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Efficacy of a Cardiac Rehabilitation Initiative Guided by Nursing Professionals on the Quality of Life among CABG Patients at Tertiary Care Hospitals in Delhi

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Abstract

Introduction: Cardiovascular diseases are a global health concern, with CABG as a crucial intervention. This article explores the often-overlooked role of nursing professionals in cardiac rehabilitation conducted in Delhi, India.

Methodology: In our study, we employed a one-group pre-test, post-test design to assess the impact of nursing-led cardiac rehabilitation on the quality of life (QoL) of CABG at a tertiary care hospital in Delhi. Purposive sampling technique was used. Data collection involved pre- and post-operative QoL assessments using the WHO BREF tool, along with demographic, lifestyle, and physiological data. The rehabilitation programme, spanning three months and guided by experienced nursing professionals, included patient education and telephonic support. Data analysis, adhering to ethical standards, showed significant QoL changes ($p < 0.05$).

Results: In our study involving 66 patients, a significant enhancement in quality of life (QoL) scores was observed after a 3-month cardiac rehabilitation programme ($p < 0.001$), spanning physical, psychological, social, and environmental domains ($p < 0.001$). Notably, QoL scores were positively associated with patients' education levels ($p < 0.013$) and the type of treatment received, favouring medication ($p < 0.045$). Physiological parameters exhibited significant improvements including weight loss, reduced BMI, enhanced ejection fraction percentage, lowered systolic blood pressure, and favourable changes in lipid profiles and fasting blood sugar levels (all p-values < 0.001).

Conclusion: Our study demonstrates the substantial positive impact of nursing-led cardiac rehabilitation initiative on the quality of life and health outcomes of elective CABG patients.

Key words: Cardiac rehabilitation programme, cardiac rehabilitation initiative, CAD, quality of life, CABG.

Introduction

Cardiovascular diseases (CVDs) continue to be a global health challenge, contributing significantly to morbidity and mortality rates worldwide. Projections indicate that by the year 2020, cardiovascular diseases are expected to emerge as the predominant contributor to global disability. These conditions are responsible for a significant proportion of mortality, accounting for approximately 10% of deaths among individuals under the age of 35, about one-third of fatalities in the age group of 35 to 45 years, and a substantial three-quarters of deaths among those aged 45 and older[1,2]. Among the various interventions employed for the management of CVDs, Coronary Artery Bypass Grafting (CABG) stands as a critical surgical procedure, often recommended for individuals with complex coronary artery disease[3,4]. While CABG offers a lifeline to patients by restoring blood flow to the heart muscle, post-operative rehabilitation and the improvement of patients' quality of life (QoL) remain paramount considerations in their overall journey towards recovery.

Background

The significance of enhancing the QoL in post-CABG patients cannot be overstated. Impaired QoL can lead to diminished physical and psychological well-being, affecting not only the patients themselves but also their families and society at large. In response to this critical concern, numerous cardiac rehabilitation programmes have been developed worldwide, aiming to optimise patients' recovery following CABG. These programmes typically involve a multidisciplinary approach, with healthcare professionals playing pivotal roles in providing comprehensive care and support[5-7].

In the dynamic healthcare landscape of India, particularly in the bustling metropolis of Delhi, where the prevalence of CVDs is notably high, the role of nursing professionals in cardiac rehabilitation has been gaining prominence. Nursing

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professionals, with their expertise in patient care and close involvement in the recovery process, have the potential to influence the outcomes and QoL of CABG patients significantly[8-10]. However, there exists a notable gap in research assessing the specific impact of cardiac rehabilitation programmes guided by nursing professionals on the QoL of CABG patients within the Indian context.

While research on cardiac rehabilitation post-CABG is extensive, studies conducted within the Indian context, and particularly in tertiary care hospitals in Delhi, have been relatively limited, with most focusing on the roles of physicians and physiotherapists. The specific contributions of nursing professionals, who are often at the forefront of patient care, remain underexplored in this context. This research gap is particularly relevant as nursing professionals can play a pivotal role in addressing the unique socio-cultural factors, patient preferences, and healthcare challenges prevalent in Delhi's healthcare system.

