ORIGINAL RESEARCH

Effect of Cardiac Rehabilitation on Hope Among Cardiac Patients After Coronary Artery Bypass Graft Surgery

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Purpose: Following coronary artery bypass graft (CABG) surgery, some patients experience psycho-mental problems such as hopelessness. The Phase 2 cardiac rehabilitation (CR) program is an important element of the secondary prevention program in treating patients with cardiovascular disease (CVD). The present study aimed to determine the effect of the Phase 2 CR program on the level of hope in cardiac patients after CABG surgery.

Patients and Methods: A clinical trial was conducted from July 2017 to late January 2018 at the Heart Surgery Centre, Al-Zahra Hospital, Shiraz, Iran. The target population was patients who sought CR therapy after CABG surgery. A total of 104 cardiac patients were recruited and equally divided into control and intervention groups. The intervention group received 20 sessions of Phase 2 CR program combined with education and counselling during 8 weeks. The control group only received routine observations and education. The data were collected pre- and post-intervention using a demographic form and the Miller Hope Scale (MHS). Descriptive statistics were expressed as percentages, frequency distribution, mean and standard deviation. Paired t-test and independent t-test were used for statistical inference. Data were analyzed using the SPSS statistical software (version 23.0) and P values <0.05 were considered statistically significant.

Results: There was no significant difference in the mean score of hope between the control and intervention groups before the intervention. However, a significant difference between the groups was observed post-intervention (P<0.001). The results showed a significant difference in the mean score of hope between pre-intervention (182.36±23.07) and post-intervention (216.94±23.05) in the intervention group (P<0.001), whereas the difference in the control group was not significant (P=0.095). The measured post-intervention effect size was high (1.05).

Conclusion: The Phase 2 CR program combined with education and counseling increased hope in CVD patients after CABG surgery.

Keywords: cardiac rehabilitation, CABG surgery, hope, nursing intervention

Introduction

Cardiovascular diseases (CVDs) are recognized as a major health problem, highly prevalent, and the leading cause of death in the world.[1] The disease may cause physical disability and put a huge financial burden on the affected patients and the national healthcare system.[2] The statistics on ischemic heart disease are staggeringly high; mainly contributed to reduced mobility, low levels of physical activity, smoking, stress, and unsuitable diets.[3] Currently, 6.4% of the total population in the United States are suffering from coronary artery disease (CAD) and it is projected

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to rise to 18% by 2030. The number of coronary artery bypass graft (CABG) surgeries in the United States is reported to be as high as 397,000 annually.[4] In Iran, about 50,000 heart surgeries are performed every year, and CVDs account for 33–38% of mortalities and 23% of disabilities.[5]

Among the recommended treatments for patients with CAD, CABG surgery is the most invasive and expensive option, but it is the only treatment for cardiac patients. The main advantages of CABG surgery over other treatment modalities are enhanced abdominal efficiency, reduced pain and disability, and better quality of life (QoL) by alleviating angina symptoms and prolonging life.[6] However, CABG surgery causes certain physical complications (issues related to the heart, lung, and neurology; inflammation and infection; kidney failure; bleeding) and psycho-mental problems (depression, anxiety, etc.).[6,7] Hope can counter psycho-mental pressures in patients with open-heart surgery and plays an important role in the recovery of patients with CVDs. Researchers consider hope to be one of the most important contributing factors in enhancing the physical health of such patients.[8] A previous study reported that hope could improve patients' life satisfaction, personal growth, self-confidence, optimism, and resilience.[9] To date, there are only a few studies that partially investigated the effect of hope in patients with CAD.[10,11] Considering the high prevalence of the disease and the increasing number of CABG surgeries, there was a need to evaluate intervention methods that counter both the physical complications and psycho-mental side effects of the surgery. Research studies have shown that regular physical activity plays a significant role in the primary and secondary prevention of CVDs. Moreover, after myocardial infarction, people who changed their lifestyle in a radical way and exercised regularly had a better QoL and increased life expectancy.[12,13]

