

Study of Persistent Cardiorespiratory Related Symptoms in Post COVID Patient

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DOI: <https://doi.org/10.52403/ijhsr.20230422>

ABSTRACT

Background: The COVID-19 epidemic, which shook the entire world in January of last year and is still a significant threat to all of humanity, is still present. Really little evidence exists for the POST COVID-19 illness. The majority of individuals get long-term illness after COVID-19. Clinicians and researchers have focused on COVID-19's acute phase, but continued surveillance is necessary to identify any long-lasting effects after discharge.

Methods: A total of 200 participants were selected based on inclusion and exclusion standards. An electronic questionnaire was converted into a Google Form, and patients without Android phones may use offline versions. The data from the online form and the offline form were combined on a Google sheet before being statistically analysed. Pie charts and graphs were used to determine and visually display the outcome's proportion.

Result: The survey received 200 responses, which is a 100% response rate. Following post-covid, 86.5% of patients reported trouble breathing, 80% difficulty performing ADLs, 64% poor energy, only 5.5% psychological problems, 51% heart problems, 25.5% palpitations, 83.5% throat pain, 94% moderate to severe weariness, and 99% normal to moderate health. CVA, facial palsy, weight gain, PCOD, joint pain, and DVT are other issues that some people experience.

Conclusion According to reports, the majority of patients suffer one or two cardiorespiratory symptoms, which negatively impact their quality of life.

Keywords: [Cardiorespiratory Problems, Covid-19.]

INTRODUCTION

Since the 1918 influenza pandemic, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection that causes the highly contagious illness coronavirus disease 2019 (COVID-19), which has killed more than 3.8 million people worldwide, is now regarded as the biggest global health catastrophe. SARS-CoV-2 spread quickly over the world when the first instances of this mostly respiratory viral infection were found in Wuhan, Hubei Province, China, in late December 2019. ⁽¹⁾

The respiratory, gastrointestinal, musculoskeletal, and neurologic systems are just a few of the body systems that could be

impacted by COVID-19 symptoms. Some respiratory symptoms include a dry cough, chest pain, rhinorrhea and/or nasal congestion, sore throat, and shortness of breath. Gastrointestinal symptoms include hemoptysis, constipation, diarrhea, nausea, vomiting, and stomach discomfort. Additionally, patients may develop generalized symptoms such loss of taste or smell, disorientation, headaches, lethargy, chills, and fever ⁽²⁾

It is unclear why some persons experience persistent symptoms for a longer period of time than others following a COVID-19 infection. Recovery from COVID-19 infection differs from person to person.

Clinically, symptoms that last or worsen after the fourth week following the clearance of an acute infection and that cannot be explained by any other type of medical diagnosis are referred to as "post-acute COVID-19⁽³⁾ symptoms" or "post-COVID-19 issues." Some patient groups have begun expressing their experience of continuous symptoms that continue longer than 4 weeks following a suspected infection or a positive diagnosis and up to 12 weeks and beyond using the existing term long COVID. This is brought on by the presence of chronic symptoms. Now that it is recognized that COVID-19 can impact multiple organ systems, a range of persistent symptoms can be caused. Exhaustion, shortness of breath, coughing, loss of taste and/or smell, myalgia, cognitive issues, and digestive disorders are among the persistent symptoms. A thorough post-COVID symptom model has recently been proposed for symptom classification following a confirmed diagnosis of COVID-19. The symptoms were divided into four categories: the transition phase (4-5 weeks), acute post-COVID-19 symptoms (5-12 weeks), long post-COVID-19 symptoms (12-24 weeks), and chronic post-long COVID symptoms (>24 weeks) ⁽⁴⁾. The "relapsing remitting" pattern of symptoms that many people with and without long-term COVID experience is mentioned in this model. These have also been employed in order to aid in results presenting. The SARS-CoV-2 coronavirus, which causes severe acute respiratory syndrome, is the cause of the COVID-19 pandemic. However, other organs may also be affected. COVID-19 mostly affects the respiratory system. According to a recent 6-month follow-up study, dyspnea (26%) and fatigue/muscle weakness (63%) were the most common persistent COVID-19 symptoms. According to multiple studies, 1.5-6 months following COVID-19, both hospitalized patients and non-participants had a significant prevalence of dyspnea (16-89%). A recent study from a Norwegian cohort found no conclusive relationship between dyspnea at 3 months and reduced gas

