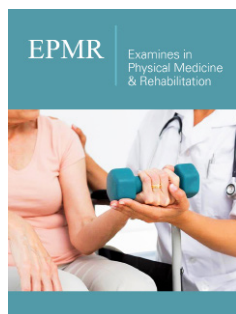




# Effects of Preoperative Aerobic Training for Improving Postoperative Functional Mobility in Coronary Artery Bypass Graft Patients

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**\*Corresponding author:** Wajeeha Sahar, The University of Lahore, Lahore, Pakistan

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**Usama Munir<sup>1</sup>, Umar Riaz<sup>1</sup>, Noor Fatima<sup>1</sup>, Wajeeha Sahar<sup>2\*</sup> and Komal Tariq<sup>1</sup>**

<sup>1</sup>Faisal Institute of Health Science, Faisalabad, Pakistan

<sup>2</sup>The University of Lahore, Lahore, Pakistan

## Abstract

**Objective:** To evaluate the effect of preoperative aerobic training for improving postoperative functional mobility in Coronary Artery Bypass Graft (CABG) Patient.

**Study design:** Quasi experimental study.

**Place and duration of study:** The study was conducted at Faisalabad Institute of Cardiology Faisalabad from April, 2022 to July 2022.

**Methodology:** A Quasi experimental study was performed on thirty eight patients who underwent elective CABG at Faisalabad Institute of Cardiology. The subjects were divided into two groups. The Group-1 was subjected to aerobic training whereas the Group-2 received the conventional treatment, 4 days a week for three weeks. The outcomes were evaluated at baseline, third week preoperatively and postoperative before discharge. After applying intervention of 4 weeks in coronary artery bypass graft patients, outcomes were evaluated using Time Up and Go test (TUG) to determine the functional mobility and Canadian Cardiovascular Society (CCS) to grading the angina pectoris. Oxygen therapy duration was also noted as outcome measures of this study.

**Result:** There was significant improvement in mean TUG test at 3rd week preoperative and postoperative before discharge ( $P < 0.05$ ). There was significant improvement in mean CCS at 3rd week preoperative and postoperative before discharge ( $P < 0.05$ ). Similarly, there was significant improvement in duration of oxygen therapy postoperative before discharge ( $P < 0.05$ ).

**Conclusion:** Both groups were found effective in improving the functional mobility, Canadian cardiovascular society grading and reduced the postoperative oxygen duration therapy, but the Aerobic training group was found more effective in improving functional mobility, CCS and reduced the postoperative oxygen duration therapy as compared to the conventional group.

**Keywords:** Coronary artery bypass graft; Aerobic training; Time up and go test; Conventional treatment; Duration of oxygen therapy

**Abbreviations:** CABG-Coronary artery bypass graft, CCS-Canadian cardiovascular society, TUG-Timed up and go test.

## Introduction

Coronary-Artery Bypass Grafting (CABG) is a surgical operation in which atherosclerotic plaque-blocked arteries are partially or completely bypassed using grafts taken from other arteries or veins. A median sternotomy is frequently used to do surgery [1]. The larger saphenous vein and the left internal mammary artery continue to be the most often used bypass. One of the leading causes of illness and mortality in the world today is cardiovascular disease. The risk factors that can be managed (modified) include high blood pressure, high cholesterol, smoking, diabetes, being overweight or obese, not getting enough exercise, eating poorly, and stress. Some risk factors cannot be changed: Age, gender, ancestry, and

race [2]. The most prevalent form of cardiovascular illness, known as Coronary Heart Disease (CHD), is the narrowing or obstruction of the cardiac arteries brought on by atherosclerosis [3]. Functional mobility is the ability of individuals to travel from one location to another in order to engage in daily activities at home, at work, and in the community [4]. Cardiac rehabilitation programs improve physical fitness. Preoperative physical therapy is useful for patients which undergo cardiac surgery. The majority of patients who are scheduled for elective CABG stay at home and get little or no physical therapy or other therapies in the weeks leading up to their procedure. Patients' functional and psychological status deteriorates during this time before surgery, according to evidence. Aerobic exercise is a kind of endurance activity ranging from low to high intensity and largely dependent on oxygen. Running or jogging for moderate to long distances, swimming, cycling, stair climbing, and walking are some examples of aerobic exercise .The use of aerobic training may activate anti-aging genes that are critical to cardiovascular function [4]. The use of activators may accelerate and improve cardiovascular function in coronary artery bypass graft patients [5].