In CVD patients, Phase 2 CR is an important component of the secondary prevention program as it puts emphasis on physical activity and exercise.[14] Based on the American Association of Cardiovascular and Pulmonary Rehabilitation and the American College of Sports Medicine guidelines, the Phase 2 CR program is mainly in the form of aerobics.[15,16] It involves some standard curative exercises aiming at strengthening the muscles and improving the aerobic capacity of such patients.[17] A previous study reported that the application of a CR program with a specific focus on phase 2 would improve patients' exercise capacity and QoL, and significantly reduces mortality rate.[14] The benefits of CR have been demonstrated in patients with various cardiac diseases such as post-myocardial infarction (MI), coronary artery bypass surgery, heart valve repair, percutaneous coronary interventions, stable angina, stable chronic heart failure, heart transplantation, cardiac arrhythmias, and severe arterial hypertension.[18]

Despite the importance of promoting hope in patients after open-heart surgery, only a few studies have investigated the effect of hope in patients with CAD. Hence, the aim of the present study to investigate the effect of the Phase 2 CR program on the level of hope in patients with CVD after CABG surgery. The outcome of our investigation would contribute to a better implementation of the Phase 2 CR program.

Patients and Methods

The present clinical trial study was conducted from July 2017 to late January 2018 at the Heart Surgery Centre, Al-Zahra Hospital, Shiraz, Iran. The target population was patients who underwent CABG surgery and were subsequently referred to Al-Zahra Heart Hospital (Shiraz, Iran) for a CR treatment program. The hospital is one of the main specialty heart clinics in the Southern Iran.

The patients were recruited in accordance with the inclusion criteria and randomly allocated to a control and an intervention group. The staff at the CR clinic (individuals other than those involved with the study) allocated patients into two groups with the same number of participants using the double-blind procedure. To ensure full participation of the patients, the education and counseling sessions were initially discussed with each of them and subsequently tailored according to their specific needs and conditions. In addition, the patients were assured full insight into their individual performances and the final study findings. Nonetheless, measures were taken to replace a patient in case of possible withdrawal.

The sample size was determined in accordance with a previous study using the G*Power software.[19,20] Initially, a sample size of 48 patients per group was estimated (power>0.80, α=0.05). However, considering the probability of loss to follow-up, four additional patients per group were recruited. At the end of the selection process, 104 cardiac patients (n=52 per group) were recruited. The inclusion criteria were at least 4 weeks post-CABG surgery and willingness to participate. The exclusion criteria were cardiac complications, systemic diseases, and

absent from more than two educational sessions. CONSORT flow diagram of the participants from enrollment to analysis is shown in Figure 1.

Intervention

At the start, a member of the research team introduced herself to the patients and presented them with the study approval letter from the Ethics Committee of Shiraz University of Medical Sciences. The goals of the study and relevant information about the forms were described. Then, those willing to participate in the study were requested to sign an informed consent form and fill in

