

# The Effects of Phase III Cardiac Rehabilitation on the Quality of Life of Patients Undergoing Coronary Artery Bypass Graft

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## Abstract

**Background:** Shortage of rehabilitation services as well as personal and financial problems prevents patients from participating in cardiac rehabilitation programs. Participation in these programs alleviates patients' perceived inadequacy, improves their quality of life, and prolongs their survival. Thus, there is a clear need to educate cardiac patients and guide them toward patient-centered and home-based rehabilitation programs.

**Objectives:** The present study was undertaken to examine the effect of phase III cardiac rehabilitation on the quality of life of patients who had undergone coronary artery bypass graft

**Methods:** This quasi-experimental study was done on forty 35 to 75 year-old patients, who were in phase III cardiac rehabilitation after bypass surgery. Patients were selected purposively and were allocated to a control and an experimental group randomly, 20 patients in each group. The groups did not differ significantly regarding patients' age, body mass index, and the duration of cardiac problems. A demographic questionnaire and the short form 36 quality of life questionnaire were used for gathering data both before and one month after the study intervention. A cardiac rehabilitation educational program was implemented for the patients in the experimental group with six 1.5-hour sessions in three subsequent weeks. Patients in the control group also received the same education in four sessions, which were held after the posttest. The data were entered in the SPSS (v. 15.0) software and were analyzed by running repeated measure analysis of variance (ANOVA), the paired- and the independent-sample t, the one-way ANOVA, and the Tukey's post-hoc statistical tests. The level of significance was set at 0.05.

**Results:** The pretest mean score of quality of life in the experimental group was  $43.6 \pm 13.2$ , which increased to  $56.1 \pm 9.4$  after the intervention ( $P < 0.001$ ). The pretest-posttest mean difference of the total quality of life scores in the experimental and the control groups was 12.5 and 4.5. This difference was statistically significant ( $P < 0.001$ ). Moreover, the scores of all domains of quality of life in the experimental group increased significantly after the study ( $P < 0.001$ ).

**Conclusions:** The findings of this study showed that phase III (home-based) cardiac rehabilitation has significant effects on the quality of life of patients, who had undergo coronary artery bypass graft. Given the limited implementation of phase II rehabilitation programs in Iranian hospitals, implementing phase III rehabilitation programs can significantly affect patients' quality of life after bypass graft surgery.

**Keywords:** Cardiac Rehabilitation, Coronary Artery Bypass Graft, Quality of Life

## 1. Background

Cardiovascular disease (CVD) is among the most prevalent non-communicable chronic diseases and its global prevalence is increasing progressively (1). It is the first leading cause of death in Iran. The high prevalence of coronary artery diseases (CAD) and its complications accelerates mortality rate, causes disability in a large population of productive workforce, reduces national product, and in-

creases healthcare costs (2).

Coronary artery bypass graft (CABG) is among the most effective modalities for managing CVD. It is currently used for managing 60% of cases of CAD (3, 4). Currently, the number of CABGs, which are done annually around the world, and in Iran, is more than eight million, and 40000, respectively (5). Although CABG improves myocardial oxygenation and alleviates the problems of myocardial is-

chemia, it cannot overcome all problems associated with CAD. Therefore, regular physical activity is needed to improve quality of life (QOL) and maximize the benefits of CABG (6).

The most important aspects of post-CABG care, include assessing patients' physical and mental needs, evaluating their understanding of the importance of post-surgery treatments, and improving their QOL for enhancing their treatment compliance (7). Currently, the length of post-CABG hospital stay has been shortened and many patients can recover at home, i.e. without receiving continuous care from healthcare professionals. Consequently, rehabilitating these patients and improving their QOL for facilitating their engagement in physical activities has become particularly important. On the other hand, the severity of CABG-related stress added to the importance of rehabilitation (7, 8). The results of a study by Esmaeili et al. (2007) in Sari, Iran, revealed that most patients had a good QOL after undergoing CABG (9). However, Bahramnezhad et al. (2012) reported a significant decline in QOL after the surgery (10).

