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Evaluating Effect of Cardiac Rehabilitation Care Plan on Quality of Life of Patients Undergoing Open Heart Surgery at Ekbatan Hospital, Hamadan

[1]Seyedeh Zahra Masoumi, [2]Farideh Kazemi, [3]Somayeh Khani, [4]Hazhir Seifpanahi-Shabani, [5]Maryam Garousian, [6]Mehran Ghabeshi, [7]Fatemeh Razmara and [8]Ghodratollah Roshanaei
[1]Center for Child and Maternity Care (RCCMC),
Hamadan University of Medical Sciences, Hamadan, Iran
[2]Department of Midwifery and Reproductive Health, School of Nursing and Midwifery,
Shahid Beheshti University of Medical Sciences, Tehran, Iran
[3]Department of Medwifery, Student Research Center,
Hamedan University of Medical Sciences, Hamedan, Iran
[4]Departmnent of Medicine, Hamedan University of Medical Sciences, Hamedan, Tehran, Iran
[5]Department of Mental Health Education, Islamic Azad University, Medical Branch of Tehran, Iran
[6]University of Medical Sciences Tehran, Tehran, Iran
[7]CCU Heart, University of Medical Sciences Hamedan, Hamedan, Iran
[8]Department of Biostatistics and Epidemiology, School of Health,
Hamadan University of Medical Sciences, Hamadan, Iran

Abstract: Cardiovascular surgeries are among the conventional surgeries aimed to increase the survival and improve the quality of life of patients. This study aimed to evaluate the effect of cardiac rehabilitation on quality of life of patients undergoing open heart surgery. This is a semi-experimental study performed on 160 patients with open heart surgery as a clinical trial. The statistical population consisted of all patients undergoing open heart surgery who had been referred to Ekbatan hospital in Hamadan during 2015. The rehabilitation program carried out for 13 weeks (3 sessions per week) in 40 sessions. In this research, the MacNew standard questionnaire and the general health questionnaire (SF 36) used before and after intervention and evaluate the quality of life of cardiac patients exclusively and generally, respectively. The questionnaires were completed 1 day before and 3 months after the open heart surgery and cardiac rehabilitation sessions by patients. In the end, the data were analyzed using SPSS16 Software and paired t-test. The significant level was considered <0.01. The findings show that the participants had no significant difference in the demographic variables. According to the results, the quality of life of patients has been increased significantly in the physical and emotional areas after the surgery and rehabilitation program. The results also indicate that there is a significant difference between various levels of research in the physical functioning variables, dysfunction due to physical health, dysfunction due to emotional health, energy/fatigue in the individuals, emotional well-being, social functioning, pain and general health. In general, the difference in the mean score of quality of life areas after the rehabilitation intervention regarding the quality of life was equal to 15.3±1.2 and there is a significant difference statistically in all the areas. The present results indicating the improved quality of life of patients in all the areas after open heart surgery and cardiac rehabilitation intervention compared to before the operation. Therefore, paying more attention to the cardiac rehabilitation is necessary due to its positive effects on increasing the quality of life of patients.

Key words: Quality of life, cardiac surgical procedures, rehabilitation, Hamadan, patients

INTRODUCTION

In recent decades, the quality of life evaluation is one of the topics can be discussed in clinical research. The importance of quality of life evaluation is to the extent that mentioned its improvement as the most important objective of therapeutic interventions and this problem is more important, particularly in the chronic diseases with definitive treatment (Fayyazi *et al*., 2012; Mousavi *et al*., 2013; Keramat *et al*., 2013). The most common cardiovascular disease is the coronary artery disease. The atherosclerosis is the most common cardiac disease in the

Corresponding Author: Somayeh Khani, Department of Medwifery, Student Research Center,
Hamedan University of Medical Sciences, Hamedan, Iran