the Miller Hope Scale (MHS) as well as a demographic information form. The participants were then equally divided into control and intervention groups. The participants in the intervention group followed 20 sessions of a CR program with specific focus on phase 2 combined with education and counseling. The latter included informative items on CAD, heart risk factors, CAD treatments, diet and weight control, relaxation techniques, self-motivation, skills involved in developing hope, and stress management techniques. The CR sessions were conducted over 8 weeks (2–3 sessions per week) and each session lasted about 60 minutes. Sessions 1–6 included education,
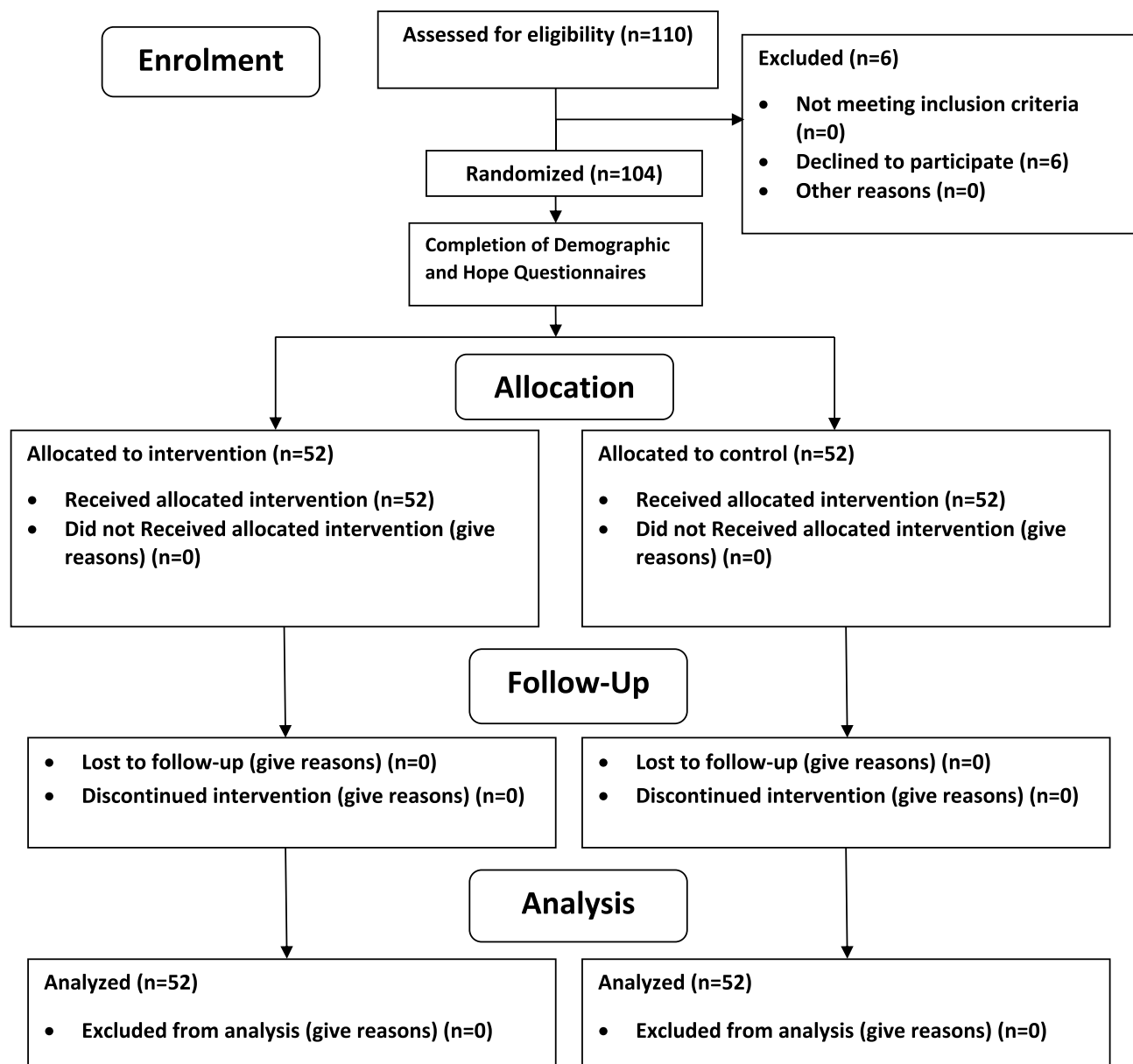

Figure 1 CONSORT Flow Diagram.

counseling, and information related to Phase 2 CR exercises. The remaining sessions[7–20] focused on the actual physical activities related to the Phase 2 CR exercises. Each exercise session consisted of three stages, namely warm-up (repeated controlled movements targeting the specific range of motion around the major joints), ergometric treadmill exercises (training the upper- and lower-limbs), and cool-down period (returning the heart and breathing rates back to normal). Depending on the tolerance of each participant, the total activity (duration, speed, and intensity) was increased by 5–7%.

Upon completion of the 20 sessions, both the control and intervention groups completed the MHS form again. Note that the control group only received routine education and did not follow any CR sessions. However, at the end of the study, they were provided with an informative booklet on CR and phase 2exercises.

