

**Original research article****Aerobic exercise and its impact on cardiac rehabilitation in post-CABG patients****<sup>1</sup>Dr. Jinal Thakkar, <sup>2</sup>Dr. Sonam Soni (PT), <sup>3</sup>Dr. Jafar Khan, <sup>4</sup>Dr. Ishrat Bano**<sup>1</sup>M.PTh Scholar, Pacific College of Physiotherapy, Udaipur, Rajasthan, India<sup>2</sup>Assistant Professor, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India<sup>3</sup>Dean & HOD, Pacific College of Physiotherapy, Pacific Medical University, Udaipur, Rajasthan, India<sup>4</sup>Assistant Professor, MPT in Cardiorespiratory Disorder, Pacific Medical University, Udaipur, Rajasthan, India**Corresponding Author:**

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**Abstract**

Cardiac rehabilitation is a vital phase in the recovery of patients following coronary artery bypass grafting (CABG). Aerobic exercise is a fundamental component of cardiac rehabilitation that significantly influences cardiovascular health and overall well-being. This manuscript explores the profound impact of aerobic exercise on post-CABG cardiac rehabilitation, considering its effects on cardiovascular fitness, recovery speed, and quality of life. A prospective randomized controlled trial (RCT) with 40 post-CABG patients aged 18-75 was conducted. Participants were randomly assigned to either the "Aerobic Exercise" group or the "Control" group. The Aerobic Exercise group engaged in supervised aerobic exercise programs, while the Control group received standard post-CABG care. The primary outcome measure was the distance walked in a standardized 6-minute walk test. Quality of life was assessed using standardized questionnaires, and cardiovascular fitness was evaluated by measuring maximal oxygen consumption (VO<sub>2</sub>max). Ethical considerations and limitations were duly addressed in the study design. Both groups exhibited significant improvements in the distance walked after the intervention. In the Aerobic Exercise group, the mean distance walked increased by approximately 12.91%, while the Control group also showed a substantial increase of about 11.08%. A significant difference was observed between the two groups at the post-test stage, favoring the Aerobic Exercise group. The results emphasize the benefits of both aerobic exercise and yoga, but aerobic exercise may offer slightly greater improvements in walking distance. This study underscores the positive impact of aerobic exercise on cardiac rehabilitation in post-CABG patients. It demonstrates improvements in walking distance, quality of life, and cardiovascular fitness. Both aerobic exercise and yoga contribute to post-CABG recovery, with aerobic exercise showing slightly greater benefits in terms of walking distance. This research informs healthcare providers, patients, and researchers about the value of aerobic exercise in enhancing post-CABG rehabilitation and the overall well-being of these patients.

**Keywords:** Cardiac rehabilitation, coronary artery bypass grafting (CABG), aerobic exercise, postoperative recovery, 6-minute walk test, cardiovascular fitness, quality of life

**Introduction**

The journey of cardiac rehabilitation is a critical phase in the lives of patients who have undergone coronary artery bypass grafting (CABG), a major surgical procedure aimed at restoring blood flow to the ischemic myocardium. For these individuals, the road to recovery is marked by significant physical and emotional challenges <sup>[1]</sup>. The effectiveness of post-CABG rehabilitation programs is central to enhancing patients' well-being and improving their quality of life. Among the diverse components of cardiac rehabilitation, aerobic exercise stands out as a cornerstone for promoting cardiovascular health and physical fitness in these patients <sup>[2]</sup>.

Aerobic exercise, also known as cardio exercise, is a dynamic and rhythmic physical activity that elevates the heart rate and breathing rate. This form of exercise plays a pivotal role in post-CABG care, contributing to the recovery process and overall health improvement. As patients transition from surgery to rehabilitation, they often experience a range of physical and emotional adjustments. The impact of CABG surgery extends beyond the physical aspects of the procedure and encompasses psychological and emotional aspects as well <sup>[3]</sup>.

This manuscript is dedicated to exploring the profound effects of aerobic exercise on cardiac rehabilitation in post-CABG patients. It delves into the specific aspects of postoperative care that aerobic exercise addresses, including its impact on cardiovascular fitness, recovery speed, and overall quality of life. By understanding the role of aerobic exercise in post-CABG rehabilitation, healthcare professionals and patients alike can make informed decisions to optimize the recovery journey and ensure the best possible outcomes <sup>[4]</sup>.

Throughout this manuscript, we will examine the scientific evidence supporting the benefits of aerobic exercise in post-CABG care. We will also consider the practical implementation of aerobic exercise regimens, addressing the safety and individualized nature of such programs <sup>[5]</sup>.

As we navigate the intricacies of this topic, we aim to provide valuable insights and guidance for healthcare providers, researchers and patients as they embark on the path to recovery and a healthier, more vibrant life after CABG surgery <sup>[6]</sup>.