United States, specified with abnormal accumulation of lipids, fat and fibrous tissue in the vessel wall that causes the artery stenosis, blockage and the reduced blood flow to the myocardium. Coronary artery bypass graft surgery is a temporary and not definitive treatment (Sherme *et al*., 2009). The new developments such as thrombolytic therapy, angioplasty through balloons and lasers and atherectomy reform and develop medical measures in the management of cardiac patients but still in many of these patients, the surgery is the only preferred treatment (Khoshay and Shasavari, 2013). Statistics show that the heart surgery is the most common type of the cardiothoracic surgery (Dehdari *et al*., 2005). Every year >8 million of this surgery performed in the world and annually forty thousand open heart surgeries carried out in Iran (Ghashghaei *et al*., 2012). It is estimated that the ischemic heart disease is ascending to the 15th peak of mortality causes of people in all ages in the world (Rahimi *et al*., 2014). In the United States there are more than 12 million people suffering from coronary artery disease. This disease lead 17 million people to death and it is predicted to become the most common cause of death in the world by 2020. If there is no preventive measures, it will reach to 24.8 million (Seyam and Heidarnia, 2013). It was shown in the studies that one person died by cardiovascular disease per second (Fayyazi *et al*., 2012). In Iran, the coronary heart disease is allocated the first place by 21% (Siavoshi *et al*., 2013). The quality of life is considered as the sign of quality for the health care and a part of health plan and its measurement in the chronic diseases is a useful guide to improve quality of care (Khoshay *et al*., 2013) while in some studies the quality of life of patients has been described unfavorable after the cardiovascular surgeries (Bradshaw *et al*., 2006). One of the most effective measures for efficacy of cardiac surgery and decrease of its complications is cardiac rehabilitation (Ghashghaei *et al*., 2012). The cardiac rehabilitation includes activities such as comprehensive medical evaluation, exercise, risk factor modification, education, observation and patient change behavior. The rehabilitation is the learning process of living with chronic diseases or debilitating conditions (Lavie *et al*., 2009). The rehabilitation programs have beneficial effects on the mortality decrease, activity tolerance and functional capacity, diet observation, blood pressure and fat levels control, angina and dyspnea symptom, weight loss, smoking, stress levels and mental functioning. This can be done through exercise, relaxation, education and consultation and behavior change in the individuals (Barlow *et al*., 2009). The rehabilitation as part of secondary preventions aimed to improve the patient status to the highest possible level of physical, mental and social abilities, especially after the open heart surgery (Yalfani *et al*., 2012). Different data in the United States indicate that the cardiac rehabilitation services only used in 14-31% of the qualified patients. According to a study, in our country only 10% of hospitals with heart surgery have provided the rehabilitation program to their patients after surgery (Khoshay and Shasavari, 2013) which is mostly limited to the patients undergoing open heart surgery and despite the importance of cardiac rehabilitation, there is not enough coherent information in this regard (Afrasiabi *et al*., 2008). Due to the importance of cardiac rehabilitation programs and on the other side the lack of enough information about cardiac rehabilitation effects on quality of life of patients in Iran, the research was essential and its results can help the evaluation of cardiac rehabilitation programs. It is hoped that, the results of this study highlight the importance of cardiac rehabilitation program in order to optimize the physical, mental and social functioning and improve the quality of life of cardiac patients after the open heart surgery.

Objectives: The present study aimed to assess the effect of cardiac rehabilitation on quality of life of patients undergoing open heart surgery.

MATERIALS AND METHODS

This is a semi-experimental study performed to determine the effect of cardiac rehabilitation on quality of life of patients undergoing open heart surgery.

Patients: First, the list of qualified people provided in the cardiac surgery section and then according to the table of random numbers, 160 cardiac patients (110 males, 50 females) who were in need of open heart surgery were chosen using simple sampling method. The sample collection carried out from the beginning of December 2014 to the end of May 2015 for 6 month. The inclusion criteria of patients undergoing open heart surgery consisted of no previous history of heart surgery, no history of recognized mental illness, no anti-anxiety drug consumption or psychotropic drug, no unusual stressful events such as returning to the operating room, the ability to understand and speech and the minimum literacy for reading and writing or living with a literate person. The exclusion criteria in these patients were non-cooperation of the patients and whether the patients have had heart attack and stroke. Then, regarding the study and its objectives, the necessary explanations were provided to the qualified subjects and in the case of having tendency to participate in the study, first, they completed the consent form of participating in the studies and then the demographic characteristics questionnaire, MacNew quality of life standard questionnaire and the SF- 36.