Furthermore, existing research on the efficacy of cardiac rehabilitation programmes often lacks comprehensive evaluation of patient-reported outcomes, especially QoL measures. As QoL is an essential determinant of overall recovery and well-being, understanding how nursing-guided cardiac rehabilitation influences these outcomes becomes imperative.

This research endeavours to bridge this gap by investigating the efficacy of a cardiac rehabilitation initiative led by nursing professionals on the QoL among CABG patients in tertiary care hospitals in Delhi. By shedding light on the contributions of nursing professionals in cardiac rehabilitation, this study aims to inform healthcare practices and policies, potentially leading to improved patient outcomes and better QoL in this vulnerable patient population.

Methodology

A one-group pre-test, post-test research design was employed to measure the outcome variable (quality of life) both before and after the intervention to assess any changes at 3-months intervals for patients who were planned for elective CABG. It was conducted at Dr. Ram Manohar Lohia Hospital, a prominent tertiary care hospital in Delhi known for its cardiac care services. The hospital provided a suitable environment for conducting this research due to its diverse patient population and established cardiac care facilities.

Ethical approval was obtained from the institutional ethics committee. Informed consent was obtained from all participants, ensuring their voluntary participation and confidentiality of their data. Participants were informed about their right to withdraw from the study at any time without consequences.

This study targeted a sample size of 66 patients who were planned for elective CABG admitted to Dr RML Hospital. Participants were selected using purposive sampling, ensuring they met the inclusion criteria which included adults aged 18 years or above, able to communicate in Hindi or English, willing to participate in the cardiac rehabilitation initiative and planned for elective CABG. All those who had left ventricular ejection fraction less than 30%, were on ventricular assistive devices and uncontrolled diabetes mellitus, preoperative intensive stay and post procedure who developed hypotension/hypoperfusion, ventilator support (>72 hours), post operative CPR, reopening of chest, any physical disability leading to inability to perform physical activity, severe cognitive impairment, and those who had attended any kind of cardiac rehabilitation programme in the past were excluded from the study.

Pre-test assessment was done before the cardiac rehabilitation initiative began; demographic data, baseline data on lifestyle, dietary, physiological and biochemical parameters and quality of life were collected using standardised WHO BREF assessment tool on the day of hospitalisation before the CABG procedure. This was followed by patient education about cardiovascular diseases, CAD, function of heart, CABG surgery, importance of self care, instruction to be followed after discharge from hospital, lifestyle modification, dietary advices, exercises backed by voice over video and importance of cardiac rehabilitation. Thereafter, return demonstration and handholding till desired proficiency was achieved. On 3rd day post-procedure, patients were encouraged to do breathing exercises followed by the care of incision site, and signs of wound infection were taught and counselling about lifestyle modification which included dietary, lipid, weight, and risk factor management, follow-up, medication adherence and reinforcement of exercise programme was done on a one-to-one basis. Individualised discharge counselling, clarification of doubts and reinforcement in order to ensure regular implementation of the cardiac rehabilitation initiative, and a booklet along with activity log sheet was given to patients for easy reference and to maintain the record of the exercise done every day.

After hospital discharge, telephonic support was provided on a weekly basis to reinforce various aspects of health management, including dietary control, lipid management, alcohol and smoking cessation, stress reduction, blood pressure regulation, regular physical activity, and medication adherence. 3 months after CABG, physiological and biochemical parameters were measured again and the same quality-of-life assessment tools used in the pre-test were

administered to the participants to measure changes in their quality of life. Nursing professionals with expertise in cardiac care guided and supervised the rehabilitation initiative. The programme spanned over a period of 3 months.

