

# Effectiveness of Pulmonary Rehabilitation Programme on Exercise Tolerance among Survivors of COVID-19

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**Abstract:** *The present study investigated the effectiveness of pulmonary rehabilitation programme on exercise tolerance among survivors of COVID-19 attending tertiary care hospital, Kottayam. A quantitative approach with quasi experimental pre test post test control group design was used for the study. The study was theoretically supported by Betty Neuman's system model. A total of 60 patients, each 30 in control and experimental group, were selected for the study using non probability purposive sampling technique. Survivors of COVID-19 were screened by using mMRCdyspnoea scale. The data were collected using socio personal and clinical data sheet and 6 minute walk test to assess exercise tolerance. After pre test, the subjects in the control group received routine care and subjects in the experimental group received pulmonary rehabilitation programme along with routine care. The pulmonary rehabilitation programme consisting of video assisted teaching of a group of exercises including walking exercises and lung exercises. The investigator followed up the daily exercise via telephone communication and monitoring card. Post test were conducted on 21<sup>st</sup> day of pre test. The results of the study revealed that the pulmonary rehabilitation programme had significant effect on improving exercise tolerance ( $p < 0.01$ ) among survivors of COVID-19.*

**Keywords:** Pulmonary rehabilitation programme; Survivors of COVID-19; Exercise tolerance.

## 1. Introduction

The novel human coronavirus disease COVID-19 had become the fifth documented pandemic since the 1918 flu pandemic.<sup>1</sup>

As we battle through this pandemic, the challenging part was how to manage this COVID-19 sequelae which may vary from mild in terms of fatigue and body aches to severe forms requiring long term oxygen therapy and lung transplantation due to lung fibrosis, significant cardiac abnormalities and stroke leading to significant impairment in quality of health. Various studies had reported that around 40–50% of patients who recovered from COVID-19 presents with persistence of at least one or more symptoms, even after being declared COVID-free.<sup>7</sup>

Based on the above-described functional problems, many patients need pulmonary rehabilitation (PR) following the acute phase. Rehabilitation in the acute stage and particularly in the recovery stage is more beneficial.<sup>12</sup> Participation in Pulmonary rehabilitation (PR) enhances exercise capacity, reduces fatigue and dyspnoea, improves the strength of respiratory muscles in patients with various forms of respiratory disorders, reduces depression and anxiety and improves Health Related Quality of life.

## 2. Objectives

1) To assess the exercise tolerance among survivors of COVID-19

2) To evaluate the effectiveness of pulmonary rehabilitation programme on exercise tolerance among survivors of COVID -19

## 3. Materials and methods

The quantitative approach was adopted for the study. Research design selected for the study was quasi experimental pretest posttest control group design. Non probability purposive sampling technique was used in this study. In this study sample consisted of 30 subjects in control and 30 subjects in experimental group who were the survivors of COVID-19 with persisting respiratory symptoms and exercise intolerance and attended the post COVID clinic and OPD of Pulmonary Medicine department at Govt Medical College Hospital, Kottayam.

Inclusion criteria of the present study was survivors of COVID 19, having score of 0-3 in Modified Medical Research Council's dyspnoea assessment scale, who were willing to participate, who were diagnosed as COVID -19 within last six months, who were having age within 21-60 years and who were hemodynamically stable. Those who excluded from the study were survivors of COVID 19, with cognitive impairment and with oxygen saturation less than 94%. Tools and techniques used to collect data in the present study were the following: Socio personal and clinical data sheet and six minute walk test to assess exercise tolerance.

Patients were screened with modified Medical Research Council's dyspnoea scale and among them sixty were selected for the study. First 30 were in the control group and rest 30 were in the experimental group, who met the

inclusion criteria. After building a rapport with the patient, pretest was conducted by using socio personal data and clinical data sheet and 6minute walk test to the control group. Prior to conducting 6minute walk test, the oxygen saturation BP and has assessed as the first step. If saturation is above 94%, patient was asked to walk for 6 minutes in normal pace through a pre-determined path. After 6 minutes, patient's dyspnoea was assessed with modified Borg scale. The control group received routine care. Post test was done after 21 days in the control group with the same tools. After completed data collection from control group, next 30 subjects were allotted to experimental group.

After pretest, the investigator provided video assisted teaching programme for 10 min followed by demonstration of pulmonary rehabilitation programme to the experimental group. Researcher then conducted return demonstration and corrections were provided as and when required. Patients were followed up on a daily basis to ensure adherence to the exercise programme. Post test was conducted on 21<sup>st</sup> day to experimental group. The obtained data was tabulated and analysed in terms of objectives of the study using descriptive and inferential statistics.