diffusion capacity, despite the fact that approximately one-fifth of hospitalized COVID-19 patients experienced dyspnea >1 on the modified Medical Research Council (mMRC) dyspnea scale. Lower exercise capacity and dyspnea may have different pathophysiological causes, which can be distinguished using a cardiopulmonary exercise test (CPET), which integrates assessments of the circulatory, respiratory, and muscular systems during maximum effort. In two trials that provided CPET data for 81 subjects hospitalized with moderate-to-severe COVID-19, a significant majority of people had decreased peak oxygen absorption ($\dot{V}O_2$ peak). A small number of participants were included in each study, and one study only included individuals who had had mechanical breathing. To our knowledge, no multicenter, population-based study has ever assessed different subgroups of hospitalized COVID-19 patients or provided comprehensive CPET results. Patients with COVID-19 should have less physical endurance, as indicated. Further, we hypothesized extended cardiopulmonary exercise limits, particularly in individuals with self-reported dyspnea or those who had been hospitalized to an intensive care unit. In order to determine the characteristics of participants with exercise restrictions and to compare the cardiopulmonary function during exercise of COVID-19 participants to that of a reference population 3-4 months after hospital discharge ⁽⁵⁾

It has become evident that many people continue to exhibit COVID-19 symptoms, such as fatigue and muscular weakness, joint and muscle pain, and shortness of breath, months after the acute phase. Six months after the initial infection, 76% of adult patients who had previously been hospitalized still show at least one symptom, according to recently published data from China outlining the long-term impact of COVID-19. According to a UK registry review of 47,780 previously hospitalized persons, multi-organ failure was the cause of 12.3% of death that occurred after initial

discharge, while 29.4% of cases required re admission⁽⁶⁾

Six to eight months after leaving the hospital, around half of Covid-19 patients still experienced persistent symptoms. The two persistent symptoms that were most common, with a multisystem involvement rate of 11.3%, were chronic fatigue and respiratory problems. More female sex was associated with an increased risk of chronic complaints.

A self-reported long COVID is defined as symptoms that persisted for more than four weeks after the first suspected coronavirus (COVID-19) infection and were not explained by anything else. As of January 31, 2022, an estimated 1.5 million private-housing residents in the UK (2.4% of the population) reported having this condition. The estimations in this study are based on self-reported extended COVID-19 symptoms rather than clinically established continued symptoms of COVID-19 or post-COVID-19 syndrome in the general population. 685,000 people (45%) who self-reported having a lengthy COVID originally had COVID-19 at least 12 weeks prior, 1.1 million people (71%) had it at least 12 weeks prior, and 344,000 people (22%) had it less than 12 weeks prior. 344,000 people (22%) who self-reported having a protracted COVID had COVID-19 for the first time in the past 12 weeks or less, 1.1 million people (71%) had it for the first time in the past 12 weeks or more, and 685,000 people (45%) had it for the first time in the past 12 months or more. 989,000 people (65% of those with self-reported long COVID) and 281,000 (18%) claimed that long-COVID symptoms had "limited a lot" their ability to perform daily duties. Most persons with self-reported lengthy COVID still listed exhaustion as their main symptom, followed by shortness of breath (35%), loss of smell (34%), loss of taste (both 25%), and difficulty focusing (25%). Ages 35 to 49, females, residents of underprivileged areas, those who worked in teaching and education, social work, or health care, as well as those who had another activity-restricting health condition or

handicap, were the groups most likely to self-report long COVID⁽⁷⁾

According to information acquired between 7 April and 13 June, 6.2% of Great Britain's adult population (defined as individuals 16 years of age and over) may have experienced extended COVID at some point during the pandemic. This 6.2% is made up of 2.6% of people who indicated they had COVID-19 but weren't sure if they had extended COVID and 3.6% of people who said "yes" when asked if they had long COVID. Another 10.1% reported they had tested positive for COVID-19 at some point or believed they had, but they had not experienced persistent COVID symptoms. The estimates of the level of prevalence of long COVID in this release differ from the results of the most recent Coronavirus Infection Survey (CIS), which showed that 1.5% of people in the UK aged 2 years and older had self-reported long COVID in June 2021. 5.75 percent of individuals in England have COVID-19 persistent symptoms, according to a recent real time assessment of COVID transmission (REACT) study. There might be variations in the estimates because of the various time periods, survey designs, and sample sizes utilized in these studies.

