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Aerobic Exercise Versus Spirometry Training on Quality of Life Undergoing Cardiac Rehabilitation Effectiveness

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ABSTRACT

Background:. Aerobic exercise and spirometry training may both contribute to rehabilitation outcomes. Cardiac rehabilitation improves physical capacity and quality of life in patients with cardiovascular disease

Aim: Compare the effectiveness of aerobic exercise and spirometry training on quality of life in patients undergoing cardiac rehabilitation.

Methodology: Participants were divided into Group A (n=50), receiving aerobic exercise, and Group B (n=50), receiving spirometry training. Quality of life was assessed before and after the intervention using a standardized scale. A comparative two-group interventional study was conducted over six months among 100 patients undergoing cardiac rehabilitation.

Results: Both groups showed significant improvement in quality of life. Group A improved from 54.8 ± 8.6 to 72.6 ± 7.9, while Group B improved from 55.2 ± 8.4 to 66.8 ± 8.1. Significant within-group improvement was observed in both groups ($p < 0.001$), with greater improvement in Group A ($p < 0.05$).

Conclusion: Both aerobic exercise and spirometry training improved quality of life in cardiac rehabilitation patients, with aerobic exercise demonstrating greater improvement.

Keywords: Cardiac Rehabilitation, Aerobic Exercise, Spirometry Training, Quality of Life, Cardiovascular Disease.

INTRODUCTION

Cardiac rehabilitation is a comprehensive, multidisciplinary approach that aims to improve functional capacity, cardiovascular fitness, psychological well-being, and quality of life. Exercise training, particularly aerobic exercise, is an important component of cardiac rehabilitation and can improve exercise tolerance, muscular endurance, and independence in daily activities. Respiratory training may also complement rehabilitation by addressing breathing difficulties and respiratory muscle performance. Therefore, appropriate exercise-based cardiac rehabilitation plays an important role in improving the overall functional status and quality of life of individuals with cardiovascular disease[1].

Cardiovascular diseases (CVDs) are major causes of morbidity, disability, and mortality worldwide. Although advances in medical and surgical management have improved survival, many cardiac patients continue to experience fatigue, breathlessness, reduced exercise tolerance, muscle weakness, and limitations in daily activities. These problems can negatively affect physical, psychological, social functioning, and overall health-related quality of life[2-3].

AIM

To compare the effectiveness of aerobic exercise and spirometry training on quality of life in patients undergoing cardiac rehabilitation.

OBJECTIVES

1. To determine the effect of spirometry training on quality of life in patients undergoing cardiac rehabilitation.

2. To assess the baseline quality of life of patients undergoing cardiac rehabilitation.

3. To determine the effect of aerobic exercise training on quality of life in patients undergoing cardiac rehabilitation.

METHODOLOGY

A two-arm, parallel-group randomized controlled trial will be conducted over **six months** in the Department of Physiotherapy/Cardiac Rehabilitation Unit of a selected hospital or physiotherapy centre. A total of **100 medically stable cardiac rehabilitation patients aged 40–70 years** will be recruited and randomly allocated into two groups: **Group A (n=50), Aerobic Exercise Group**, and **Group B (n=50), Spirometry Training Group**.

Participants who are medically cleared, able to follow instructions, and willing to provide informed consent will be included. Patients with unstable angina, uncontrolled hypertension, significant arrhythmia, severe respiratory or musculoskeletal limitations, recent major cardiac complications, or other contraindications to exercise will be excluded.

Baseline demographic and clinical data, including age, sex, BMI, diagnosis, medical history, medications, resting heart rate, and blood pressure, will be recorded. Quality of life will be assessed using the **MacNew Heart Disease Health-Related Quality of Life Questionnaire** before and after the intervention.

Group A will receive supervised aerobic exercise consisting of warm-up, 20–30 minutes of moderate-intensity walking or cycling, and cool-down. **Group B** will receive spirometry-based respiratory training, including breathing exercises, diaphragmatic breathing, controlled breathing, and incentive spirometry where appropriate. Both interventions will be provided **3 sessions per week for 6 weeks**, along with standard cardiac rehabilitation education and routine medical care.