Questionnaires: MacNew standard questionnaire containing 27 questions and evaluate the quality of life of patients in three areas of emotional functioning, physical functioning and social functioning. The score of the person in the physical functioning obtained with computation of the mean score of 5 questions in the same area in the emotional functioning with mean score of 11 questions related to the emotional functioning area and in the social functioning with the mean score of 10 questions in the social functioning area. The final score was also computed by calculating the score of all the questions. In each area, the highest score could be 7 and the lowest score is 1, representing the high quality of life and low quality of life, respectively. Also, in studying the level of quality of life, the minimum score of 26-65 was considered poor quality of life and maximum score of 146-182 was considered excellent quality of life. The unanswered questions were not included in evaluation and final conclusion. The questionnaire was normalized in 2010 for the cardiac patients in Isfahan by Yousefi. The reliability of the questionnaire in research of Yousefi and Jafari was obtained 94% using Cronbach's alpha (Nekouei *et al*., 2012).

The SF-36 is a common tool used for the general assessment of health-related quality of life and consists of 8 subscales, including physical functioning, social role functioning, vitality, emotional role functioning, bodily pain, physical role functioning, mental health and general health perceptions. The eighth item assesses perceived changes in general health over a 1 year period (health transition). In addition there is a general health transition question. There is also a global question about the respondent's perception of their health. The questionnaire items are given scores of 0-100 with higher scores indicating a better quality of life (Fayers and Machin, 2016). This questionnaire was first translated and validated in Iran by Montazeri *et al*. (2005).

The patients qualified to participate in the study completed a series of questionnaires before intervention and cardiac surgery. These patients were discharged after the surgery and 6 week after the surgery referred to participate in the rehabilitation program. The rehabilitation program carried out for 13 week (3 sessions per week) in 40 sessions. Each rehabilitation session was also performed due to the evaluations (cardiopulmonary status and exercise tolerance test) for 1-1.5 h.

Intervention: The programs provided in these rehabilitation sessions for the patients.

- Examined by the cardiac rehabilitation doctor, general check-up and control of risk factors for cardiovascular diseases, including: high blood pressure, high blood lipids, diabetes, smoking, sedentary lifestyle, obesity, mental stress
- The nutrition counseling program and diet therapy, weight control and providing health nutrition orders
- The control of conflicts and mental diseases with adverse effects on the cardiology and the process of cardiac diseases (such as stress, anxiety, depression, etc.,) and holding relaxation sessions
- The physiotherapy and proper physical activities consultation under the supervision of physiotherapist
- The nursing care and patient education
- Standard medical exercise program due to the individual exercise power by modern devices under the supervision of doctor and physiotherapist

The people who formed the cardiac rehabilitation team included the cardiac rehabilitation doctor, trained nurses, physiotherapist, nutritionist and psychologist. The proposed exercise program included. Warm up exercises, exercise main phase: treadmill, stationary bike and handy bike (ergometer logo). Cooling and stretching exercises. In this phase, the patients were also participated in the training, nutrition, psychology and relaxation sessions. All patients participating in the study remained until the final phase of rehabilitation sessions. At the end of the last rehabilitation session, the initial quality of life questionnaires were frequently completed by these patients.

Statistical analysis: Data analysis performed using descriptive statistics. In order to compare the features of both groups before and after surgery, the paired t-test was used. SPSS16 Software was used for data analysis and the significant level of tests was considered to be <0.05.

RESULTS AND DISCUSSION

In this study, among all the patients undergoing open heart surgery who referred to Ekbatan Hospital in Hamadan from the beginning of 2015, 160 patients qualified and consented to participate in the study were included. In this study, $p<0.01$ is considered significant. The mean age of the participants was equal to 61.5±3.10. The minimum age and maximum age were reported 21and 86 year, respectively. The demographic characteristics are available in Table 1-4.