Cardiac rehabilitation (CR) is among the most important strategies for increasing the effectiveness of CABG and minimizing complication. It improves cardiac perfusion and reduces the extent of CABG-related myocardial injury (11). Cardiac rehabilitation refers to a set of coordinated and multidisciplinary interventions, which have been developed for improving cardiac patients' physical, psychological and social functioning (12). It is a combination of physical exercises and education, which can promote patients' physical performance and long-term health after CABG. Studies have shown that CR improves cardiac health status and reduces cardiac mortality rate by 34% (13). The world health organization also introduced alleviating cardiac symptoms and improving QOL as the goals of CR (14). Participation in CR programs reduces patients' sense of insufficiency, improves their QOL, alleviates the symptoms of activity intolerance, slows the progression of CAD, decreases the likelihood of subsequent heart attacks, minimizes the serious complications of CAD, and prolongs patients' survival (15). Mohammadi et al. (2006) found that the rate of cardiovascular accidents among patients, who had participated, and patients, who had refused to participate in a comprehensive CR program ten years after a CABG was 18% and 35%, respectively (16). Nonetheless, these programs are rarely launched by healthcare centers.

A comprehensive CR program is implemented in three phases. Phase I is implemented in hospital settings and during patients' hospital stay while phase II is launched two to eight weeks after hospital discharge and in a specialized center. Phase III is usually implemented at patients' homes and aims at helping them reach their maximum

level of functional capacity. A key component of the phase III CR is physical exercise (17). In a review study on cardiac patients, Dalal et al. (2010) found that there was no significant difference between the QOL of patients, who had received home-based and center-based CR services (18). Jolly et al. (2003) also reported that post-CABG home-based CR was more effective than center-based CR in improving QOL (19).

In Iran, CR services are rarely provided by healthcare centers. Therefore, there is a clear need for educating patients and guiding them towards patient-centered and home-based CR programs (20).

## 2. Objectives

As patients, who undergo CABG need a home-based CR program for improving their QOL, this study was undertaken to examine the effects of Phase III CR on patients' post-CABG QOL.

## 3. Methods

This two-group pretest-posttest quasi-experimental study was done in 2013 on 40 patients, who had undergone CABG at Ali Ebn-e Abitaleb teaching hospital, Zahedan, Iran. Sampling was done purposively. Patients were included if they had undergone CABG one year to three months before the study, were aged 35 to 75 years, had been treated with a cardiopulmonary machine during CABG, had no previous history of cardiac surgeries or known mental disorders, received no anxiolytic or psychoanalytic agents, had not experienced any unusual postoperative stressful events (such as returning to the operating room), were able to understand and speak Persian, and lived in Sistan and Baluchistan province, Iran. Patients, who opted for withdrawing from the study, were excluded and replaced by other eligible patients. Initially, the aim of the study was fully explained to the participants and their written consent was secured. Then, they were randomly allocated to the experimental and the control groups.

The data collection tool consisted of a demographic questionnaire and the Persian version of short form 36 QOL questionnaire (SF-36). The American association of cardiovascular and pulmonary rehabilitation approved the use of SF-36 for QOL assessment. The SF-36 is the most commonly used and the most comprehensive standardized QOL assessment instrument. It comprises of 36 questions in eight main components including general health (six questions), physical health (ten questions), mental health (six items), social functioning (two questions), bodily pain (two questions), role limitations due to physical health

(four questions), role limitations due to emotional problems (three questions), and vitality (three questions) (21). This questionnaire has been trans-culturally adapted and validated for the Iranian context. Montazeri et al. (2006) developed and validated the Persian version of SF-36 and reported that it has satisfactory validity and reliability (22). The questions of the SF-36 are scored on a five-point Likert-type scale from one to five (which stand for excellent, very good, good, relatively bad, and bad, respectively). The one to five metric scoring of each question was changed to 0 - 100 scoring and then, the scores of the questions were added together and divided by the total number of questions, therefore, scores of 0 and 100 represent the lowest and the highest possible level of each domain of SF-36 (22).

Before implementing CR educational program, all patients in both study groups completed the demographic questionnaire and the SF-36. Data collection for patients with low literacy level was performed through interviewing them. Then, the CR educational program was implemented for the patients in the experimental group during six 1.5-hour sessions in three subsequent weeks, two sessions a week. Initially, patients' educational needs were assessed and included in the educational program. The needs were mainly related to the improvement of QOL and the modification of risk factors. Education sessions were conducted by the first author and through adopting a lecture, question-and-answer, and group discussion teaching methods as well as using teaching aids such as pamphlets and booklets. Educational sessions were mainly related to the anatomy and physiology of the heart, the process of CABG, CVD etiology and risk factors, CVD prevention strategies, lifestyle modifications, prevention of CABG complications, post-CABG permitted level of physical and sexual activities, dietary regimen, medications, smoking, and travelling. In order to clarify any probable ambiguities and answer their questions, we kept contact with the participants by telephone during the study. The participants were asked to refer to the study setting one month after the intervention in order to recomplete the SF-36. As an ethical practice, we also provided the patients in the control group with the same educational sessions, which had been provided for their counterparts in the experimental group. Educations for the patients in the control group were provided in four sessions, which were held after the posttest. Moreover, they were provided with an educational pamphlet and booklet.