Data Collection Instruments

The data were collected using a demographic form and the MHS. The demographic information was defined in accordance with a previous study[21] and based on the recommendation of CR specialists and two nurses familiar with CVDs and psycho-mental problems. The demographic characteristics included age, sex, education level, and occupation.

Miller Hope Scale (MHS)

The scale was developed by Miller and Powers in 1988 to measure hope in adults. The MHS has no subscales and thus the scores of all items are added to calculate the total score; ranging from 48 to 240. Higher scores indicate a higher level of hope.[22] The validity and reliability of MHS have been confirmed by its developers and by various other studies.[23–26] Miller and Powers confirmed the convergent validity of the MHS by calculating the correlation of each item with the Symptom Hope Scale in adults. The reported correlation between these two tools was 89%, indicating a high level of validity. The reliability was reported by a Cronbach's alpha of 88%-89%.[22] An Iranian study by Ahmarian et al, in 2015, also reported the validity and reliability of MHS as 0.93 and 0.71, respectively, and the Cronbach's alpha coefficient was 0.9.[27]

Data Analysis

The data were analyzed using SPSS statistical software (version 23.0). Descriptive statistics were used to examine the characteristics of the patients. Qualitative and quantitative variables were analyzed using the Chi-square test and independent t-test, respectively. The independent t-test was used to compare the mean scores between the two groups and the paired t-test was used to compare the mean scores of pre- and post-interventions in each group. P values <0.05 were considered statistically significant.

Results

The participants in the present study (n=104) included 79 men and 25 women, with an average age of 58.18±8.71 years. Among the hazardous risk factors, high blood pressure was prominent in both the intervention (n=28, 53.8%) and the control group (n=31, 59.6%). In terms of cardiac risk factors, only diabetes showed a significant difference between groups (P=0.008) (Table 1). To investigate the effect of diabetes on the patients' hope score, normal distribution of the scores was examined separately in each group. Since the data were not distributed normally, the Mann–Whitney test was used to compare the scores between the groups.

As shown in Table 2, there was no significant difference in the mean score of hope in both groups before the intervention. However, the difference in the mean score of hope

Table 1 Demographic Characteristics of the Patients in the Intervention and Control Groups

Variables		Group, n (%)		P
		Intervention	**Control**	
Age (years)	Mean±SD	9.41±56.56	7.69±59.81	0.138
Age (years)	30–40	3 (5.7%)	1 (1.9%)	0.057
	41–50	13 (25%)	5 (9.6%)	
	51–60	19 (36.5%)	19 (36.5%)	
	61–70	17 (32.7%)	27 (51.9%)	
Sex	Male	42 (80.4%)	37 (71.2%)	0.251
	Female	10 (19.6%)	15 (28.8%)	
Education level	Elementary	29 (55.8%)	37 (71.2%)	0.24
	Diploma	14 (26.9%)	8 (15.4%)	
	University	9 (17.3%)	7 (13.5%)	
Occupation	Unemployed	15 (28.8%)	24 (46.2%)	0.167
	Employed	21 (40.4%)	14 (26.9%)	
	Retired	16 (30.8%)	14 (26.9%)	
Risk factor	Hypertension	28 (53.8%)	31 (59.6%)	0.553
	Hyperlipidemia	23 (44.2%)	25 (48.1%)	0.694
	Diabetes	13 (25%)	26 (50%)	0.008
	Smoking	15 (28%)	13 (25.5%)	0.658
	Family history	16 (30.8%)	9 (17.3%)	0.108
	Sedentary lifestyle	29 (55.8%)	28 (53.8%)	0.884
	Obesity	7 (13.5%)	11 (21.2%)	0.300

Table 2 The Difference in the Mean Pre- and Post-Intervention Scores for Hope in the Intervention and Control Groups

Groups	CR	Mean±SD	P
Intervention(n=52)	Pre- Post	182.36±23.07 216.94±23.05	<0.001
Control(n=52)	Pre- Post	187.03±21.26 192.09±30.24	0.095

Table 5 Determination of the Difference Between the Mean Total EF Pre- and Post-Intervention in the Intervention and Control Groups

Groups	EF	N	Mean±SD	P
Control	Pre Post	52 52	51.53±6.06 52.21±5.97	0.018
Intervention	Pre Post	52 52	50.19±5.50 51.25±4.63	0.010

between pre-intervention (182.36±23.07) and post-intervention (216.94±23.05) was significant in the intervention group (P<0.001). In the control group, the difference between pre-intervention (187.03±21.26) and post-intervention (192.09±30.24) was not significant (P=0.095).