The WHOQOL BREF tool was employed to evaluate the quality of life in patients both before the procedure and three months after the procedure. This assessment encompassed four key domains: physical health, psychological well-being, social relationships, and environmental factors. These domains included a total of 24 facets related to the quality of life. The scoring system ranged from 1 to 5, with a reverse scale (5 to 1) for negatively phrased items. To standardise the scores and make them comparable with the WHOQOL-100, a preliminary transformation was applied to the raw scores. This transformation method converted the scores to a range between 4 - 20. In this range, a higher score indicated a higher quality-of-life. Each domain had a maximum score of 20, and the mean score of items within each domain was used to calculate the domain score. These domain scores were scaled positively, where a higher score denoted a higher quality of life.

Data collection commenced from May 2022 and continued until the completion of the 3-month cardiac rehabilitation initiative. In the present study, past smoking, tobacco use, and alcohol intake was defined if the patient had ceased taking them for the past six months. The data were checked, coded, and entered into Microsoft excel sheet and exported to SPSS Version 26 for analysis, cleaned and checked for outliers and completeness. Descriptive statistics were used to summarise the demographic characteristics of participants. Frequencies, and percentages, were computed. Paired-sample t-tests and ANOVA tests were employed to compare pre-test and post-test scores on quality-of-life measures. Statistical significance was set at $p < 0.05$.

Result

The study involved a total of 66 patients, with 6 patients having been lost to follow-up during the course of the study. The mean age of study participants was 51 to 60 years with male predominance. The majority of patients were Hindu, married, stayed in nuclear families, had education up to the primary school level, were skilled workers, and belonged to the upper lower class. The majority of them had been past smokers, and 25% of participants had a family history of CAD (Table I).

There was a significant improvement in the quality-of-life score after administration of the cardiac rehabilitation initiative at 3-month intervals, with a change in mean score from 40.63 ± 7.13 to 84.13 ± 5.66 ($p < 0.001$) (Table II). Quality-of-life domain-wise analysis revealed significant improvement in the post-test physical, psychological, social, and environmental domains of quality-of-life, with scores of 15.48 ± 0.93, 14.97 ± 1.34, 9.40 ± 1.90, and 10.12 ± 1.68, respectively, ($p < 0.001$) (Table III).

Table I: Frequency and percentage distribution of socio-demographic characteristics of CABG patients N = 60.

S. No.	Variables	Frequency	Percentage (%)
1.	Age in Years		
	Below 40	3	(5%)
	41 - 50	8	(13.3%)
	51 - 60	23	(38.3%)
	Above 60	26	(43.3%)
2.	Gender		
	Male	53	(88.3%)
	Female	7	(11.7%)
3.	Religion		
	Hindu	50	(83.3%)
	Muslim	5	(8.3%)
	Christian	0	(0%)
	Sikh	5	(8.3%)
4.	Marital Status		
	Single	1	(1.7%)
	Married	59	(98.3%)
5.	Type of Family		
	Joint family	27	(45%)
	Nuclear family	33	(55%)
6.	Education of the patient		
	Profession	5	(8.3%)
	Honours Graduate	7	(11.7%)
	Intermediate or Diploma	3	(5.0%)
	High school certificate	17	(28.3%)
	Middle school certificate	14	(23.3%)
	Primary school certificate	11	(18.3%)
	Illiterate	3	(5.0%)
7.	Occupation of the patient		
	Unemployed Legislators, Senior Officials and Managers	0	(0%)
	Professionals	3	(5.0%)
	Technicians and Associate Professionals	1	(1.7%)
	Clerks	0	(0%)

