Effect of PRECEDE educational model on depression and quality of life of patients with coronary artery bypass graft surgery

Leyla Sabzmakan[(1)], **Sayyed Mohammad Mahdi Hazavei**[(2)], **Katayoun Rabiei**[(3)],
Hassan Jahani Hashemi[(4)], **Mohsen Mirmohammad Sadeghi**[(5)], **Hamidreza Roohafza**[(6)]

Abstract

BACKGROUND: This study was conducted to evaluate the effect of an educational intervention on depression and quality of life (QoL) of patients with coronary artery bypass grafting (CABG) surgery.

METHODS: This was a quasi-experimental study on 54 patients after CABG who were randomly divided into the test and control groups. To evaluate depression, Cardiac Depression Scale was used. Then a researcher-made questionnaire of Predisposing, Reinforcing, Enabling Causes in Educational Diagnosis and Evaluation (PROCEED) was used and finally the 36-item Short-Form Health Survey (SF-36) was employed. The intervention was done through 9 educational sessions, once a week, lasting 60-90 minutes based on PRECEDE model and it was followed-up for two months.

RESULTS: After the educational intervention, the mean score of predisposing causes, enabling causes, reinforcing causes and self-care behaviors significantly increased in the test group compared to the control group (P < 0.001). There was a significant difference in mean score of depression between the two groups after the educational intervention (P < 0.001). In addition, there was a significant difference after the intervention in physical functioning (P = 0.04), mental problems related to QoL (P < 0.001) and generally, in psychological health (P = 0.04).

CONCLUSION: The findings of this study confirmed the efficacy of PRECEDE educational model and its components (predisposing, enabling and reinforcing causes) and behavioral factors of it on improvement of psychological status and depression of the patients which finally increased QoL of patients after CABG.

Keywords: Educational Intervention, Depression, Quality of Life, PRECEDE Model.

Introduction

Coronary artery disease (CAD) is one of the most important cardiovascular diseases and a worldwide health problem. It is estimated that in 2020, almost 25 million deaths will occur due to cardiovascular diseases. Accordingly, one in every three deaths would be due to the cardiovascular diseases.[1] Cardiovascular diseases are recognized as the major cause of mortality in Iran and mortality statistics in 18 provinces showed that 46% of all deaths and 27.2% of lost years of life are due to this disease.[2]

Today, open heart surgery is considered as one of the effective and valuable methods in treatment of cardiovascular diseases.[3] In Iran, 60% of all the open heart surgeries are coronary artery bypass grafting (CABG) .[4] The main goal of CABG is relief of angina and increased life expectancy.[5]

Dimensions of quality of life (QoL) are related to each other. Three major domains in QoL are physical, psychological and social dimensions. Psychological dimension is correlated to the concepts of mental and emotional well-being and some other issues such as depression, fear, anger, happiness, self-control and anxiety.[6] One of the dimensions of QoL in recovery period after CABG is mental status of patients which has an inevitable role in other dimensions including social functioning and restarting job and activities. Depression is the major and most prevalent mental outcome in this period that can influence the process of recovery in patients.[7]

The prevalence of mental disorders after CABG was reported between 11.6 to 46.6%. Mental

1- Lecture, Department of Public Health, School of Health, Ghazvin University of Medical Sciences, Ghazvin, Iran.
2- Associate Professor, Department of Health, School of Health Services, Isfahan University of Medical Sciences, Isfahan, Iran.
3- General Practitioner, Cardiac Rehabilitation Research Center, Isfahan Cardiovascular Research Institute, Isfahan University of Medical Sciences, Isfahan, Iran.
4- Assistant Professor, Department of Biostatistics, School of Health, Ghazvin University of Medical Sciences, Ghazvin, Iran.
5- Assistant Professor, Department of Cardiac Surgery, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran.
6- Associate Professor, Psychosomatic Research Center, Isfahan University of Medical Sciences, Isfahan, Iran.
Correspondence To: Katayoun Rabiei, Email: ktrabiei@gmail.com

problems after the CABG surgery are anxiety, depression, restlessness, agitation, irritability, fear and anger due to sense of worthlessness, lack of control and reduction of self-confidence. Depression as one of the outcomes of CABG surgery has been reported in 54% of patients and has significant impact on QoL of cardiac patients. It also can influence the acceptance of patients for prescribed medications and changes of lifestyle and is associated with the high risk of morality, inability, increased need for medical cares and decreased daily activities and functioning.[8]