In the information obtained in comparing quality of life before and after surgery and after the implementation of a cardiac rehabilitation program after open heart surgery using MacNew specific questionnaire, the subjects with poor quality of life score reduced from 2-0

Table 1: Frequency distribution of demographic characteristics before and after surgery and cardiac rehabilitation intervention in patients referring to Ekbatan hospital in Hamadan

Variables	N (%)
Gender	
Femal	50 (31.2)
Male	110 (68.8)
Age	
20-35	1 (0.6)
36-45	11 (6.9)
46-55	30 (8.18)
56-65	65 (6.40)
66-75	40 (25)
85-76	13 (1.8)
Educational level	
Primary school	76 (47.5)
Secondary school	70 (43.8)
High school	5 (3.1)
Academic	9 (5.6)
Occupation	
Working	79 (49.4)
Non working	81 (50.6)
Number of children	
0	1 (0.6)
1-4	58 (36.2)
5-8	86 (53.8)
9-12	15 (9.4)
Region	
Urban	100 (62.5)
Rural	60 (37.5)

Table 2: Frequency distribution of different levels of quality of life (McNew specific questionnaire) before and after surgery and cardiac rehabilitation intervention in patients referring to ekbatan hospital in Hamadan

	Before surgery		After surgery		
Quality of life	N	Percentage	N	Percentage	p-values
Low (26-65)	2	1.25	0	0	p<0/001
Moderate (105-66)	34	21.25	5	3.125	p<0/001
Good (145-106)	69	43.125	74	46.25	p<0/001
Excellent (182-146)	55	34.375	81	50.625	p<0/001
Total	160	100	160	100	p<0/001

Total score mean difference = 15.3; p<0/001; SD = 1.2; t = 12.3; emotional domain mean difference = 29.9; p<0/001; SD = 1.1; t = 28.2; physical domain mean difference = -35.7; p<0/001; SD = 0.7; t = -49.4 social domain mean difference = -1.5; p = 0/148; SD = 1.0; t = -1.5

Table 3: Comparison of differences in quality of life areas (Sf 36) before and after surgery and cardiac rehabilitation intervention in the patients referring to the Ekbatan hospital in Hamadan

Variables	Mean difference	SD	t-values	p-values
PF	2.7	0.6	3.4	p<0/001
RP	-26.7	3.4	-8.0	p<0/001
RE	-26.0	3.2	-8.1	p<0/001
EF	-4.8	0.7	-6.5	p<0/001
EW	-1.5	0.3	-4.9	p<0/001
SF	-5.8	1.0	-5.7	p<0/001
P	-3.6	0.7	-4.9	p<0/001
GH	-11.0	1.0	-10.8	p<0/001
Health somatic	-11.0	1.1	-9.9	p<0/001
Health psycho	-9.5	1.1	-8.6	p<0/001

subjects with medium score reduced from 34-5 subjects, the subjects with good quality of life score increased from 69 subjects to 74 subjects and with excellent score increased from 5 subjects 1 subjects difference between

Table 4: Total score and eight-dimension score of quality of life (Sf_ 36) before and after surgery and cardiac rehabilitation intervention in patients referring to Ekbatan hospital in Hamadan

	Before surgery		After surgery		
Domains	M	SD	M	SD	p-values
PF	67.4	30.0	70/1	26.0	p<0/001
RP	45.8	43.9	72.5	39.7	p<0/001
RE	48.1	45.1	74.2	41.5	p<0/001
EF	58.6	13.9	63.3	12.8	p<0/001
EW	56.9	15.5	58.4	15.0	p<0/001
SF	75.8	24.8	81.6	21.1	p<0/001
P	67.6	26.1	71.2	24.8	p<0/001
GH	53.0	17.7	64.0	14.5	p<0/001
Health somatic	58.4	22.7	69.4	19.2	p<0/001
Health psycho	59.8	18.9	69.4	14.8	p<0/001

mean scores of quality of life areas before and after the surgery in terms of quality of life was -15.3±1.2, emotional area 29.9±1.1 and physical area -35.7±0.7 and these statistical differences was significant with (p<0.001) but in terms of social area with p = 0.14, no statistically significant difference was obtained (Table 2).

In the results obtained using SF 36 questionnaire, the mean score difference in quality of life areas before surgery and after participating in the cardiac rehabilitation program after open heart surgery in terms of physical functioning was 2.7±0.6 dy function due to physical health 26.7±3.4, dysfunction due to emotional health 26.0±3.2, energy/fatigue in the individuals -4.8±0.7, emotional well-being 1.5±0.3, social functioning -5.8±1.0, pain -3.6±0.7 and general health -11.0±1.0 and these differences were statistically significant (p<0.001) which indicating the great impact of the program on the quality of life of cardiac patients after surgery.