- Of all the age groups, people between the ages of 30 and 49 (8.0%) were the most likely to report having perhaps endured a protracted COVID.

- Women (6.6%) were more likely than males (5.8%) to report having maybe encountered a protracted COVID.

- Adults with disabilities (8.0%) reported this possibility more frequently than non-disabled people (5.4%) did.

- Adults in England's most impoverished districts experienced extended COVID at a rate of 8.4%, compared to 5.2% in the least destitute areas.

This is crucial in low- to middle-income countries like Bangladesh, where the vast majority of people reside outside of the crowded capital city of Dhaka in rural areas. There are currently just two published investigations on persistent symptoms following COVID-19 infection in

Bangladesh. Diarrhea was the most common symptom (12.7%), followed by fatigue (11.5%), in a survey of 1002 people that found 20% of the subjects reported symptoms that remained after COVID-19. A second, more focused study of 355 patients found that 46% of COVID-19 survivors continued to have symptoms, with fatigue being the most often reported complaint. 8 However, there is little information available regarding symptoms that linger even after healing (8)

As a result, it's crucial to keep an eye on any lingering cardiorespiratory symptoms in patients who have been let go from the hospital or a quarantine. It is crucial to comprehend the prevalence, types, and risk factors of this condition as well as how they affect people's daily lives in order to better comprehend post-COVID-19 cardiorespiratory symptoms (9). As a result, this study's goal was to "study of persisting cardiorespiratory related problems in post covid patient."

MATERIALS & METHODS

The study received ethical clearance by the Institutional Ethical Committee of Dr. A.P.J Abdul Kalam College of Physiotherapy, PIMS-DU. A self- made questionnaire was formed and validated by validator and that questionnaire was used to evaluate the post covid-19 cardiorespiratory symptoms.

This study employed survey method consisted of 200 participants according to the inclusion and exclusion criteria. The inclusion criteria were 1) both males and females 2) willing to participate 3) History of covid 4) Age 20-50. while the exclusion criteria 1) Known case of respiratory disease like Asthma 2) Known case of cardiac disease 3) Known case of diabetes 4) Obesity with BMI >29 5) Not willing to participate in the survey.

The Questionnaire was designed in Google from as well as in offline form. link was kept open for the participants for their convenience on social media platform and were requested to forward the link to their colleagues, family and friends. And for

participant who don't have android phone or not able to used android phone were provided by offline questionnaire print. And they were searched from patient which were admitted to hospital, patients relative. A snowball type of sampling was done.

Some items were scored according to normal, mild, moderate and severe form. and some were scored according to 0-10 NPRS Scale.

Questionnaire considered 3 domains:- Demographic details, question about current symptoms patient were facing and questions regarding how patient were affected and how much their quality of life were disturbed by covid-19.

Statistical Analysis and Result:

The final study sample was 200 participants, from which 55% were male and 45% were females, aged between 20-50 years, with an average of 35.77 years (SD=9.6) In an average BMI of individual is 24.45 (SD=2.5). According to study 22.5% were alcoholic. 88.5% participants were one-time covid positive and 11.5% were 2-3 times covid positive with mean of 1.115(SD=0.31) and 55% were admitted to hospital and 17.5% were on ventilator.

DEMOGRAPHIC DATA:

Table No. 1: Gender wise classification of participants.