	Skilled Workers and Shop and Market Sales Workers	18	(30.0%)
	Skilled Agricultural and Fishery Workers	15	(25.0%)
	Craft and Related Trade Workers	1	(1.7%)
	Plant and Machine Operators and Assemblers	1	(1.7%)
	Elementary Occupation	5	(8.3%)
	Unemployed	16	(26.7%)
8.	Total monthly income		
	≥123,322	0	(0.0%)
	61,663-123,321	1	(1.7%)
	46,129-61,662	0	(0%)
	30,831-46,128	4	(6.7%)
	18,497-30,830	16	(26.7%)
	6,175-18,496	20	(33.3%)
	≤6,174	19	(31.7%)
9	Residence		
	Urban	35	(58.3%)
	Rural	25	(41.7%)
10	Smoking		
	Past	29	(48.3%)
	Current	2	(3.3%)
	Never	29	(48.3%)
11	Alcohol Intake		
	Past	28	(46.7%)
	Current	0	(0%)
	Never	32	(53.3%)
12	Tobacco use		
	Past	20	(33.3%)
	Current	2	(3.3%)
	Never	38	(63.3%)
13	Family history of CAD		
	Yes	18	(30.0%)
	No	42	(70.0%)
14	Type of investigation undergone		
	Angiography	0	(0%)
	Echocardiography	0	(0.0%)
	TMT	0	(0.0%)
	ECG	0	(0%)
	Echocardiography, ECG & Angiography	60	(100%)
15	Type of treatment undergone		
	Medication	57	(95.0%)
	Thrombolytic therapy	0	(0%)
	Coronary Angioplasty	2	(3.3%)
	Intra-coronary stent	1	(1.7%)
	Any other, specify	0	(0%)
16	Co-morbidity history		
	Diabetes mellitus	12	(20%)
	Hypertension	10	(16.7%)
	Diabetes mellitus and Hypertension	15	(25%)
	Bronchial asthma	0	(0%)
	Any other chronic illness	1	(1.7%)
	No co-morbidity history	22	(36.7%)
17	Dietary habits		
	Non-Vegetarian	35	(58.3%)
	Vegetarian	25	(41.7%)

Table II: Mixed method ANOVA to compare pre-test and post-test quality-of-life scores of CABG patients. (N = 60).

Time points #	Mean ± SD	Within Group Comparison 'F' value (p value)	Within subject 'F' value (p value)	Between subject 'F' value (p value)	Interaction Group*time 'F' value (p value)
1.	40.63 ± 7.13	F = 1730.847	F = 481.251	F = 140.722	F = 145.819
2.	84.13 ± 5.66	**p <0.001***	**p <0.001***	**p <0.001***	**p <0.001***

#Time points *1= Pre-test, 2 = Post-test (3 months), *Level of significance p <0.05*

Table III: Comparison of pre-test and post-test (3 months) quality-of-life domains of CABG patients. (N = 60).

QOL domains	Pre-test Mean ± SD	Post-test Mean ± SD	Test value	P value
Physical	4.75 ± 0.95	15.48 ± 0.93	2258.545	**<0.001***
Psychological	5.05 ± 1.80	14.97 ± 1.34	852.104	**<0.001***
Social	8.87 ± 2.49	9.40 ± 1.90	16.723	**<0.001***
Environmental	8.23 ± 2.00	10.12 ± 1.68	150.922	**<0.001***

*Repeated measures ANOVA test; *Level of significance P <0.05.*

A significant association was observed between the post-test quality-of-life score and the education level of patients (p <0.013). Furthermore, the analysis also unveiled that quality of life scores among CABG patients had a notable connection with the "Type of Treatment Undergone" (p <0.045). Specifically, patients who underwent "Medication" as a treatment option displayed higher quality of life scores in comparison to those who underwent other types of treatment. These findings imply that the choice of treatment, particularly medication, may have had a positive

impact on the quality-of-life of CABG patients in this study (Table IV). It is crucial to emphasize that all other variables and categories in Table IV, including age, gender, religion, marital status, and various lifestyle factors, did not exhibit a statistically significant association with the quality of life scores.

Table IV: Association of pre-test, post-test quality-of-life scores of CABG patients with selected variables N = 60.