## 4. Results

### 4.1 Socio personal data of survivors of COVID-19

Among 60 patients, 43.33% patients in control group and 33.33% patients of experimental group belonged to the age group of 51-60 years. The data showed that majority of survivors of COVID -19 in experimental group (70%) and control group (73.33%) were females. Data pointed out that 46.67% of patients in control group were having high school education. The data showed that majority (60%) of subjects in the control group and 33.33% of the experimental group were unemployed. The data showed that majority of patients in the control (66.67%) and experimental group (73.33%), were moderate workers. Among the 60 subjects 83.33% of patients in the control group and 76.67% of patients in the experimental group had no unhealthy habits, whereas 10% of patients in the control group and 16.67% patients in the experimental group were smokers. The data pointed out that 93.33% patients from control and 90% patients from experimental group had no occupational exposure to any air pollutants. Majority of patients in control group (83.33%) and experimental group (90%) were from rural area. The data showed that in control group 83.33% of patients and in experimental group 96.67% of patients had no air pollutants in the residential area.

### 4.2 Clinical data of survivors of COVID-19

The data pointed out that in control group 23.33% of patients had asthma/COPD and 13.33% patients had coronary artery disease with diabetes mellitus. In experimental group 16.67% had asthma/COPD or hypothyroidism and 40% of patients had no comorbidities. The data showed that 43.33% of patients from the experimental group were diagnosed as COVID positive, 2-4 months back. In control group 46.67% of patients had diagnosed as COVID positive, 4-6 months back. The data showed that 90% patients in the control group and 86.67%

of patients from the experimental group had developed mild symptoms during the course of illness. And 6.67% patients in control group and 10% patients in the experimental group had developed COVID pneumonia during the course of illness. The data pointed out that 73.33% of patients in the experimental group and 66.67% of patients in the control group were in the home quarantine with treatment. The data showed that 50% of patients in the control group and 43.33% in the experimental group had received two doses of COVID vaccination before illness. The data showed that 60% in the control group and 80% in the experimental group had no history of dyspnoea before the COVID-19 infection. The data showed that most of the patients in the control group (83.33%) and in the experimental group (76.67%) were diagnosed to have COVID-19 for the first time.

### 4.3 Exercise tolerance among survivors of COVID-19

**Table 1:** Frequency distribution and percentage of survivors of COVID-19 in control and experimental group based on exercise tolerance during pretest, (n=60)

Exercise tolerance	Control (n=30)		Experimental (n=30)		df	$\chi^2$	p
	f	%	f	%			
Slight intolerance (2)	0	0	1	3.33	6	5.25	0.51
Moderate intolerance (3)	5	16.67	5	16.67			
Some what severe (4)	5	16.67	11	36.67			
Severe intolerance (5)	11	36.67	7	23.33			
(6)	3	10.0	1	3.33			
Very severe intolerance(7)	5	16.67	4	13.33			
(8)	1	3.33	1	3.33			

Table 1 depicts that 36.67% of patients in the control group and 23.33% of patients in the experimental group had severe exercise intolerance in pretest whereas in the experimental group 36.67% of patients had somewhat severe exercise intolerance before intervention. Chi square value shows that there is no statistically significant difference between control and experimental group; hence both groups were homogenous in terms of exercise tolerance.

### 4.4 Effectiveness of pulmonary rehabilitation programme on exercise tolerance among survivors of COVID-19

**H<sub>01</sub>:** There is no significant difference in exercise tolerance among survivors of COVID -19 between control and experimental group.

**Table 2:** Median and Inter quartile range (IQR) of pre test and post test scores of exercise tolerance among survivors of COVID-19 between control and experimental group, (n=60)

Group	Pre test		Post test	
	Median	IQR	Median	IQR
Control (n=30)	7	2	4	2
Experimental (n=30)	6	1	2.5	2

**Table 3:** Mean rank, sum of ranks and U value of post test scores of exercise tolerance among survivors of COVID-19 in control and experimental group, (n=60)

Exercise tolerance				
Group	Mean rank	Sum of ranks	U	p
Control (n=30)	38.13	1144	221	0.00
Experimental (n=30)	22.87	686		

The table 3 shows that the mean rank of post test scores of exercise tolerance among survivors of COVID-19 in control and experimental group was 38.13 and 22.87 respectively. The obtained U value is significant at 0.01 level. Hence the null hypothesis is rejected and it is inferred that pulmonary rehabilitation programme was effective in improving exercise tolerance among COVID-19 survivors.

## 5. Conclusion

Pulmonary rehabilitation programme was effective in improving exercise tolerance among survivors of COVID-19. Findings of the study can be used to improve the patient care in the clinical as well as public health settings and can be used for rehabilitative patients. Pulmonary rehabilitation programme is a complimentary, safe, and effective clinical treatment modality in patients with respiratory disorders. Practicing pulmonary rehabilitation programme is effective in improving exercise tolerance and thereby enhancing the health status and quality of life among survivors of COVID-19 with persisting respiratory symptoms like dyspnoea, cough, fatigue and exercise intolerance.

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