Gender	No. Of Responses	Percentage (%)
Female	90	45
Male	110	55



Graph No. 1: Signifies the gender wise classification of participants

Result No. 1: The above table and pie chart shows that there was a total of 200 participants out of which 45% were females and 55% were males

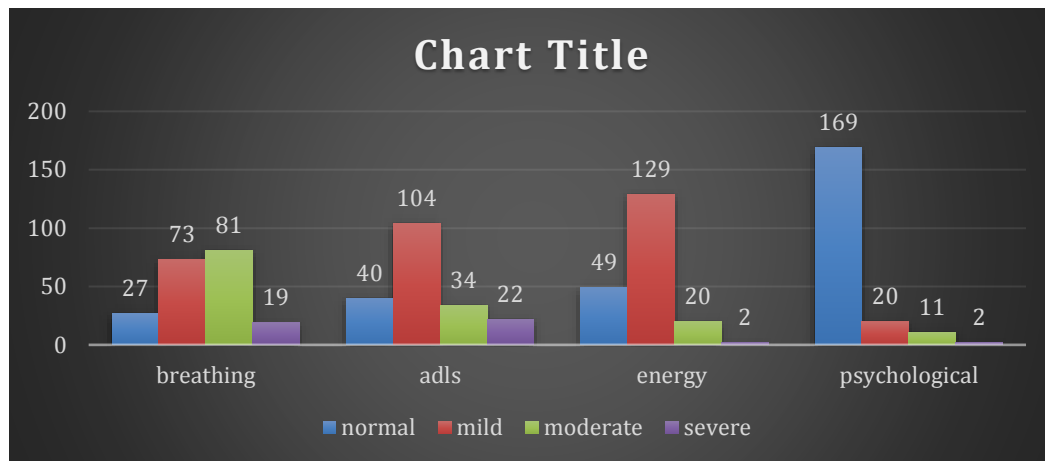
Table 2. Demographic and Clinical Characteristics of the Study Sample

Characteristics	Values	P value
Age, mean (SD), years	35.77(9.62)	0.025
Weight, mean (SD), kg	60.86(8.52)	0.0022
Height, mean (SD), CM	157.58(6.41)	0.0017
BMI, mean (SD), CM ²	24.45(2.57)	>0.10
Alcohol Status, n (%)		
Alcoholic	45(22.5)	
Non- Alcoholic	155(77.5)	
Tobacco Status, n (%)		
Active	70(35)	
None	130(65)	
No. of time covid positive, mean (SD)	1.115(0.31)	<0.0001
Days at Hospital, mean (SD)	5.98 (8.15)	<0.0001
Days at Home Quarantine, mean (SD)	12.58 (5.64)	<0.0001

QUESTIONNAIRE ANALYSIS AND RESULT:

Table No. 3: REPRESENTS NUMBER OF PATIENT HAVING DIFFICULTY IN NORMAL, MILD, MODERATE, SEVERE.

Severity	Normal	Mild	Moderate	Severe
Breathing	27	73	81	19
ADL	40	104	34	22
Energy	49	129	20	2
Psychological	169	20	11	2



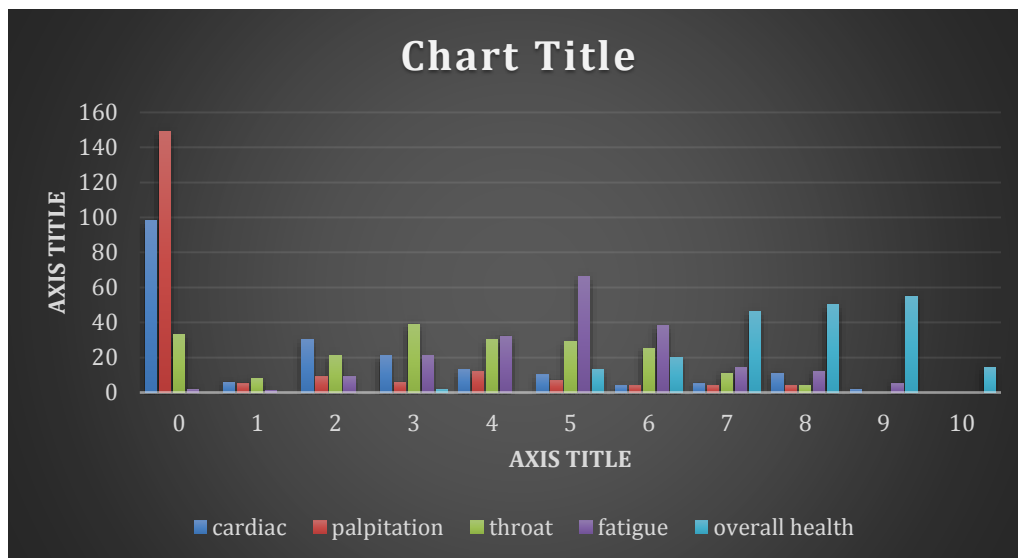
Graph No. 2: Signifies the number of patients having difficulty in normal, mild, moderate and severe form