The results showed that there was no significant difference between the mean total score of hope in pre- and post-intervention with respect to demographic variables such as age, sex, education level, and occupational status in the intervention group (P>0.05) (Table 3).

In the pre-intervention stage, the measured effect size for hope in the intervention and control groups was 1.49 and 0.22, respectively. However, post-intervention, the effect size was high (1.05) in both groups (Table 4).

Table 3 Determination of the Difference Between the Mean Total Score for Hope Pre- and Post-Intervention in Terms of Demographic Variables (Age, Sex, Level of Education, and Occupational Status) in the Intervention Group

Demographic Variables		Mean±SD	The Statistics	P
Age (years)		56.5±9.4	r=0.043	0.765
Sex	Male Female	33.3±22.9 39.9±21.3	t=0.825	0.413
Education level	Elementary Diploma University	35.2±23 34.5±22.4 32.7±24.3	f=0.042	0.959
Occupation	Unemployed Employed Retired	40.7±22.6 31.3±23.1 33.1±22.3	f=0.801	0.455

The pre-intervention left ventricular ejection fraction (LVEF) level in the intervention and control groups was 50.19±5.50 and 51.53±6.06, respectively. However, 8 weeks post-CABG, a significant improvement in LVEF was observed in both the control (52.21±5.97) and intervention (51.25±4.63) groups (P<0.05) (Table 5).

Discussion

In a clinical trial study, we investigated the effect of the Phase 2 CR program in cardiac patients after CABG surgery using the MHS. Overall, the results showed that the hope score had significantly increased after 20 sessions of Phase 2 CR.

A previous study by Komlesh et al (2018) investigated the effect of a CR program on QoL and physiological parameters after CABG surgery.[28] They reported that the QoL of their patients improved after the CR program. In relation to our study, one could consider hope and QoL to be interrelated variables. Participation of male patients (66%) and the average age of the patients (60±8.3 years) in their study were similar to ours. However, they conducted 8 sessions of CR program combined with education, whereas we performed 20 sessions of CR program combined with education and counseling. Another study by Dallier et al (2013) investigated the effect of a short duration CR program on depression and anxiety in cardiac patients after CABG surgery.[29] They reported that depression and anxiety decreased after the CR program. Again, we consider depression and anxiety to have a direct inverse relationship with hope. In line with our study,

Table 4 Effect Size for Hope Pre- and Post-Intervention in the Intervention and Control Groups

Groups	Pre	Post	Difference	Effect Size(Paired) [cl]
Intervention Control	182.36±23.07 187.03±21.26	216.94±23.05 192.09±24.3	34.57±22.62 5.05±21.44	1.49[−0.77, 3.71] 0.22[−1.59,1.23]
Effect size (independent) [cl]		1.05[0.63,1.45]	1.34[0.91, 1.76]	

their participants were mainly men (70%), the average age was 58.8±9.07 years, and they mostly had an elementary education (29%). The main difference between the studies was the number of sessions; 8 sessions of CR program and education versus our 20 sessions of CR program combined with education and counseling.