Variable	Categories	Pre-test		Post-test	
		Test value	p-value	Test value	p-value
Age		0.020	0.830	0.077	0.402
Gender	Male	-0.173	0.059	-0.086	0.348
	Female				
Religion	Hindu	-0.124	0.179	-0.037	0.692
	Muslim				
	Christian				
	Sikh				
Marital status	Single	-0.090	0.328	-0.099	0.284
	Married				
Type of family	Joint family	-0.254	**0.005***	-0.047	0.613
	Nuclear family				
Education of the patient	Profession	-0.264	**0.004***	-0.226	**0.013***
	Honours Graduate				
	Intermediate or Diploma High school certificate				
	Middle school certificate				
	Primary school certificate Illiterate				
Occupation of the patient	Legislators, Senior	-0.135	0.143	-0.081	0.381
	Officials and Managers				
	Professional				
	Technicians and Associate Professionals				
	Clerks				
	Skilled Workers and Shop and Market Sales Workers				
	Skilled Agricultural and Fishery Workers				
	Craft and Related Trade Workers				
	Plant and Machine Operators and Assemblers				
	Elementary Occupation				
	Unemployed				
Total monthly income	≥123,322	-0.400	**<0.001***	-0.146	0.113
	61,663 - 123,321				
	46,129 - 61,662				
	30,831 - 46,128				
	18,497 - 30,830				
	6,175 - 18,496				
	≤6174				
Residence	Urban	0.050	0.589	-0.024	0.798
	Rural				
Smoking	Past	0.021	0.820	0.079	0.389
	Current				
	Never				
Alcohol Intake	Past	-0.062	0.502	-0.064	0.490
	Current				
	Never				
Tobacco use	Past	-0.111	0.227	0.011	0.907
	Current				
	Never				
Family history of CAD	Yes	-0.143	0.120	0.128	0.164
	No				
Type of investigation undergone	Angiography	-0.010	0.911	-0.139	0.131
	Echocardiography				
	TMT				
	ECG				
	Echocardiography, ECG and Angiography				
Type of treatment undergone	Medication	0.052	0.573	0.183	**0.045***
	Thrombolytic therapy				
	Coronary Angioplasty				
	Intra coronary stent				
	Any other, specify				
Co-morbidity history	Diabetes mellitus	-0.002	0.981	-0.092	0.320
	Hypertension				
	Diabetes mellitus and Hypertension				
	Bronchial asthma				
	Any other chronic illness				
	No comorbidity history				
Dietary habits	Non-Vegetarian	-0.038	0.677	0.077	0.404
	Vegetarian				

Paired t-test

Significant changes were observed in various physiological parameters following a 3-month intervention period. A highly significant decrease in weight (p - value <0.001) occurred, with values shifting from 64.61 ± 10.66 on day-1

to 59.11 ± 10.46 at the end of the 3-month period. Similarly, BMI exhibited a highly significant decrease (p - value <0.001), transitioning from 24.66 ± 5.11 Kg/m^2 on day-1 to 22.56 ± 4.95 Kg/m^2 after 3 months. Notably, ejection fraction percentage demonstrated a highly significant increase (p - value <0.001), rising from 43.10 ± 6.76% on day-1 to 59.13 ± 2.51% over the 3-month period. Systolic blood pressure also exhibited a highly significant decrease (p - value <0.001), declining from 127.32 ± 18.56 mmHg on day-1 to 116.92 ± 5.39 mmHg after 3 months (Table V).

Table V: Comparison of physiological parameters before and after the intervention N = 60.

Physiological	Mean ± SD					
parameters	**Day-1**	**Day-75**	**MD**	**SE_{MD}**	**'t' value**	**p- value**
Weight (Kgs)	64.61 ± 10.66	59.11 ± 10.46	5.49	0.12	47.01	**<0.001***
Height (cms)	162.54 ± 10.11	162.54 ± 10.11	0.00	–	–	–
BMI (Kg/m^2)	24.66 ± 5.11	22.56 ± 4.95	2.10	0.05	40.59	**<0.001***
Ejection Fraction (%)	43.10 ± 6.76	59.13 ± 2.51	-16.03	0.88	18.23	**<0.001***
Heart Rate (per minute)	76.28 ± 10.50	77.35 ± 5.18	-1.07	0.90	-1.18	0.241
Systolic BP (mmHg)	127.32 ± 18.56	116.92 ± 5.39	10.41	2.14	4.86	**<0.001***
Diastolic BP (mmHg)	76.81 ± 11.03	77.97 ± 13.10	-1.15	2.28	-0.51	0.615