Result No. 2: Study revealed that 13.5% of the 200(p=<0.0001) study participants had no respiratory problems. The percentage of respondents who reported having mild, moderate, or severe breathing issues was 36.5%, 40.5%, and 9.5%, respectively. 20% of respondents said they had no trouble with ADLs. 17% said they had moderate trouble with ADLs, 11% said they had severe difficulty, and 52% said they had very light

difficulty. 24.5% said they had a normal level of energy. 64.5% of respondents said they had a minor issue, 17% said they had a medium problem, and 11% said they had a major problem. 84.5% of respondents said they had no psychological problems. 10% of them indicated that they had a slight psychological problem, 5.5% that they had a significant problem, and 0% that they had a serious problem.

Table No. 3: REPRESENTS NUMBER OF PATIENT HAVING DIFFICULTY ON 0-10 SCALE

Problem	0	1	2	3	4	5	6	7	8	9	10
Cardiac	98	6	30	21	13	10	4	5	11	2	0
Palpitation	149	5	9	6	12	7	4	4	4	0	0
Throat	33	8	21	39	30	29	25	11	4	0	0
Fatigue	2	1	9	21	32	66	38	14	12	5	0
Overall health	0	0	0	2	0	13	20	46	50	55	14



Graph No. 3: Signifies the number of patients having difficulty on 0-10 NPRS scale

Result No. 3: On a scale of 0 to 10, 16.5% of the 200 survey participants ($p=0.0192$) said they had no symptoms of throat pain. 83.5% of those surveyed said they had mild to severe throat pain. There were 200 participants in the study who were given a scale from 0 to 10 ($p = 0.0001$). The majority of individuals admitted that they were now showing moderate to severe indicators of fatigue. Some people particularly said that they had slight to common symptoms of weariness before taking covid. There were 200 participants in the study ($p = 0.0001$), and they were given a scale of 0 to 10. 92% of participants answered that right now, their general health is between normal and moderate. All respondents (100%) claimed they have mild to normal overall health.

DISCUSSION

Recent research on COVID-19 and the coronavirus has been active, focused on its epidemiology, etiopathogenesis, pathology, prevention approach, and prevention-related elements. ⁽¹⁰⁾ These preliminary findings suggest a significant increase in post-COVID symptoms despite the absence of a COVID-19 pandemic. Recovery from a COVID-19 infection differs from person to person, and it is unclear why some suffer from chronic symptoms for a longer period of time. ⁽¹¹⁾ However, there haven't been many studies

that have evaluated the participants' post-covid cardiorespiratory challenges.

Both online and offline methods were used to perform the current study, which was titled "Study of Persistent Cardiorespiratory Related Symptoms in Post-Covid Patient." For the investigation, a total of 200 samples were collected. Convenient criteria were used to choose the participants. The participants were chosen using a practical sample technique and in accordance with the inclusion and exclusion criteria. Responses totaling 100% were recorded. Out of 200 patients who completed the survey, 55% of the respondents were men, and 45% of the remaining respondents were women. with a BMI of 24.45 ± 2.57 for both sexes. A persistent 2 or more cardiorespiratory symptoms were observed in active smokers. 10.5% of patients with medical comorbidities report experiencing one or more persistent symptoms.