Aerobic exercise is an essential component of cardiac rehabilitation provided to patients who have had heart surgery. Exercise-based cardiac rehabilitation is practiced in the United States. The goal of the current era is to enhance aerobic and functional endurance, using aerobic-based exercise to increase capacity for instance walking and stationary cycling, provide benefits such as relieving symptoms and a reduction in cardiovascular vulnerability, reduced hospital admissions and illness progression as well as death [6]. The purpose of this study was to evaluate the effect of preoperative aerobic training for improving postoperative functional mobility of Coronary Artery Bypass Graft patients [7].

## Methodology

Patients waiting for coronary artery bypass grafting who were willing to participate in the study and were male or female and between the ages of 40 and 60 were included. Patients with neurological impairment, pulmonary problems, or pacemaker dependent were excluded. Additionally, patients with concurrent

valve disease and high blood pressure were also excluded from the study. A total of 38 patients were included in the study and non-randomly divided into two groups. Group-1 as Aerobic training group and Group-2 as Conventional group. The Modified Healthy Heart Questionnaire was used as a screening tool. The Time Up and Go test and Canadian Cardiovascular society grading tools were used for determined functional mobility and grading the angina pectoris. Group-1 received Aerobic training in the form of Walking on a flat surface, light to moderate pace for 10-15 min and Stepping 8-12 repetitions, once a day, four days in a week for 3 weeks. Warm up and Cool down activity was also included. In Warm up activity, Range of motion exercises (8-12 repetitions) of upper and lower limb included. In Cool down activity, Static stretching exercises (8-12 repetitions) of upper and lower limb included. Group-2 received the Conventional treatment which includes the early mobilization, Deep breathing exercises include Diaphragmatic and pulse lip breathing. Huff and cough technique was also included once in a day, four days in a week for 3 weeks. The outcome measures were evaluated at Baseline, Preoperatively at 3rd week and Postoperatively before discharge. Statistical analysis was performed by using SPSS version 22. The Normality of the data was checked through the Shapiro Wilk test for all dependent variables before conducting inferential statistics. Data was found not normally distributed, then non-parametric tests were applied. Friedman test and Mann-whitney test were conducted for data analysis.

## Result

The TUG and CCS readings significantly improved at 3<sup>rd</sup> week preoperative and postoperative before discharge as compared to the baseline values in both group-1 and group-2 (P=0.00) as shown in (Table 1). There was significant improvement in mean TUG readings at 3<sup>rd</sup> week preoperative and postoperative before discharge readings in Group-1 with P<0.05. Results showed there was improvement in CCS readings at 3<sup>rd</sup> week preoperative and postoperative before discharge readings in Group-1 with P<0.05. There was significant reduction in oxygen therapy duration postoperatively in Group-1(P< 0.05) as shown in (Table 2) [8].