Health education is a necessary tool for health and aims to promote health level and reduce the behaviors causing disease. On the other hands, health and quality of life also have a mutual relationship. Meanwhile, educational programs as intervening factor can play an important role in removing the health problems and changing the QoL. In other words, the goal of health education is to promote health and quality of life of individuals. Early health education can be effective not only in health improvements, but also in other social domains and QoL.[9] Health education programs and attempt to change lifestyle in cardiac patients, including patients with CABG, should be the first priority. Most of the risk factors causing cardiac disease are related to behavior and awareness of individual. The experiences of advanced countries have shown that educational interventions focusing on behavior change were able to modify risk factors. Mental health educational programs showed the importance of controlling mental pressure and depression in recovery and promotion of QoL in cardiovascular patients.[10]

The value of health education programs is dependent upon their efficacy, and effectiveness of health education programs highly depends on appropriate use of required theories and models in health education.[11] In 1979, Green and Kreuter developed the Predisposing, Reinforcing, Enabling Causes in Educational Diagnosis and Evaluation (PRECEDE) model in order to find the causes of behavioral problems and also designed, planned and evaluated the health education programs. This model begins from results (causes) and continues toward 7 successive stages in design, practice and evaluation. This model shows how social recognition, epidemiology and behaviors lead to a clear understanding from needs, issues and tendencies of society's individuals. It also reviews the behavioral causes that are closely related to health. One of the key aspects of PRECEDE is to provide a simple and effective way to identify and prioritize effective factors on health and QoL promotion.[12] QoL is the sign of health care quality as well as a part of disease control programs. CADs are proper disease in terms

of QoL criteria.[13]

This study aimed to assess the effect of an educational intervention based on PRECEDE model on depression and QoL in patients with CABG surgery. It can help us to use effective programs and establish preventive services to increase QoL after CABG.

Materials and Methods

In a quasi-experimental study, cardiovascular patients who underwent CABG for the first time were evaluated. Age range of patients was 35 to 70 years. They were referred to Isfahan Cardiovascular Research Center since September 2006 and 4 to 8 weeks after the CABG surgery, with a letter of introduction from a cardiologist to participate in the educational programs. Out of 80 potential candidates, 62 patients referred. They were randomly divided into intervention and control groups using two red and blue balls. Four patients were excluded from the study due to reasons such as unwillingness to participate, working and having no relatives. During the follow-up, one of the patients passed away and two of them withdrew due to cold weather. Finally, 27 patients remained in the study.

Considering eefect size (d) = 15, β = 0.2, α = 0.05 and σ = 26, 24 patients are needed for each group. In the study of Hare and David,[14] the change range of depression score was reported to be 156. In order to estimate standard deviation, the range of changes was divided by 6. In the mentioned study, mean score of depression was reported 80 and the maximum absolute error was 15; i.e. the relative error was 16%. Three questionnaires were used. For evaluating the depression, Cardiac Depression Scale (CDS) was used. It consisted of 6 demographic questions and 26 7-point Likert scale (from completely agree to completely disagree) in seven dimensions (no-pleasure, sleep, judgment and insight, memory, mood and desperate). The lowest and highest scores in this questionnaire were 26 and 182, respectively and mean score of depression was calculated as 80.[14] The classification of scores conducted as Beck Depression Inventory.

In Beck Inventory, score 10-19 considered as mild depression, 20-25 as moderate depression and scores greater than 25 as severe depression.[15] In this study 80-99 was considered as mild depression, 100-110 as moderate depression and greater than 110 as severe depression. The reliability of the questionnaire was obtained by Cronbach's alpha coefficient of 0.90. The validity of the questionnaire was confirmed and translated to fluent Persian by professors and experts in health education, cardiologists and mental specialists.

The second questionnaire based on PRECEDE model included basic data (predisposing, enabling and reinforcing causes) and behavioral factors which was

designed according to the National Plan Inventory for Prevention and Control of Cardiovascular Diseases of Isfahan Healthy Heart Program.[16] Its Cronbach's alpha coefficient was 0.81. It consisted of 11 main subjects in relation with awareness. Each question had four choices as "Yes" (2 positive scores), "No" (1 negative score), "Probably" (1 positive score) and "I have no idea" (0 score). It also had 8 questions about the attitude with a 5-point Likert scale (from completely agree to completely disagree). Furthermore, this questionnaire included 10 questions about skills that had two parts. The first part was related to the educational source consisted of 5 questions with Yes and No responses (1 positive score and 0 score, respectively). The second part was related to the skills with 5 questions; correct answers (2 positive scores), average (1 positive score) and incorrect answer (1 negative score). This questionnaire also included four questions about reinforcing factors with Yes and No responses (1 positive score and 0 score, respectively). The last part of the second questionnaire consisted of 5 questions about behaviors with following responses: Always (3 positive scores), often (2 positive scores), sometimes (1 positive score) and never (0 score).