To ensure problems are found, all monitoring for persisting symptoms following post-COVID. Given that these patients were admitted during the pandemic, moreover Participants who spent a few days in the hospital (5.98 ± 8.15) and required an ICU stay had relatively modest to severe issues, with 13.5% needing ventilator assistance. Additionally, the vast majority of participants are under quarantine at home. Additionally, the majority of patients

(12.58± 5.6) did not visit the hospital but rather underwent a brief home quarantine. Wirth, K.J.; Scheibenbogen, C. et al studied “Dyspnea in Post-COVID Syndrome following Mild Acute COVID-19 Infections: Potential Causes and Consequences for a Therapeutic Approach Understanding the differences in the pathophysiology of post-COVID dyspnea between patients with mild and severe acute infections is made possible by the understanding that hyperventilation plays a significant pathophysiological role in the development of PCS in patients with minor acute infections. Patients who have limited lung capacity as a result of acute, serious pulmonary infections will experience inadequate ventilation during exercise, which will result in dyspnea. These individuals may still hyperventilate, but because of decreased gas exchange, they won't have hypocapnia and alkalosis, two of the three mechanisms that cause intramuscular salt loading. As a result, intracellular sodium may continue to be below the level at which the NCX switches to importing calcium, leading to calcium excess and injury. Thus, while having reduced lung functioning, these individuals may actually be shielded from this particular ionic disruption in skeletal muscle. Low respiratory drive patients who become highly hypoxic during the acute infection are also less prone to experience hyperventilation and respiratory alkalosis⁽¹¹⁾.

The majority of the patients in our sample had symptoms that persisted for months and were graded as normal, mild, moderate, or severe. The following issues about problems following COVID were covered in this study. Patients who had first-time infections at a rate of 88.5% and those who had second-time infections at a rate of 11.5% also had post-COVID symptoms and difficulties.

86.5% of the patients in our study had mild to severe dyspnea, which negatively impacted their quality of life. Contrarily, 13.5% of participants reported not having any such discomfort. Since COVID-19 directly affects the respiratory system, it is well known that it can also cause

inflammation in several cardiovascular system organs. Some patients were on ventilators and hospitalised for 10 to 20 days, which may have had a greater impact on the lungs and resulted in reduced lung function. may obstruct the patient's daily activities. 80% of the patients reported having trouble with daily tasks. According to others, it might be caused by exhaustion and shortness of breath. Along with exercise, it has been noted that the energy level of 64.5% of the patients has fallen below average, as shown by feelings of restlessness. It has also been observed that COVID has had an impact on the 5.5% of people affected by COVID-19's usual psychological characteristics, such as anxiety, depression, and social withdrawal. Rosario Fernández-Plata et al studied “Risk of Pulmonary Fibrosis and Persistent Symptoms Post-COVID-19 in a Cohort of Outpatient Health Workers” Data indicate that the majority of patients had respiratory symptoms. Because it is one of the few viral infections that frequently results in long-lasting chronic respiratory symptoms in outpatients, this discovery is significant. Patients with severe influenza who are hospitalised frequently experience respiratory sequelae, whereas other illnesses relatively infrequently do as well. According to several studies, COVID-19 individuals continue to experience neurological symptoms, which can take the form of a complex neurological illness. The most frequent neurological signs include encephalitis, cerebrovascular illness, loss of taste and smell, headaches, dizziness, and vertigo. Acute COVID-19-related diseases of the central and peripheral nervous systems are typically short-lived, but neurological aftereffects might last for months. In this regard, the question of whether the chronic sequelae can become reversible is still open and can be clarified with careful monitoring of these patients.⁽¹²⁾

The subject of how COVID-19 has affected you is now raised in our study. The classifications are New, Old, and None. and a scale of 0 to 10. Patient reports of palpitations, angina, and chest pain were

made up of 49.5%. 51% said they had a mild to serious heart problem. By 25.5%, palpitations were recorded. COVID affects the respiratory system, as is well known. 83.5% of the patients experienced early-stage congestion of the throat as well as sore throat and discomfort.

Most research indicated that they became weary quite quickly. The similar issue was also noted in our investigation. 95% of participants felt slight to average tiredness before to COVID. After covid 19 positive, 94% of respondents said they had moderate to severe difficulty. It also decreased the patient's ability to work.

Jocelin Hall et al studied "Identifying patients at risk of post-discharge complications related to COVID-19 infection"; 119/200 (60%) Despite no radiological or physiological abnormality being found, some individuals with "post-COVID-19 syndrome" continued to experience subjective symptoms, which is anticipated to pose a significant management challenge for the healthcare system. 40% of those examined did, however, have a major discovery. (13)

In our study, 99% of participants said that, following covid, their general health was between normal and moderate. This may be brought on by issues including weariness, soreness in the throat, and shortness of breath. The impact of COVID was profound on everyone's life.