A previous study conducted in Iran by Sharif et al (2012) investigated the effect of a CR program on depression in cardiac patients after CABG surgery.[30] Although they did not specifically address hope in their study, they stated that a decrease in depression after the CR program was associated with the level of hope in their patients. Note that Sharif et al conducted 8 sessions of CR program combined with education, which was less than ours and without counseling sessions. Kalka et al (2007) also investigated the effect of a CR program on QoL, depression, and anxiety in patients with heart failure.[31] Similar to our study, they conducted 20 sessions of CR program with education (without counseling) in which the majority of the participants were men (72%), had an elementary education (44%), and the average age was 59±10.7 years. They showed a reduction in depression and anxiety and improvement in QoL of their patients after the CR program. Note that they did not specifically address the effect of the program on the level of hope in their patients. A previous study conducted in the United States by Beckie et al (2015) investigated biopsychosocial health disparities among young women enrolled in a CR program.[32] They reported that variables such as health perception, QoL, optimism, hope, social support, and stress were significantly worse in young women compared to older women. Also, the symptoms of depression and anxiety were significantly greater in young women. Furthermore, in comparison with those who completed the CR program, the participants who withdrew prematurely tended to be younger women, more obese, worse QoL, and greater symptoms of depression and anxiety. In a randomized clinical trial, Beckie et al (2010) also investigated the effects of a dedicated CR program on the global QoL.[33] They reported that the CR program, which was specifically tailored for women, significantly improved the global QOL compared to traditional CR. It is recommended to conduct further studies to explore the mechanisms by which such programs affect QoL.

A previous study conducted by Salami et al (2017) investigated the effect of spiritual self-care group therapy on life expectancy in Iranian patients with CAD.[34] In line with our study, they showed that a CR program increased the level of life expectancy. The reported mean life expectancy a week after the intervention was significantly higher in the intervention group (176.76±43.38) compared to the control group (159.50±41.87) (P=0.035). They also reported the mean score of life expectancy (post-intervention) had significantly increased in the intervention group compared to pre-intervention (mean difference of 13.35±14.07, P<0.001). Similar to our study, their participants were mainly male patients (63%) and had an undergraduate degree (67%). However, they only conducted three sessions of intervention with training compared to our 20 sessions.

Among the few studies that have investigated the effect of hope, Don et al (2011) studied the effect of a Phase 2 CR program on reducing hopelessness in CAD patients at home and in hospitals.[35] In line with our findings, they reported a significant hopelessness reduction in their patients. Similar to our study, most of their participants were men (67%) and unemployed (67.3%). However, their intervention period was almost 12 weeks compared to our 20 sessions in 8 weeks.

Overall, the intervention period in the present study was longer compared to the above-mentioned studies. In addition, we specifically focused on the Phase 2 CR program combined with education and counseling. As a direct result, our CR program significantly improved the level of hope in cardiac patients after CABG surgery.

Research Limitations

The main limitations of the present study were the selection of patients from a single center and the limited time to perform the intervention. It is recommended that future studies include the participation of a wide range of health centers across different cities and extend the duration of the CR program beyond 8 weeks. Some variables such as blood pressure, blood lipids, and diabetes were measured only before the intervention. It is recommended to further enrich the data by measuring and comparing these variables in both pre- and post-intervention stages.

Conclusion

The Phase 2 CR program increased the level of hope in cardiac patients after CABG surgery. Considering the high prevalence of CVD in Iran and the key role nurses play in health promotion, more emphasis should be put on performing the Phase 2 CR program. The findings of the present study can be used to better design CR programs and improve health care for open-heart surgery patients.

Data Sharing Statement

The data that support the findings of this study are available on reasonable request from the corresponding author, [Mahnaz Rakhshan]. The data are not publicly available due to the privacy of research participants.

Ethical Considerations

The study was approved by the Ethics Committee of Shiraz University of Medical Sciences, Shiraz, Iran (number: IR.SUMS.REC.1395.204), and registered at the Iranian Registry of Clinical Trials (code: IRCT 2017041633344N2). This trial was conducted in accordance with the Declaration of Helsinki.

The participants of the present study were personally informed about the goals of the research, methodology, and confidentiality of any disclosed information. In addition, sharing of deidentified individual participant data was guaranteed and voluntary participation was assured. Written informed consent was obtained from all participants.

Acknowledgment

Disclosure

The authors report no conflicts of interest in this work.

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