In the results obtained using SFf 36 questionnaire, the quality of life of patients undergoing open heart surgery who participated in the cardiac rehabilitation program after surgery increased in terms of mean score (physical functioning from 67.4±30-70.1±26, dysfunction due to physical health from 45.8±43.9-72.5±39.7, dysfunction due to emotional health from 48.1±45.1-74.2±41.5, energy/fatigue from 58.6±13.9-63.3±12.8, emotional well-being from 56.9±15.5-58.4±8, social functioning from 75.8±24.8-81.6±21.1, pain from 67.7±26.1-71.2±24.8, general health from 53.0±17.7-64.0±14.5, total physical health from 58.4±22.7-69.4±19.2, total mental health from 59.8±18.9 to 69.4±14.8). Due to evaluation of the effect of cardiac rehabilitation program after coronary artery bypass surgery, the quality of life of the subjects in all areas of eight-dimension quality of life had a statistically significant difference (p<0.001). The mean score of quality of life of subjects in all areas of the SF36 also increased significantly compared to before surgery and cardiac rehabilitation and considering these results shows the importance of paying more attention to the

implementation of the rehabilitation program and the various methods to perform this program (Table 3). This study aimed to evaluate the effect of cardiac rehabilitation care plan on quality of life of patients undergoing open heart surgery. According to the results from Table 1, none of the demographic characteristics had a significant relationship with various areas of quality of life of the subjects. This finding can be hopeful that with the implementation of rehabilitation care program, the quality of life of cardiac patients can be increased without the involvement of the demographic characteristics. According to the information obtained from this study in evaluation of the frequency distribution of quality of life different levels (MacNew) in patients undergoing open heart surgery and after the rehabilitation sessions, the quality of life score is increased from poor and medium levels to good and excellent.

The difference of the mean score of quality of life areas before and after surgery has been increased generally in terms of quality of life, emotional and physical areas with statistically significant difference but in terms of social area no significant difference was obtained with $p = 0.148$. This conclusion is in agreement with the results by Hirano *et al.* (2005) and Mohammadi *et al.* (2006). In these studies, due to the significant areas of quality of life, no significant relationship was obtained in terms of social area. In the study by Amirian the quality of life score of patients increased after surgery and was equal to 6.51±70.9 (Schaefer *et al.*, 2013) which is in agreement with the present study. Siavoshi *et al.* (2013) did not obtained significant results in terms of mental health and pain but there was a significant difference in terms of physical role variable (physical limit) as well as in improvement of the emotional role (emotional limit) which is in agreement with the results of the present study.

The findings of the present study are in agreement with Seki *et al.* (2003) study. However, it should be noted that the individuals participating in the Seki study was only 20 subjects in the intervention group and 18 subjects in the control group and the quality of life score is measured after 6 months. On the other hand, some studies show that in the subjects with more complicated mental problems, the effect of cardiac rehabilitation on quality of life is more (Lavie *et al.*, 2009). Nevertheless, various studies have conflicting results in this regard. Serber *et al.* (2009) show that patients with more complex mental problems had also lower quality of life in terms of physical, mental and social areas with more depression and anxiety, however, the cardiac rehabilitation was also performed on them. Mostafavi *et al.* (2012) found that women had greater improvement in terms of mental health and the constraints caused by the physical problems (Mostafavi *et al.*, 2012). In general, it can be attributed to the lower initial quality of level of women and their exercise capacity compared to men (Kennedy *et al.*, 2003, Unsar and Sut, 2010). The findings of the present study also approve the Merkris results. In this study, in order to evaluate the quality of life, the MacNew questionnaire has been used and the quality of life of patients has been investigated before the surgery, 4 months after the surgery and 1 year later. The results of this study show that, the quality of life of patients has been increased significantly 4 months after the surgery and this improvement observed with lower degrees for 1 year (Merkouris *et al.*, 2009). Wissler found that the quality of life of patients improved after the rehabilitation (Zwisler *et al.*, 2008). Arrigo *et al.* (2008) show that the impact of a cardiac rehabilitation period improve the quality of life of patients for 1 year after the cardiac rehabilitation. Nordhorn *et al.* (2004) found that the cardiac rehabilitation has caused significant improvement in the quality of life of patients after the open heart surgery (Nordhorn *et al.*, 2004).