This is the first study to use combined stress echocardiography and CPET to assess COVID-19 recovery in patients. Anaerobic threshold testing and other phases of effort assessment are more applicable to daily activity than peak exercise alone. Our study is an effort to logically explain the functional impairment that many COVID-19 recovery patients suffer. Our primary findings are as follows: (1) Similar to earlier studies, two thirds of the patients had at least one lingering symptom. 4-6; (2) patients recovering from COVID-19 frequently have abnormally low peak VO₂; (3) the mechanism of the decline is a mix of chronotropic incompetence and reduced SV

reserve and varies depending on specific symptoms; (4) Severe gas exchange abnormalities and very limited breathing reserve are rather uncommon causes of effort intolerance (5) Chronotropic incompetence, limited SV reserve, limited RV systolic reserve, and peripheral factors (low peak A-VO₂ difference) each independently contribute to the reduced exercise capacity in patients recovering from COVID-19. (14)

Bang Zheng, et al studied, "Prevalence, risk factors and treatments for post-COVID-19 breathlessness: a systematic review and meta-analysis", According to meta-analyses, 26% of COVID-19 survivors reported having breathlessness symptoms more than four weeks after infection, and according to the MRC/mMRC dyspnea scale, 41% of survivors reported having poorer physical stamina as a result of post-COVID breathlessness. At 1-6 months after COVID, the pooled prevalence of self-reported dyspnea symptoms was 28%; at 7-12 months, it was 20%. Different clinical and population features, analytical techniques, and prevalence estimates all showed significant variances. (15)

According to our study, some patients who received Covid-19 experienced joint pain, CVA, facial palsy, weight gain, headaches, and DVT. And after a month of covid positive symptoms other than cardiorespiratory symptoms, several females experienced PCOD. This indicated that Covid-19 affects neurological system, gastrointestinal system, cardiovascular system, circulatory system, reproductive system, musculoskeletal system, and endocrine system in addition to cardiorespiratory symptoms.

CONCLUSION

This study significantly revealed that massive issues were reported by participants on problems faced by them after covid positive. Various parameters that were surveyed in the Research like Breathing, ADL'S, Energy Level, Psychological problems, Cardiac condition, Palpitation, Throat pain, Fatigue and patient overall

health resulted notable alteration pre- covid and post- covid symptoms. It has also been observed that most of patient have 1-2 or more than 2 persistent cardiorespiratory related symptoms and which lead to affect their quality of life.