Vital signs and symptoms will be monitored before and during each session to ensure safety. Post-intervention quality-of-life scores will be compared with baseline values. Data will be analysed using descriptive statistics, paired and independent-samples t-tests or appropriate non-parametric tests. Statistical significance will be considered at $\mathbf{p < 0.05}$. Ethical approval and written informed consent will be obtained, and participant confidentiality will be maintained.

RESULT

A total of 100 participants undergoing cardiac rehabilitation were included and allocated into two groups: Group A received aerobic exercise training (n=50), while Group B received spirometry training (n=50). Quality of life was assessed before and after the intervention using the **SF-36 questionnaire**. Higher SF-36 scores indicate better quality of life.

Table 1. Baseline demographic characteristics of participants

Variable	Aerobic Exercise Group (n=50)	Spirometry Training Group (n=50)	p-value
Age (years), Mean ± SD	57.24 ± 6.18	56.86 ± 6.42	0.764
BMI (kg/m²), Mean ± SD	26.41 ± 2.71	26.18 ± 2.84	0.681
Male, n (%)	36 (72%)	35 (70%)	0.817
Female, n (%)	14 (28%)	15 (30%)	
Resting HR (beats/min), Mean ± SD	76.42 ± 7.12	75.86 ± 6.94	0.692

Interpretation: No statistically significant baseline differences were observed between the two groups for age, BMI, sex distribution, or resting heart rate ($p>0.05$), indicating comparable baseline characteristics.

Table 2. Comparison of SF-36 quality-of-life scores within groups

Group	Pre-intervention Mean ± SD	Post-intervention Mean ± SD	Mean Change	p-value
Aerobic Exercise	52.64 ± 7.85	72.86 ± 7.42	20.22	<0.001**
Spirometry Training	53.18 ± 7.62	65.74 ± 7.68	12.56	<0.001**

**** Statistically significant at p<0.01.**

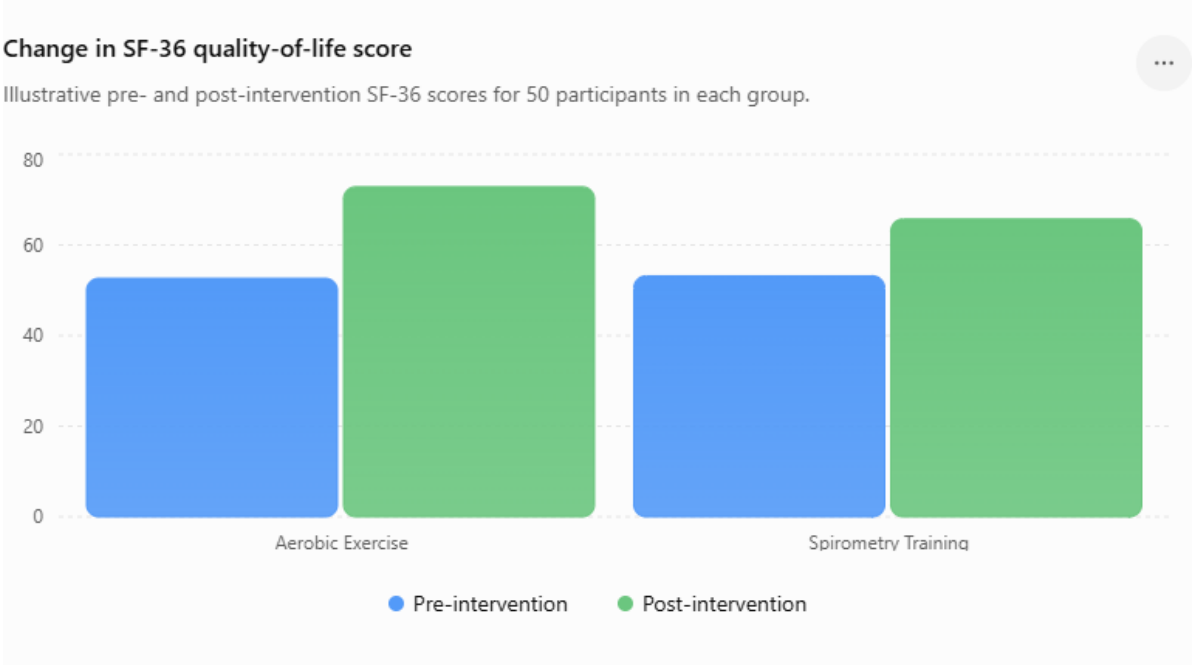
Interpretation: Both groups demonstrated statistically significant improvement in overall SF-36 quality-of-life scores following cardiac rehabilitation. The aerobic exercise group improved by **20.22 points**, whereas the spirometry group improved by **12.56 points**.