A highly significant decrease in total cholesterol levels (p - value <0.001) was observed, with levels decreasing from 196.10 ± 20.56 mg/dL on day-1 to 149.13 ± 22.87 mg/dL after 3 months. Similarly, a highly significant decrease in LDL cholesterol levels (p - value <0.001) occurred, with levels going from 120.82 ± 14.05 mg/dL on day-1 to 92.97 ± 9.05 mg/dL after 3 months. Conversely, there was a highly significant increase in HDL cholesterol levels (p - value <0.001) from 34.47 ± 2.68 mg/dL on day-1 to 54.40 ± 3.52 mg/dL after 3 months. Additionally, there was a highly significant decrease in triglyceride levels (p - value <0.001) from 180.52 ± 28.62 mg/dL on day-1 to 144.02 ± 25.95 mg/dL after 3 months, and a significant decrease in fasting blood sugar levels (p - value <0.001) from 118.63 ± 36.40 mg/dL on day-1 to 100.98 ± 9.75 mg/dL after 3 months. (Table VI).These findings collectively indicate that the intervention had a significant and positive impact on these physiological and biochemical parameters during the study period as demonstrated by the statistically significant changes observed in the post-test following the 3-month intervention.

Table VI: Comparison of biochemical parameters before and after the intervention among CABG patients. (N = 60).

Biochemical	Mean ± SD					
parameters	**Day-1**	**Day-75**	**MD**	**SE_{MD}**	**'t' Value**	**p-value**
T Cholesterol (mg/dL)	196.10 ± 20.56	149.13 ± 22.87	46.97	2.96	15.87	**<0.001***
LDL Cholesterol (mg/dL)	120.82 ± 14.05	92.97 ± 9.05	27.85	1.72	16.18	**<0.001***
HDL Cholesterol (mg/dL)	34.47 ± 2.68	54.40 ± 3.52	-19.93	0.58	-34.62	**<0.001***
TRI (mg/dL)	180.52 ± 28.62	144.02 ± 25.95	36.50	3.02	12.07	**<0.001***
Fasting blood sugar (mg/dL)	118.63 ± 36.40	100.98 ± 9.75	17.65	4.01	4.40	**<0.001***

Discussion

The findings of this study present several significant insights into the management of coronary artery disease (CAD) and the impact of cardiac rehabilitation initiatives on CABG patients. We will delve into key aspects of the results, considering their clinical relevance, implications, and avenues for future research. Emerging economies, such as India, and middle-income countries in South East Asia, are grappling with a significant coronary artery disease (CAD) epidemic[11,12].

In our study, first and foremost, the substantial improvement in quality-of-life scores following the cardiac rehabilitation initiative is a noteworthy observation. The mean quality-of-life score increased significantly from baseline, emphasizing the effectiveness of such programmes in enhancing the overall well-being of CABG patients. This result aligns with previous research indicating that comprehensive rehabilitation, encompassing physical, psychological, social, and environmental dimensions is crucial for CAD patients' recovery and overall quality-of-life[13,14,15]. Moreira *et al* showed improvement in the physical domain only[16]. In another study that implemented a cardiac rehabilitation programme with an emphasis on psychological aspects and the quality-of-life of patients with coronary artery disease, there was an observed enhancement in their self-efficacy, self-regulation, and self-care abilities[5]. Our findings reinforce the importance of cardiac rehabilitation as an integral component of CAD management, echoing the recommendations of professional organisations and guidelines. A similar study conducted in Karachi found significant improvement in the physical and psychological domain but not in the social domain among younger

patients, and also shows a lower psychological score among female patients[17,18].

Of particular interest is the association between education level and quality-of-life scores. Our study-revealed that patients with lower education levels exhibited comparatively lower post-test quality-of-life scores. This observation highlights the need for tailored interventions to address the diverse educational backgrounds of CAD patients. Healthcare providers should consider educational disparities in designing and implementing rehabilitation programmes to ensure equitable access and outcomes. Future research in this area could further elucidate the specific needs of patients with varying educational backgrounds and guide the development of targeted interventions.