**Table 1:** Comparison of mean change in outcomes measure in Group 1 and 2.

Outcomes Measure	Timing	Aerobic Training Group		Conventional Group		P-Value
		Mean	Standard Deviation	Mean	Standard Deviation	P-Value
Time and go test	Baseline	16.21	1.81	16.31	1.82	
	Pre-op	13.89	1.62	15.26	1.91	
	Post-op	12.89	1.62	15.05	1.98	
Canadian Cardiovascular Society (CCS)	Baseline	2.42	0.507	2.31	0.671	
	Pre-op	1.42	0.507	1.94	0.779	
	Post-op	1.42	0.507	1.84	0.737	
Duration of Oxygen therapy	Post-op	50.315	6.289	59.78	8.972	0.002

**Table 2:** Comparison of mean change in outcomes measure in Group 1 and 2.

Outcomes measure	Timing	Aerobic Training Group		Conventional Group		P-value
		Mean	Standard deviation	Mean	Standard deviation	P-value
Time and go test	Baseline	16.21	1.81	16.31	1.82	0.835
	Pre-op	13.89	1.62	15.26	1.91	0.044
	Post-op	12.89	1.62	15.05	1.98	0.001
Canadian Cardiovascular Society(CCS)	Baseline	2.42	0.507	2.31	0.671	0.716
	Pre-op	1.42	0.507	1.94	0.779	0.031
	Post-op	1.42	0.507	1.84	0.737	0.41
Duration of Oxygen therapy	Post-op	50.315	6.289	59.78	8.972	0.002

## Discussion

Miozzo et al. [9] conducted the study to analyze the effects of aerobic exercise and high-intensity inspiratory muscle training on a patient's physical stamina, respiratory muscle strength, and quality of life. Two groups of 24 patients were being randomly assigned. IMT combined with aerobic exercise was given to one group, while only aerobic exercise was given to the other. At the baseline, the 12<sup>th</sup> session, the 24<sup>th</sup> session, and the 36<sup>th</sup> session, measurements were taken. The findings demonstrated that there was no discernible difference between the two groups. In this current study 38 patients were allocated non randomly into two groups. One received aerobic exercise and the other group received conventional treatment. Readings were taken at baseline, 3rd week preoperatively and postoperatively before discharge. Above study shows similar results to the current study, they also use aerobic exercise to improve functional capacity, in current study improve functional mobility through aerobic exercise [9]. Prabhu et al. [10] conducted a systematic review to evaluate the functional capacity and level of physical activity by performing aerobic exercises. A sum of 21 studies was considered for this review. The findings indicated that both functional capacity and degree of physical activity had significantly improved. The findings of this study were consistent with current study results because there was improvement in functional capacity [10]. Borges et al. [6] conducted a study to investigate the impact of aerobic exercise following CABG on pulmonary function and functional ability. There were 34 patients total, and they were split into two groups. One group received the standard of care. The intervention group performed additional aerobic exercise with a cycle ergometer in addition to the same routine. Prior to surgery and after hospital discharge, the readings were collected. Both groups' pulmonary function was significantly reduced.

Functional ability was maintained in the intervention group but considerably declined in the patients in the control group. In this current study functional mobility of the aerobic training group was improved as compared to the conventional group. Functional mobility was measured by time up and go test in this study. Findings of this study were consistent with above study results, that functional capacity is improved by aerobic exercise [6]. Zanini

et al. [11] conducted the research. The goal of this study was to assess how different rehabilitation techniques, such as resistance training, affected the patients' pulmonary function and functional capacity throughout inpatient cardiac rehabilitation. This was a single blinded randomized control trial. 40 patients were randomly assigned into four groups. All groups received chest physiotherapy and exercises. Patients were accessed on postoperative day 6 and post discharge day 30. Above study showed contrary results to the current study because in the above study improved functional capacity and pulmonary function through resistance training, in the current study functional mobility improves through aerobic exercise [11]. Wajeaha et al., conducted a study to compare preoperative respiratory muscle strengthening to standard care. They came to the conclusion that respiratory muscle training significantly increased the length of oxygen therapy. In contrast to the above study, the current investigation demonstrated that aerobic exercise improved the duration of oxygen therapy [12].

## Conclusion

It is concluded that all two groups are found effective in improving the functional mobility, Canadian cardiovascular society grading and reduced the postoperative oxygen duration therapy. But the Aerobic training group was found more effective in improving functional mobility, CCS and reduced the postoperative oxygen duration therapy as compared to the conventional group.

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