The study data were entered into the SPSS (v. 15.0) software. Descriptive statistics was used to describe the data while they were analyzed by running repeated measure analysis of variance (ANOVA), paired- and the independent-sample t, one-way ANOVA, and Tukey's post-hoc statistical tests. The level of significance was set at 0.05.

#### 4. Results

This study was done on 40 patients, who had undergone CABG. On average, the patients in the experimental and the control groups were aged  $60.5 \pm 10.9$  and  $63.33 \pm 6.6$  years, respectively ( $P = 0.33$ ). The length of their CVD and body mass index (BMI) were on average  $11.3 \pm 7.2$  and  $11.8 \pm 6.1$  years ( $P = 0.79$ ) and  $23.8 \pm 2.5$  and  $24.6 \pm 3.6$  ( $P = 0.43$ ) for the experimental and control groups, respectively. There was no significant difference between the groups regarding variables such as age, BMI, gender, marital and educational status, the duration since CVD, and the history of hypertension, diabetes mellitus, and hyperlipidemia (Table 1).

The pretest mean-scores of QOL in the experimental and the control groups were  $43.6 \pm 13.2$  and  $43.3 \pm 6.5$ , respectively. After the study, these scores increased to  $56.1 \pm 9.4$  and  $47.8 \pm 6.3$ , respectively. This between-group difference was statistically significant ( $P < 0.0001$ ). Moreover, except for the domains of bodily pain, social functioning, and role limitation due to emotional problems, the posttest scores of all other domains of QOL in both groups were significantly higher than the pretest values (Table 2). On the other hand, the pretest-posttest mean difference of the total QOL scores in the experimental and the control groups were 12.5 and 4.5. This difference was statistically significant. Table 3 shows the pretest-posttest mean difference scores of QOL and its domains in the study groups.

#### 5. Discussion

This study was undertaken to examine the effect of phase III CR on patients' post-CABG QOL. Before the study intervention, there was no significant difference between the groups regarding QOL and its domains, denoting the homogeneity of the groups at baseline. Therefore, post-intervention significant difference between the groups regarding the total score of QOL and the scores of QOL domains can be attributed to the effectiveness of the implemented CR educational program.

The study findings revealed that in the experimental group, the increases in the scores of all domains of QOL were significantly larger than the control group. In addition, except for the scores of social functioning, bodily pain and role limitations due to emotional problems domains, the scores of other domains of QOL increased significantly in the control group. This finding can be attributed to partial recovery from heart problems after undergoing CABG. The main goals of CABG are to prolong life, alleviate chest pain and improve QOL (23, 24). Many studies in different countries have shown significant improvement in QOL after CABG (25-29). Besides, significant increases in the

**Table 1.** Comparing the Study Groups Regarding the Frequency Distribution of Patients' Demographic Characteristics

	Experimental Group, N = 20, Frequency (%)	Control Group, N = 20, Frequency (%)	P Value
<b>Gender</b>			0.53
Male	8 (40)	11 (55)	
<b>Marital status</b>			1
Married	15 (75)	15 (75)	
<b>Literacy</b>			1
Illiterate	7 (35)	12 (60)	
Primary and secondary	6 (30)	4 (20)	
High school and higher	7 (35)	4 (20)	
<b>History of hypertension</b>	10 (50)	12 (60)	0.75
<b>History of diabetes mellitus</b>	2 (10)	6 (30)	0.23
<b>History of hyperlipidemia</b>	9 (45)	15 (75)	0.053

