PDF Generation Date :- Mon, 22 Nov 2021 07:29:48 GMT)

CTRI Number	CTRI/2021/11/038158 [Registered on: 22/11/2021] - **Trial Registered Retrospectively**
Last Modified On	18/11/2021
Post Graduate Thesis	Yes
Type of Trial	Observational
Type of Study	Cross Sectional Study
Study Design	Other
Public Title of Study	Scope of Rehabilitation for persons with long COVID
Scientific Title of Study	Scope of Rehabilitation for persons with long COVID symptoms attended for Neuro-Muscular Rehabilitation in Bangladesh

Secondary IDs if Any

Secondary ID	Identifier
NIL	NIL

Details of Principal Investigator or overall Trial Coordinator (multi-center study)

Details of Principal Investigator	
Name	MD Waliul Islam
Designation	Clinical Physiotherapist
Affiliation	center for the rehabilitation of the paralysed
Address	center for the rehabilitation of the paralysed savar dhaka 1343 country Bangladesh Crp p&O department room 2 no 2 1343 Other
Phone	8801717928486
Fax	
Email	olee32@gmail.com

Data collection Permission

Permission Letter

Date: November 22, 2021

To

The Executive Director

Center for the Rehabilitation of the Paralyzed (CRP),

Chapain, Savar, Dhaka-1343.

Through: Proper channel.

Subject: **Prayer for permission to collect data in order to conduct a thesis.**

Sir,

With due respect, I am MD Waliul Islam, a student of part-II M. Sc. in Physiotherapy program at Bangladesh Health Profession Institute (BHPI). As per course curriculum, I shall have to complete a thesis. In this respect, my research title is "**Scope of Rehabilitation for the persons with long COVID symptoms attended for Neuro-muscular rehabilitation in Bangladesh**". In this thesis, my participants will be the patients who are suffering from long covid symptoms. I believe outdoor department of CRP (All centers) is the best place to collect data from participants. In order to materialization of the thesis, I need your kind permission to collect data. I have already obtained approval of Institutional review board (IRB) and reference number is **CRP/BHPI/IRB/11/2021 /512 .**

May I therefore, hope that you would be kind enough to give me permission for data collection and oblige thereby.

Sincerely Yours

MD Waliul Islam (Student Id: 111190070)
Student of Part-II M.Sc. in Physiotherapy Program
BHPI, CRP, Savar, Dhaka-1343
Session: 2019-2020

Forwarded
E. Rahman
22.11.21

Recommended
22.11.21
Prof. Md. Obaidul Haque
Vice-Principal
BHPI, CRP, Savar, Dhaka

Approved
Dr. Mohammad Sohrab Hossain
Executive Director, CRP