Declaration by Authors

Ethical Approval: Approved

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Cascella M, Rajnik M, and Aleem A, et al., "Features, Evaluation, and Treatment of Coronavirus (COVID-19)," in *NCBI Bookshelf*, StatPearls Publishing, Treasure Island (FL), 2022, pp. 1-2.
2. Wu, Yi-Ch, Chen, Ching-Sung and Chan, Yu-Jiun, "The outbreak of COVID-19: An overview," *Journal of the Chinese Medical Association*, vol. 83, no. 3, 2020.
3. Ani Nalbandian, Kartik Sehgal, and Elaine Y. Wan, "Post-acute COVID-19 syndrome," *Nature Medicine*, 2021.
4. César Fernández-de-las-Peñas , Domingo Palacios-Ceña , Víctor Gómez-Mayordomo, María L. Cuadrado and Lidiane L. Florencio, "Defining Post-COVID Symptoms (Post-Acute COVID, Long COVID, Persistent Post-COVID): An Integrative Classification," *International Journal of Environmental Research and Public Health*, vol. 18, no. 5, 2021.
5. kjørten I, Ankerstjerne OAW, Trebinjac D, et al. Cardiopulmonary exercise capacity and limitations 3 months after COVID-19 hospitalisation. *Eur Respir J* 2021; 58: 2100996 [DOI: 10.1183/ 13993003.00996-2021].
6. .Daniel Munblit, Polina Bobkova, Ekaterina Spiridonova, Anastasia Shikhaleva, Aysylu Gamirova, Oleg Blyuss, Nikita Nekliudov, Polina Bugaeva, Margarita Andreeva, Audrey DunnGalvin , Pasquale Comberati, Christian Apfelbacher, Jon Genuneit, Sergey Avdeev, Valentina Kapustina, Alla Guekht, Victor Fomin1, Andrey A. Svistunov, Peter Timashev, Vladislav S. Subbot, Valery V. Royuk, Thomas M. Drake, Sarah Wulf Hanson, Laura Merson, Gail Carson, Peter Horby, Louise Sigfrid, Janet T. Scott, Malcolm G. Semple, John O. Warner, Theo Vos, Piero Olliaro, Petr Glybochko, Denis Butnaru, Sechenov, "Incidence and risk factors for persistent symptoms in adults previously hospitalized for COVID-19," wiley, 2021
7. "Prevalence of ongoing symptoms following coronavirus (COVID-19) infection in the UK," 2022.
8. Mohammad Anwar Hossain, K M Amran Hossain, Karen Saunders, Zakir Uddin, Lori Maria Walton, Veena Raingar, Mohamed Sakel, Rubayet Shafin, Mohammad Sohrab Hossain, Md Feroz Kabir, Rafey Faruqui, Md Shohag Rana, Md Shahoriar Ahmed, Sonjit Kumar Chakrovorty, Md Anwar Hossain and Iqbal Kabir Jahid, "Prevalence of Long COVID symptoms in Bangladesh: a prospective Inception Cohort Study of COVID-19 survivors," *BMJ Global Health* , vol. 6, no. 12, 2021
9. M. Angelo Carfi, M. Roberto Bernabei, M. P. Francesco Landi and e. al, "Persistent Symptoms in Patients After Acute COVID-19," *jama_carf*, vol. 324, no. 6, 2020
10. Agarwal A, Agarwal S, Motiani P. Difficulties encountered while using PPE kits and how to overcome them: an indian perspective. *Cureus*. 2020 Nov;12(11). DOI: 10.7759/cureus.11652
11. Wirth, K.J.; Scheibenbogen, C. Dyspnea in Post-COVID Syndrome following Mild Acute COVID-19 Infections: Potential Causes and Consequences for a Therapeutic Approach. *Medicina* 2022, 58, 419. <https://doi.org/10.3390/medicina58030419>
12. Fernández-Plata, R.; Higuera-Iglesias, A.-L.; Torres-Espíndola, L.M.; Aquino-Gálvez, A.; Velázquez Cruz, R.; Camarena, Á.; Chávez Alderete, J.; Romo García, J.; Alvarado-Vásquez, N.; Martínez Briseño, D.; et al. Risk of Pulmonary Fibrosis and Persistent Symptoms Post-COVID-19 in a Cohort of Outpatient Health Workers. *Viruses* 2022, 14, 1843. <https://doi.org/10.3390/v14091843>
13. Hall J, Myall K, Lam JL, et al. "Identifying patients at risk of post-discharge complications related to COVID-19 infection" *Thorax* 2021;76:408–411.
14. Yishay Szekely, MD, Yael Lichter, MD, Sapir Sadon, MS, Lior Lupu, MD, Philippe Taieb, MD, Ariel Banai, MD, Orly Sapir, MD, Yoav Granot, MD, Aviram Hochstadt,

MD, Shirley Friedman, MD, Michal Laufer-Perl, MD, Shmuel Banai, MD, and Yan Topilsky, MD, Tel Aviv, Israel in "Cardiorespiratory Abnormalities in Patients Recovering from Coronavirus Disease 2019" journal of the American Society of Echocardiograph volume 34 number 12.

15. Zheng B, Daines L, Han Q, et al. Prevalence, risk factors and treatments for postCOVID-19 breathlessness: a systematic review and meta-analysis. *Eur Respir Rev* 2022; 31:

220071 [DOI: 10.1183/16000617.0071-2022]

How to cite this article: Aditi D. Pansare, Sambhaji Gunjal. Study of persistent cardiorespiratory related symptoms in post COVID patient. *Int J Health Sci Res.* 2023; 13(4):176-185.
DOI: <https://doi.org/10.52403/ijhsr.20230422>