The third questionnaire was the international standard 36-item Short-Form Health Survey (SF-36), including eight scales of physical functioning, physical limitation, bodily pain, general health, vitality, social functioning, mental problems and two summary assessments which included the integration of scales as follows: physical health (physical functioning, physical limitation, bodily pain and general health) and mental health (vitality, social functioning, mental health). The scores of each scale varied from zero to 100. Zero indicated the worst and 100 indicated the best status in this scale. In a study which was conducted to determine the reliability of SF-36 on people over 15 in Tehran, its Cronbach's alpha coefficient was calculated as 0.7.[17] The reliability of this questionnaire was 0.82 using correlation test in patients with open heart surgery.[18] In this study, the Cronbach's alpha coefficient also obtained approximately 0.70 for most of the scales. The pre-test included completion of the questionnaires in both groups. Both test and control groups received the ordinary cares prescribed by the cardiologist. The participants in the test group also participated in 9 educational sessions for two months including lecture, question and answer meetings, group discussion, scientific show and scientific trip (Table 1).

To support group discussion, the test group was divided into three educational groups and each week one educational session was held for every educational group for 60-90 minutes. In most of sessions, one of the family members of the patients participated too. The educational programs were designed based on the framework of PRECEDE model which is a diagnostic approach in health education planning and has seven stages (Figure 1). These patients were followed-up for two months in terms of continuation of educational health behaviors. During the follow-up times, a leader was chosen for each group who was associated with the patients. The patients referred to the center twice a week for implementation of exercise and relaxation and then they returned the checklists that they completed about relaxation and exercises to the researcher. Final examination included completion of the questionnaires that was done after the intervention for both groups. Data analysis was done by SPSS software (version 15; SPSS Inc., Chicago, IL.) using paired t-test, independent t-test, Mann-Whitney and chi-square tests.