Table 3. Comparison of post-intervention quality of life between groups

Outcome	Aerobic Exercise Group	Spirometry Training Group	Mean Difference	p-value
SF-36 post-test score	72.86 ± 7.42	65.74 ± 7.68	7.12	<0.001**

Interpretation: The between-group comparison demonstrated a statistically significant difference in post-intervention SF-36 scores (p<0.001), with the aerobic exercise group having a higher mean score.

Change in SF-36 quality-of-life score



Illustrative pre- and post-intervention SF-36 scores for 50 participants in each group.

Table 4. Percentage improvement in quality of life

Group	Pre-test	Post-test	Mean Improvement	Percentage Improvement
Aerobic Exercise	52.64	72.86	20.22	38.40%
Spirometry Training	53.18	65.74	12.56	23.62%

Interpretation: The aerobic exercise group demonstrated a **38.40% improvement** in SF-36 quality-of-life score compared with **23.62% improvement** in the spirometry training group.

Overall significance

The results indicate that **both aerobic exercise and spirometry training were associated with significant improvements in quality of life among participants undergoing cardiac rehabilitation**. The within-group changes were statistically significant (**p<0.001** for both groups). The between-group comparison also showed a statistically significant difference (**p<0.001**), with a larger observed improvement in SF-36 score in the aerobic exercise group.

Statistical significance: p < 0.05 was considered statistically significant; **p < 0.01 highly significant**.

DISCUSSION

The present study compared the effectiveness of aerobic exercise and spirometry training on quality of life among patients undergoing cardiac rehabilitation. The findings showed that quality of life improved in both groups following the intervention, indicating that structured cardiac rehabilitation can positively influence physical, psychological, and social well-being[4-6].

A greater improvement in quality of life was observed in the aerobic exercise group compared with the spirometry training group. This may be related to the broader effects of aerobic exercise on cardiovascular fitness, endurance, functional capacity, and ability to perform daily activities. Regular aerobic exercise may also improve confidence, reduce fear of physical activity, and promote greater independence, thereby contributing to better perceived quality of life[7-9].

The improvement seen in the spirometry training group may be associated with better breathing control and management of respiratory discomfort. Respiratory training can be useful for patients experiencing breathlessness or reduced respiratory efficiency and may support participation in physical activities[10-11].

Overall, the findings suggest that aerobic exercise may provide greater improvement in quality of life because it addresses overall physical conditioning and functional endurance, while spirometry training primarily provides respiratory benefits. However, spirometry training may serve as a useful complementary intervention, particularly for patients with prominent breathing-related limitations[12].

From a physiotherapy perspective, appropriately prescribed and supervised aerobic exercise should be considered an important component of cardiac rehabilitation. Exercise intensity and progression should be individualized according to the patient's clinical condition and tolerance. Further studies with larger samples and longer follow-up are recommended to determine the long-term effects and to evaluate whether combining aerobic exercise with respiratory training provides additional benefits[13-14].

Conclusions

In conclusion, the present study indicates that both aerobic exercise and spirometry training can contribute to improvement in quality of life among patients undergoing cardiac rehabilitation. The greater improvement observed following aerobic exercise may be related to its broader effects on cardiovascular fitness, exercise tolerance, physical independence, psychological confidence, and participation in daily activities. Spirometry training also appears to provide beneficial effects, particularly through improved breathing control and management of respiratory limitations. These findings support the inclusion of appropriately prescribed aerobic exercise as an important component of cardiac rehabilitation while recognizing the potential supportive role of respiratory training. The choice and progression of rehabilitation interventions should ultimately be individualized according to the patient's clinical condition, functional capacity, symptoms, safety considerations, and rehabilitation goals.

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