Furthermore, the connection between the type of treatment undergone and quality-of-life scores is intriguing. Patients who underwent medication-based treatment demonstrated higher quality-of-life scores compared to those who underwent other forms of treatment. While this finding suggests the potential benefits of medication-based approaches, it also raises questions about the interplay between treatment modalities and their impact on patients' well-being. Further investigations are warranted to explore the mechanisms underlying this association and to identify the optimal treatment strategies for different subsets of CAD patients.

Our study also revealed significant changes in various physiological parameters following a 3-month intervention period, reflecting substantial improvements in participants' health. Participants experienced a noticeable reduction in weight and BMI, suggesting successful weight management and a shift towards a healthier body composition. Ejection fraction percentage increased significantly, indicating improved heart function and cardiac output, potentially reducing the risk of cardiovascular diseases. The significant decrease in systolic blood pressure suggests improved regulation and the potential for a reduction in health issues related to hypertension. This finding aligns with results from other studies as well[6,19]. Another study revealed that engaging in physical activity represents a potent factor in enhancing both physical and psychosocial well-being, functional abilities, and overall health. These factors serve as robust markers of an individual's quality-of-life[7].

Total cholesterol and LDL cholesterol levels decreased significantly, while HDL cholesterol levels increased significantly. These changes in cholesterol profiles indicate a positive impact on lipid metabolism and heart health. Triglyceride levels and fasting blood sugar levels decreased significantly, suggesting potential benefits for metabolic health and a reduced risk of metabolic disorders. Similar findings from another study also revealed significant improvement in triglyceride levels compared to the control group[6].

In summary, our 3-month intervention demonstrated substantial improvements in various physiological parameters, pointing to enhanced overall health and potential implications for the prevention and management of chronic diseases. Further research is needed to delve into the mechanisms behind these improvements and to assess their long-term sustainability.

Implications: The implications of this study are multifaceted. Firstly, it underscores the pivotal role of cardiac rehabilitation programmes in enhancing the quality-of-life for individuals with coronary artery disease, emphasizing the importance of their integration into clinical practice and healthcare policy. The comprehensive nature of quality-of-life improvements, encompassing physical, psychological, social, and environmental domains, highlights the holistic impact of such initiatives. Secondly, the findings underscore the significance of tailored interventions, considering patients' education levels and treatment choices, as this customisation could yield more favourable outcomes. Beyond clinical practice, these results call for further research efforts, particularly studies with control groups, diverse populations, and objective measures, to strengthen the evidence base and refine the strategies for managing coronary artery disease. Overall, this study contributes to the broader understanding of cardiac rehabilitation and its potential to improve the well-being of CAD patients, both clinically and beyond.

Limitations: This study acknowledges several limitations. First, the absence of a control group restricts our ability to establish causal relationships between the cardiac rehabilitation initiative and the observed improvements. Additionally, the predominantly male and age-restricted sample may limit the generalisability of the findings to broader CAD patient populations. Moreover, reliance on self-reported data introduces potential biases, such as response bias. These limitations emphasize the need for caution in interpreting the results and call for further research with more diverse samples, objective measures, and controlled study designs to strengthen the evidence base for cardiac rehabilitation interventions.

Conclusion

This study demonstrates the profound positive effects of a cardiac rehabilitation initiative on the quality-of-life and various physiological and biochemical parameters in patients with coronary artery disease. The comprehensive enhancements in quality-of-life, encompassing physical,

psychological, social, and environmental domains, underscore the holistic benefits of cardiac rehabilitation. Furthermore, the findings emphasize the importance of individualised treatment plans, considering patients' education levels and treatment choices, in optimizing outcomes. While this research provides valuable insights, the absence of a control group and the specific demographic characteristics of the sample warrant further investigation. Nonetheless, the results underscore the pivotal role of cardiac rehabilitation in improving the well-being of CAD patients and highlight the necessity of broader integration of such programmes into clinical practice and healthcare policy.

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