Table 1. Educational content of the interventional program for the test group

| Session	Educational Content
1	Familiarity with heart structure and functioning, atherosclerosis and its risk factors, the method of CABG surgery (predisposing causes)
2	Familiarity with patients who have a common problem (CABG) (predisposing, reinforcing causes)
3	Familiarity with behavior type A, symptoms of anxiety and depression, the correlation of depression in recurrent cardiovascular (predisposing causes)
4	Familiarity with health behavior, relaxation and its advantages in improvement physical and mental health as well as its practice during the program (predisposing, enabling causes)
5	Familiarity with deep breath, breathing exercises and its role in improvement of physical and mental health as well as its practice during the program (predisposing, enabling causes)
6	Familiarity with specific exercises after the cardiac surgery, learning its method and its practice during the program (predisposing, enabling causes)
7	Familiarity with the importance of participate in the cardiac rehabilitation program and its role in improvement of physical and mental health (predisposing, enabling causes)
8	Familiarity with appropriate walking program, familiarity with friends in Heart Association and participation in group walking program (predisposing, enabling, reinforcing causes)
9	Self-control (controlling blood lipid, blood glucose, blood pressure, weight, ejection fraction, learning how to measure heart rate during exercise as well as cardiac risk factors (predisposing, enabling causes)
10	Identifying the problems and barriers in changing process of educated behaviors as group discussion (reinforcing factors)
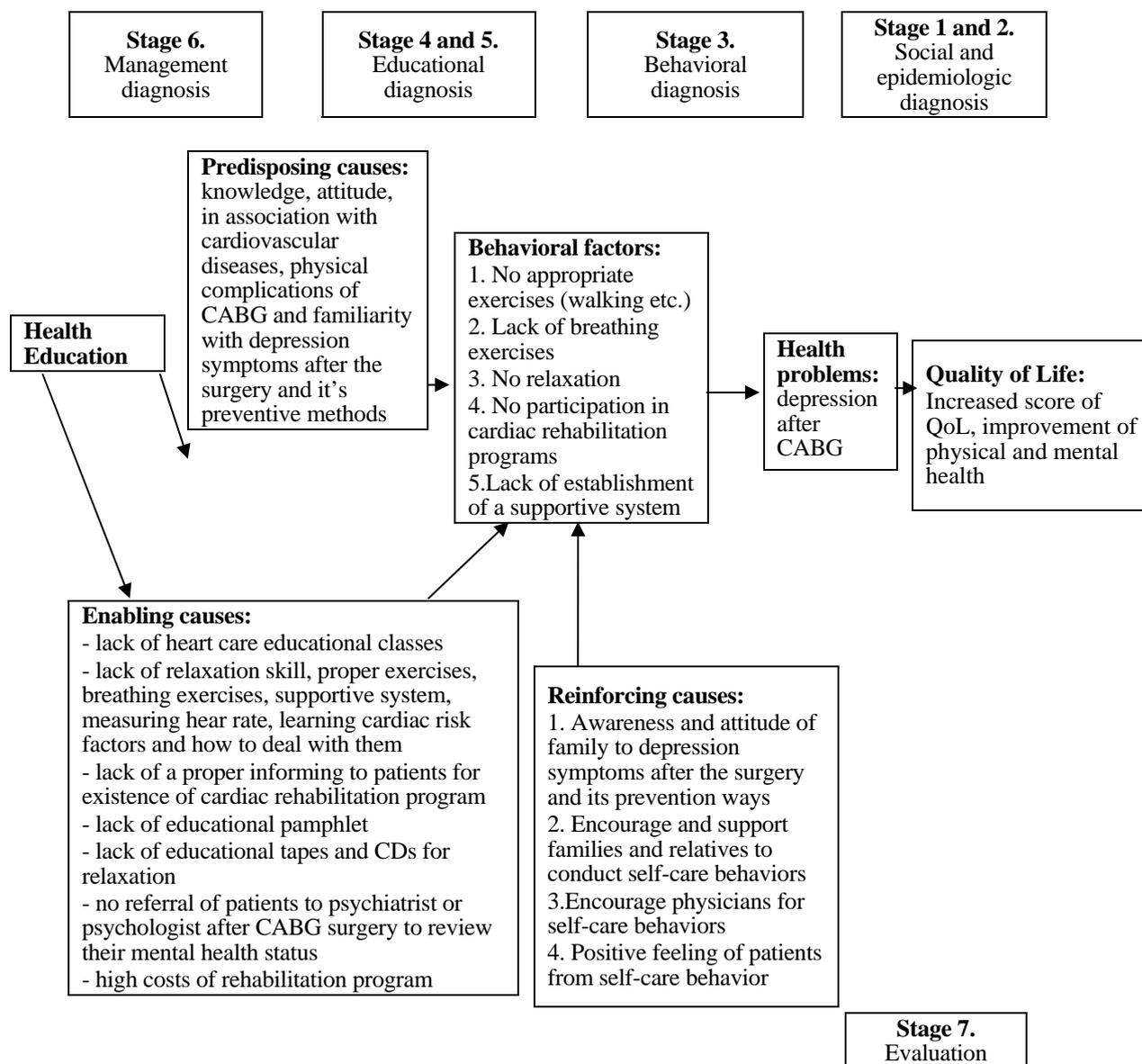
Figure 1. Application of PRECEDE model on quality of life (QoL) of patient after CABG surgery

Results

In this study, 54 patients were randomly divided into test and control groups. There were 77.8% of male subjects and 22.2% of females. Age in the test group was 56.8 ± 7.2 years and it was 56.5 ± 7.5 years in the control group (Mean ±SD). Among the patients, 40.8% had low educational level, 16.7% were high-school graduates, 24.1% higher education and only 18.5% were illiterate. In terms of employment, 33.3% were retired, 33.3% were employed, 20.4% were housekeepers and the rest of them were unemployed. There was no significant difference in age, sex, literacy and employment status between the two groups. None of the groups suffered from other diseases except cardiac disease and had no mental problem.

Table 2 illustrates the mean scores of awareness, attitude, skills and self-care behaviors as well as mean score of depression before and after the intervention. There was a significant difference between the two groups after the intervention. Mean scores of awareness and attitude toward risk factors of atherosclerosis, heart surgery, depression symptoms, relaxation, exercising and its advantages, cardiac rehabilitation programs and ways to improvement mental and psychological status were considered as predisposing causes. There was no significant difference between the two groups before the

educational intervention; however, it was significant after the intervention (P < 0.0001).