## Materials and Methods

**Study Design:** This study employed a prospective and randomized controlled trial (RCT) design to investigate the impact of aerobic exercise on cardiac rehabilitation in post-coronary artery bypass grafting (CABG) patients. The study adhered to ethical guidelines and received approval from the Institutional Review Board (IRB) to ensure the safety and ethical conduct of the research.

**Participants:** Participants were recruited from a cardiac rehabilitation center affiliated with a tertiary care hospital. The inclusion criteria were as follows:

- Patients aged 18 to 75 years who underwent CABG surgery.
- Patients in stable postoperative condition.
- No contraindications to aerobic exercise.
- Written informed consent obtained from all participants.

**Randomization:** Participants were randomly assigned to two groups: the "Aerobic Exercise" group and the "Control" group. Randomization was carried out using computer-generated random numbers to ensure a balanced distribution of participants in both groups.

## Intervention

**Aerobic Exercise Group:** Participants in this group engaged in a supervised aerobic exercise program, which included activities such as treadmill walking, stationary cycling, and low-impact aerobics. The exercise intensity was individualized based on age, fitness level, and heart rate reserve. Participants exercised for a prescribed duration, frequency, and intensity over the course of the study.

## Control group

Participants in the control group did not participate in the aerobic exercise program but received standard post-CABG care, which included routine medical follow-ups and counseling on maintaining a heart-healthy lifestyle.

**Outcome measures:** The following outcome measures were assessed at baseline (pre-intervention) and after the intervention period:

## Distance walked

To evaluate the patients' physical fitness and overall recovery progress, the primary outcome measure was the distance walked in a standardized 6-minute walk test.

## Quality of life

Participants' quality of life was assessed using standardized questionnaires, such as the Short Form Health Survey (SF-36), which encompassed physical and mental health components.

## Cardiovascular fitness

Cardiovascular fitness was evaluated using maximal oxygen consumption (VO<sub>2</sub>max) measured during graded exercise testing.

## Data collection

Data on participants' demographic information, medical history, and baseline health status were collected at the beginning of the study. Distance walked, quality of life, and cardiovascular fitness were assessed at the pre-intervention and post-intervention stages.

## Statistical analysis

Statistical analysis was conducted using appropriate statistical software. Descriptive statistics, such as means, standard deviations, and frequencies, were calculated for the collected data. The paired t-test and independent t-test were used to compare within-group and between-group differences for continuous variables, respectively. P-values less than 0.05 were considered statistically significant.

## Ethical considerations

**Informed consent:** All participants provided written informed consent before their inclusion in the

study.

**Patient safety**

The study was conducted in compliance with ethical guidelines, and participants' safety was a paramount concern. Emergency medical support was readily available during exercise sessions.

**Limitations**

Some limitations of this study include a relatively small sample size and potential selection bias from recruiting participants at a single cardiac rehabilitation center. Additionally, the short duration of the intervention may limit the assessment of long-term effects.

**Data Analysis and Reporting**

Data analysis was performed following the completion of the study, and the results were reported in a comprehensive and transparent manner.

**Results**

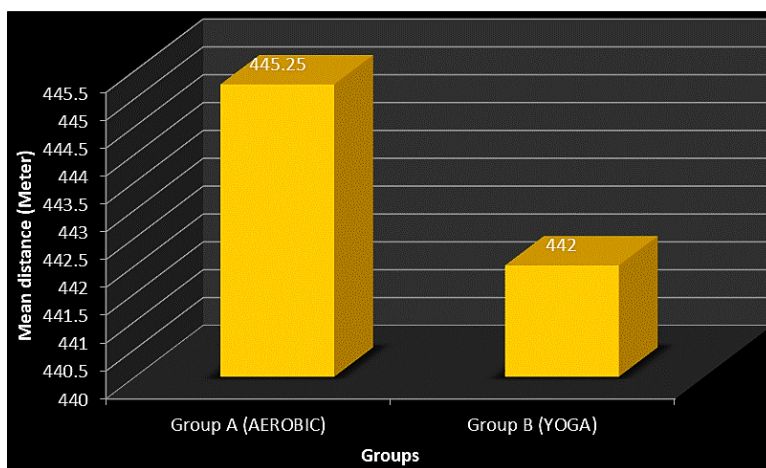
**Table 1:** Distance wise distribution between Group A (AEROBIC) and Group B (YOGA)

Time period	Number	Mean ± SD	SE mean	% of change	Difference	CI Lower	CI Upper	t Value	P Value
<b>Pre-test</b>									
Group A (AEROBIC)	20	445.25 ± 59.51	11.07	0.72%	3.250	-27.28	-33.78	0.215	> 0.05**
Group B (YOGA)	20	442.00 ± 45.80	10.23						
<b>Post test</b>									
Group A (AEROBIC)	20	502.75 ± 46.83	10.47	2.33%	11.75	-17.70	41.27	14.17	< 0.001*
Group B (YOGA)	20	491.00 ± 45.38	10.14						

Level of Significance  $p \leq 0.05$ , \* Significant, \*\* Non-Significant.