**Table 2.** Within-Group Comparison of the Scores of Quality of Life (QOL)

Domains of QOL	Study Groups					
	Experimental Group, N = 20			Control Group, N = 20		
	Before, Mean ± SD	After, Mean ± SD	P Value	Before, Mean ± SD	After, Mean ± SD	P Value
<b>Total QOL score</b>	43.6 ± 13.2	56.1 ± 9.4	< 0.001 <sup>a</sup>	43.3 ± 6.5	47.8 ± 6.3	< 0.001 <sup>a</sup>
<b>Physical health</b>						
Physical functioning	35 ± 16.1	51.3 ± 11.1	< 0.001 <sup>a</sup>	27.7 ± 9.9	34.7 ± 9.1	< 0.001 <sup>a</sup>
Role limitations due to physical health	38.7 ± 23.6	61.2 ± 27.5	< 0.001 <sup>a</sup>	40 ± 27.4	51.2 ± 27.5	0.009 <sup>a</sup>
General health	40.5 ± 15.4	51 ± 12.6	< 0.001 <sup>a</sup>	43.2 ± 8.8	46.7 ± 7.5	0.001 <sup>a</sup>
Bodily pain	46.5 ± 21.3	55.4 ± 15.3	< 0.001 <sup>a</sup>	44.2 ± 15.7	45.3 ± 15.3	0.16
<b>Mental health</b>						
Vitality	48.7 ± 12.1	55 ± 8.4	< 0.001 <sup>a</sup>	51.5 ± 7.9	54.2 ± 8.3	0.004 <sup>a</sup>
Mental health	51.4 ± 14.9	58.8 ± 9.9	< 0.001 <sup>a</sup>	57.6 ± 8.2	6.9 ± 59	0.02 <sup>a</sup>
Social functioning	51.2 ± 21.8	61.2 ± 17.2	0.002 <sup>a</sup>	53.7 ± 17.2	53.7 ± 15.2	0.96
Role limitations due to emotional problems	56.7 ± 32.6	71.7 ± 32.9	0.03 <sup>a</sup>	58.3 ± 32.9	61.7 ± 29.2	0.16

<sup>a</sup>The difference is significant at a P value of less than 0.05.

scores of some domains of QOL in the control group may be due to patients' increased awareness of and sensitivity to QOL-related issues. The study pretest might have sensitized the patients in the control group to QOL and hence, they might have attempted to acquire information from different sources in order to improve their QOL. This finding denotes that the patients in the control group have not been inactive after undergoing CABG. The findings of the present study are in line with the findings reported by Falcoz et al. (2006) and Moafi et al. (2011). They found that the scores of all domains of QOL increased significantly in both

groups after several weeks from implementation of the CR programs (28, 30). Taylor et al. (2004) also reviewed twelve studies systematically and reported that QOL increased significantly in both control and exercise-based rehabilitation groups (31).

### 5.1. Conclusion

The findings of this study showed that phase III (home-based) CR has significant effects on the QOL of patients who undergo CABG.

In many hospitals of Iran, CR programs are not implemented officially. Currently, only 10% of Iranian hospi-

**Table 3.** Comparing the Study Groups Regarding the Scores of Quality of Life (QOL) and its Domains

Domains of QOL	Study Groups		P Value
	Experimental Group, N = 20, Mean $\pm$ SD	Control Group, N = 20, Mean $\pm$ SD	
<b>Changes in total QOL score</b>	12.5 $\pm$ 6.6	4.5 $\pm$ 2.9	< 0.001 <sup>a</sup>
<b>Physical health</b>			
Physical functioning	16.2 $\pm$ 8.2	7 $\pm$ 5.5	< 0.001 <sup>a</sup>
Role limitations due to physical health	22.5 $\pm$ 17.9	11.2 $\pm$ 17.2	0.05 <sup>a</sup>
General health	10.5 $\pm$ 7.8	3.5 $\pm$ 4	0.001 <sup>a</sup>
Bodily pain	8.9 $\pm$ 8.6	1 $\pm$ 3.1	< 0.001 <sup>a</sup>
<b>Mental health</b>			
Vitality	6.3 $\pm$ 7.2	2.8 $\pm$ 3.8	0.06
Mental health	7.4 $\pm$ 8.2	1.4 $\pm$ 2.3	0.003 <sup>a</sup>
Social functioning	10 $\pm$ 12.6	0 + 0	0.001 <sup>a</sup>
Role limitations due to emotional problems	15 $\pm$ 27.5	3.3 $\pm$ 10.2	0.08

<sup>a</sup>The difference is significant at a P value of less than 0.05.

tals have active rehabilitation centers. Besides, patients encounter different personal and financial problems when using services provided by such centers. Therefore, they need education in order to pursue home-based CR programs and improve their QOL. Implementing home-based CR programs by community health nurses and other legitimate professionals and centers is recommended to enhance patients' participation in rehabilitation programs. Absolute prerequisites for the implementation of such programs are provision of patient and public education as well as special attention to nurses' role in providing post-discharge educations.

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