Educational sources (pamphlets, educator, psychologist, rehabilitation nurse, classes, relaxation film, educational film related to appropriate exercises for cardiac patients, images and slides about appropriate and deep breathing after the surgery, rehabilitation programs, etc.), trained skills (walking, exercising, relaxing, breathing exercises skills, formation of supportive system with a group of patients who participated in the program, learning how to measure heart rate during physical activity, etc.) were considered as enabling causes.

In terms of educational sources, there was no significant difference between the two groups before the educational intervention; however the frequency of using educational sources increased in the test group but it did not change in the control group (it was so little, if any). Chi-square test showed a significant difference between the two groups in terms of enabling causes in terms of using educational sources after the educational intervention (P < 0.0001). Enabling causes (encouragement of others) after the self-care behaviors before the educational intervention was not at all (or it was so little, if any). After the educational intervention in the test group, the encouragement of others for self-care

behaviors significantly increased (P < 0.0001).

Behaviors of walking, exercising, relaxation exercises, forming a supportive system, participation in cardiac rehabilitation programs were considered as self-care behaviors without any significant difference between the two groups before the educational intervention; however, it was significant afterwards (P < 0.001).

Before the intervention, there was a significant difference between the test and control group in terms of physical limitation. Therefore, it was ignored in rest of the study. However, after the intervention, there was a significant difference in terms of physical functioning and mental problems.

In the control group, physical functioning, bodily pain, social functioning, mental problems and mental health had a significant difference before and after the intervention; however, it was not significant for physical limitation, general health and vitality. In the test group, all the dimensions had a significant difference except the general health dimension.

Before the intervention, mental and physical health between the two groups had no significant difference. After the intervention, there was no significant difference between the two groups in terms of physical health; however, there was a significant difference in terms of mental health (Table 3).

Table 2. Comparing the mean scores of awareness, attitude, skills, behaviors, and depression before and after the educational intervention

Variables	Before the intervention					After the intervention				
	Test group		Control group		P	Test group		Control group		P
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Awareness	66.8	11.3	73.8	15.1	0.06	147.4	2.45	69.2	18.5	<0.001
Attitude	24.6	2.04	25.2	1.9	0.22	38.2	2.6	24.2	3.01	<0.001
Skills	1.22	0.6	1.29	0.6	0.66	9	1.2	1.7	0.9	<0.001
Behaviors	1.6	1.2	2.03	1.2	0.29	12.5	3.4	3.5	2.4	<0.001
Depression	112.8	21.9	104.5	30.4	0.25	66.2	22	89.2	27.8	0.001

Table 3. Comparing the mean of QoL dimensions before and after the educational intervention between the test and control groups

Variables	Before the intervention					After the intervention				
	Test group		Control group		P	Test group		Control group		P
QoL; SF-36	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Physical functioning	56.6	17.9	59.62	20.5	0.57	82.59	11.6	73.51	19.1	0.04
Physical limitation	10.1	18.6	25.9	34.3	0.04	42.5	28.4	37.9	36.2	0.6
Bodily pain	41.7	25.9	48.4	24.2	0.33	69.1	20.4	64.4	24.01	0.43
General health	57.4	14.6	59.4	20.9	0.68	66.3	21.5	59.1	24.9	0.26
Vitality	40.3	17.5	48.7	22.1	0.13	64	20.4	55	18.8	0.09
Social functioning	45.8	27.2	55.0	30	0.24	76.8	24.6	72.2	29.07	0.53
Mental problems	24.6	34	34.5	37.5	0.31	85.1	26.6	61.7	39.9	0.01
Mental health	46.3	20.3	52	18.8	0.29	73.0	18.4	64.4	19.03	0.09
Physical health	41.5	14.1	48.3	18.9	0.13	65.1	15.01	58.7	19.8	0.18
Mental health	39.3	20.9	47.5	22.2	0.16	74.7	17.05	63.3	22.7	0.04

Discussion

The findings of this study showed that test group received higher scores in predisposing causes dimension (awareness and attitude). After the educational intervention, the test group obtained higher scores than the control group in enabling causes (mentioned skills and educational sources). In terms of the educational sources after the intervention in the test group, educator, pamphlets, relaxation tapes and group activity were completely used. After the intervention, the test group obtained higher scores in the enabling causes compared to the control group. In this study, encouragement of others and positive feeling after implementation of self-care behaviors were considered as reinforcing causes. All patients in the test group after the self-care behaviors were encouraged by families, educator, and a group of cardiac patients as well as the physician. In terms of positive experience after the self-care behaviors, decreased score of depression and its severity were expressed as reinforcing causes.