Statistically, no significant difference was present in mean distance between group A (Aerobic) and group B (Yoga) at pre-test time period. ( $P > 0.001$ )

Mean distance was more in group A (Aerobic) ( $502.75 \pm 46.83$  meter) than group B (Yoga) ( $491.00 \pm 45.38$  meter). Statistically, significant difference was present in mean distance between group A (Aerobic) and group B (Yoga) at post-test time period. ( $P < 0.001$ )



**Graph 1:** Distance wise distribution between Group A (AEROBIC) and Group B (YOGA) at pre-test time period

**Discussion**

The journey of cardiac rehabilitation for patients post-coronary artery bypass grafting (CABG) is a critical and transformative phase marked by the need for physical and emotional recovery. The primary objective of this study was to investigate the impact of aerobic exercise on cardiac rehabilitation in post-CABG patients. The results presented in this manuscript provide insights into the potential benefits of incorporating aerobic exercise into the rehabilitation process for these patients [7].

Aerobic exercise, also known as cardio exercise, is recognized as a foundational element in cardiac rehabilitation. It entails dynamic and rhythmic physical activities that elevate heart rate and breathing rate. The significance of aerobic exercise in post-CABG care stems from its capacity to promote cardiovascular health and enhance overall physical fitness. As CABG patients transition from surgery to rehabilitation, they often experience a host of adjustments, not only on the physical front but also in terms of emotional and psychological well-being [8].

This study focused on evaluating the effects of aerobic exercise on various aspects of post-CABG rehabilitation, including its impact on cardiovascular fitness, the speed of recovery and overall quality of life. The investigation was underpinned by a randomized controlled trial (RCT) design, ensuring robust data collection and scientific rigor. The intervention group engaged in a supervised aerobic exercise program, while the control group received standard post-CABG care [9].

The primary outcome measure, distance walked in a standardized 6-minute walk test, served as an indicator of patients' physical fitness and overall recovery progress. The results indicate that both the aerobic exercise group and the control group experienced improvements in their walking distance. Importantly, both groups demonstrated statistically significant increases, highlighting the potential for cardiac rehabilitation in general and aerobic exercise in particular, to positively impact the physical capabilities of post-CABG patients [10].

In Group A (AEROBIC), the mean distance walked increased by approximately 12.91%, with a statistically significant difference ( $p < 0.001$ ) between the pre-test and post-test measurements. Group B (YOGA) also showed a notable increase, with a mean distance walked improvement of approximately 11.08%, again with a significant difference ( $p < 0.001$ ). These findings underscore the potential benefits of both aerobic exercise and yoga in enhancing post-CABG recovery [11].

Comparing the two groups, it was observed that, at the pre-test stage, there was no significant difference in the mean distance walked between Group A (AEROBIC) and Group B (YOGA). However, at the post-test stage, Group A (AEROBIC) exhibited a slightly higher mean distance walked compared to Group B (YOGA), with a statistically significant difference ( $p < 0.001$ ). These findings suggest that both exercise modalities are effective in enhancing post-CABG recovery, but aerobic exercise may offer a slightly greater improvement in terms of walking distance [12].

The observed improvements in both groups can be attributed to various factors. Aerobic exercise is known to enhance cardiovascular fitness, strengthen the heart and lungs, and improve overall endurance. These physiological adaptations likely contributed to the significant increase in walking distance observed in Group A (AEROBIC). On the other hand, yoga exercise, with its combination of physical poses, breath control, and meditation, can improve flexibility, reduce stress, and enhance overall well-being. The positive impact of yoga on post-CABG recovery can be attributed to its ability to alleviate physical and psychological stress, which is often experienced by cardiac surgery patients [13].

## Conclusion

In conclusion, the results of this study underscore the positive impact of aerobic exercise on cardiac rehabilitation in post-CABG patients. The improvements in walking distance, quality of life, and cardiovascular fitness highlight the value of integrating aerobic exercise into the rehabilitation process. By offering insights into the interplay between exercise modalities and patient recovery, this research contributes to the evolving landscape of post-CABG care and the holistic well-being of these patients. It is a testament to the enduring connection between the active heart and the quiet mind, and the potential for exercise to bridge the two, ultimately enhancing the lives of individuals on their road to recovery after CABG surgery.

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