Alexander and Wagner (2006) evaluated the impact of cardiac rehabilitation program for 12 weeks on the patients and a significant improvement was observed both in the short and long periods in quality of life of patients. Grace *et al.* (2008) approve the improvement in quality of life and anxiety after cardiac rehabilitation on women. Kaliani in evaluating and determining the impact of cardiac rehabilitation on the quality of life found that a significant difference can be observed after 1 year since the intervention started in the quality of life in both test and control groups (Caliani *et al.*, 2004). The results of review systematic study show that the cardiac rehabilitation both at rehabilitation centers and at home improve quality of life of patients (Artham *et al.*, 2008; Benzer *et al.*, 2007).

Also, according to the results obtained in the present study using SF36, the cases of dysfunction due to physical health, dysfunction due to emotional health, energy/fatigue, emotional well-being, pain and general health, total physical health and total mental health had significant and considerable improvement after the surgery and cardiac rehabilitation than before. In 2002, Lindsay *et al.* (2003) perform a study on 183 patients undergoing bypass surgery and SF36 questionnaire was completed to measure the impact of cardiac rehabilitation after bypass surgery for both control and test groups, the results show that after the implementation of cardiac rehabilitation programs with major contribution of education, a significant difference was observed between both groups in terms of physical functioning, general health, social functioning and physical role limit. The

cardiac rehabilitation program can reduce the mental stresses associated with cardiovascular diseases and improve quality of life of patients (Artham *et al*., 2008). Izawa *et al*. (2004) found that a 12 month period cardiac rehabilitation improve the physical and quality of life indices in the cardiac patients. Sebregts *et al*. (2005) during a clinical trial on patients with myocardial infarction and coronary artery bypass reported that patients training in the follow-up programs has reduce the fatigue and depression symptoms in the intervention group.

The exercises considerably increase the quality of life and patient's heart functioning (Atlantis *et al*., 2004), the patients show a significant difference after receiving the cardiac rehabilitation compared to the beginning of intervention, in terms of frequency, duration and intensity of the hiking program, also the mean incidence of physical symptoms such as dyspnea, chest pain and fatigue are decreased during these exercises. In this regard, Cugila and Cooper reported that regular exercises reduce the blood pressure and balance the weight, also 12 week implementation of physical activities such as walking with moderate intensity in the home rehabilitation program, have positive impact on the cardiovascular risk factors (hyperlipidemia) (Coghill and Cooper, 2008). The patients who received rehabilitation program, compared to people who didn't receive rehabilitation program, return to work faster and show the signs of improvement in the quality of life and mental functioning (Bengtsson *et al*., 2004). Studies have shown that cardiac rehabilitation decreases the mortality up to 34% and cardiac diseases recurrence up to 29% (Barlow *et al*., 2009).

In another study, the amount of cardiovascular events in the patients who participated in a comprehensive cardiac rehabilitation program 10 year after open heart surgery was 18%, compared to 35% of patients who refused to participate in cardiac rehabilitation (Mohammadi *et al*., 2006). Due to the significant cardiac rehabilitation effects shown in the present study, the results are similar to the previous studies. In Iran, most of the cardiac rehabilitation programs are limited to the patients undergoing open heart surgery and despite the importance of cardiac rehabilitation, there is not enough coherent information in this regard (Afrasiabri *et al*., 2008). Due to the importance of cardiac rehabilitation programs and on the other side, not enough information on cardiac rehabilitation effects on quality of life of patients in Iran and also approving the impact of rehabilitation programs, the research was essential in this regard and the findings can be useful in evaluation of cardiac rehabilitation programs.

CONCLUSION

As mentioned earlier, the results of the present study and previous studies on cardiac rehabilitation indicating the improved quality of life of patients undergoing open heart surgery with cardiac rehabilitation intervention. Therefore, the accurate implementation of cardiac rehabilitation by the nurses and motivating the patients for participation can have effective impact on the improvement of quality of life of patients than before the surgery and the nurses and other colleagues such as clinical psychologist who is related to these patients, undoubtedly play an important role in the efficacy and continuity of rehabilitation services in the society. More attention to the cardiac rehabilitation is also necessary due to its positive effects on the increase in the quality of life of patients.

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