Mean score of behaviors in the control group was lower than the test group after the intervention. It can be concluded that lack of awareness in the individuals was the major cause for lack of using self-care behaviors. In this study, depression after the CABG surgery was determined as a health problem. After the educational intervention, mean score of depression decreased both in test and control groups; however, the decreased score of depression was more in the test group (41% vs. 14%). In the study of Holst et al., patients with congestive heart failure showed that counseling meetings after 6 months reduced the depression from 92.2 to 76.6%.[19] A study by Allen et al., aiming to review the effect of short-term interventions on cardiovascular patients, showed that educational intervention program reduced anger and type A behavior, but it had no effect on depression.[20] The findings of this study regarding the components of PRECEDE model including predisposing causes (awareness and attitude), enabling factors (educational sources and skills), reinforcing causes, behavioral factors and health problems were in accordance with the studies of Parslow and Jorm,[21] Chiou et al.,[22] Allen et al.,[23] Taghizadeh[24] and Lesan[25] in different domains.

After the educational intervention, there were 46% and 23% increase in score of physical functioning dimension, 31% and 46% increase in physical limitation, 66% and 33% reduction in bodily pain, 15% and 0.5% increase in score of general health, 59% and 13% increase in the score of vitality, 68% and 31% increase in social functioning, 24% and 78% increase in mental problems and the score of mental health dimension increased 57% and 23% in the test and control groups, respectively. As indicated, there was 57% increase in score of physical health in the test group but 21% in the control group as well as 90% increase in score of mental health in the test group and 33% in the control group. The study of Michalsen et al. using SF-36 questionnaire in cardiovascular patients showed significant improvements in the test group after the intervention in seven dimensions of general health, physical functioning, physical limitation, social functioning, mental health, vitality and bodily pain while the patients of the control group had significant improvement only in four dimensions of general health, social functioning, mental health and bodily pain. Mean improvement of QoL for the test group was higher in seven dimensions out of eight dimensions of SF-36 questionnaire, although the difference between the two groups only was significant in physical functioning after the intervention. Accordingly, the total scores of physical dimension components were higher in the test group. Depression, anxiety, anger and stress similarly reduced in both group.[26]

In a study by Smith et al, SF-36 questionnaire were used to determine the effect of rehabilitation programs after the CABG surgery. There was a significant difference between the two groups in terms of physical functioning and physical limitation.[27] In a study by Babaee et al., they also used SF-36 questionnaire in order to evaluate the QoL after the CABG surgery. The test group participated in the educational intervention programs based on Miko Education Pattern. One month after the CABG surgery, the results showed that there was a significant correlation between the physical functioning, mental problems, physical limitation, mental health and vitality. It showed that health education improved QoL of patients after CABG surgery.[4] Dehdari using SF-36 questionnaire showed that one month after the surgery, there was a significant difference between the test and control groups in terms of physical functioning, physical limitation, mental problem, vitality and mental health.[18] In this study, similar to the study of Michalsen et al. (for the physical functioning) as well as the studies of Babaee et al. and Dehdari, there was a significant difference after the intervention between the two groups in terms of mental problems. Given to the QoL dimensions in this study, the major objective of the researcher was to intervene on mental dimension of QoL which its score finally increased regarding to the self-care behaviors (walking and exercising, relaxation, breathing exercises, forming a supportive system and participation in cardiac rehabilitation programs) and

also the depression of the patients decreased after four months from CABG surgery in the test group.

Conclusion

No study has ever been done exactly similar to the present study. It seems that the cause of improvement in depression status and increase of QoL score in the test group compared to the control group could be due to application of educational programs based on PRECEDE model and its components which was an important principle with more emphasis on accountability and self-care. The other difference of this study was the application of CDS questionnaire. In the mentioned studies, Beck Inventory was used to evaluate depression. Health officials, health planners, hospitals and research centers can implement extensive behavioral-interventional educational programs to prevent patients from depression and reduce probable recurrent coronary artery diseases and unhealthy behaviors as well as health costs and finally can increase QoL in patients.

Acknowledgments

Conflict of Interests

Authors have no conflict of interests.

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