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Website:
www.jehp.net

DOI:
10.4103/jehp.jehp_154_16

Demographic and psychological predictors of recovery from coronary artery bypass graft

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Abstract:

OBJECTIVES: Worldwide, i.e. in Iran, coronary artery bypass grafting (CABG) is one of the most common and expensive surgeries. This study was designed to explore the demographic and psychological factors which predict the recovery process in CABG patients.

MATERIALS AND METHODS: During a prospective correlational study, 250 CABG patients, in two public and private hospitals, investigated for indexes of recovery during hospital stay and 4 weeks after discharge. Demographic and psychological variables were collected through checklist and Farsi validated and reliable versions of type D personality, the multidimensional scale of perceived social support, revised illness perception questionnaire (IPQ-R). Data were analyzed through statistical tests through SPSS version 20.

RESULTS: Considering the total recovery index, 91.2% of CABG patients have not been recovered 4 weeks after surgery. Furthermore, 99% of them reported high scores of depression and anxiety. Marital and insurance status, and perceived personal control, showed significant difference between recovered and unrecovered patients based on total recovery index ($P < 0.05$); however, in regression analysis, they did not identify as predictor variables. Age, gender, insurance status, and perceived personal control were the most frequent variables identified as predictors of recovery indexes, separately.

CONCLUSION: The correlation between depression, anxiety, perceived personal control, and recovery status among our patients reveals the importance of considering psychological and mood assessment in developing guidelines for CABG patients. Our findings will assist clinicians for designing of psychological interventions for promotion of perceived personal and illness control and better recovery post-CABG.

Keywords:

6-min walking, coronary artery bypass grafting, demographic variables, psychological variables, recovery

Introduction

Cardiovascular diseases (CVDs) are the main causes of different illnesses in the health system of all the countries around the world and the second leading cause of disability-adjusted life year.^[1,2] Moreover, coronary artery bypass grafting (CABG) is one of the most common surgeries in the United States, and each year, approximately 519,000 cases of CABG are performed.^[3-7]

The relationship between psychological factors, recovery process, and prognosis in patients with CVD has been studied by many researchers. Depression along with an increase in mortality and complications after surgery in patients undergoing CABG has been determined.^[8,9,11-23,31,32] The term "recovery" in this study is mostly referred to returning to everyday life activities.

In early studies on patients undergoing open-heart surgery, high levels of depression

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How to cite this article: Sadeghi M, Hashemi M, Sararoudi RB, Merasi MR, Molaeinezhad M, Shamsolketabi H. Demographic and psychological predictors of recovery from coronary artery bypass graft. *J Edu Health Promot* 2017;6:92.

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Received: 03-02-2017

Accepted: 05-02-2017

and anxiety before surgery have been positively correlated with postoperative readmissions and cardiac events.^[9-13,31,32]

Studies regarding the effects of depression and other psychological factors such as negative attitudes, type D personalities, and their predicted effects on the poor prognosis of patients' health and quality of life (especially coronary artery disease) are increasing.^[14-18] In some of these studies, significant association between depression and mortality in general population samples has been observed.^[19] This subject has been also recognized in patients with CVD, diabetes, and hypertension.^[20-24]

Depression ranges from temporary mood states along with feelings of sadness and sorrow to major depressive disorder. Anxiety involves a feeling of very unpleasant and often nonspecific distress that is consistent with physical symptoms such as empty feeling in the stomach or dyspnea, chest pain, tachycardia, and sweating. The focus of background studies since 2005 has been mostly on depression, anxiety, and impact on the recovery process. Other psychological factors such as social support, self-control, and personality type and illness perception have been less studied by researchers. Therefore, the necessity of studying these elements is obvious.

In 2005, Doering *et al.* (this is the first time and all the names should be mentioned) in the United States of America revealed that depressed patients had lower recovery in comparison to other patients, both physically and emotionally. In addition, even after 6 weeks of discharge, they could walk a shorter distance in 6 min as compared to healthy individuals. Moreover, it was determined in the study that people with depression suffer from infection and impaired wound healing more than nondepressed people.^[25] Stafford *et al.* (2009) in Australia investigated the impact of illness perception on health-related quality of life (HRQOL) and depression in a study and indicated that a positive attitude toward the disease would improve the HRQOL. The patients in this study represented fewer symptoms of depression.^[26]

Furthermore, it was revealed that negative attitudes toward the disease in the elderly and people from lower social classes were higher than other people.^[26] Sorensen and Wang in the United States investigated the relationship between social support, depression, functional status, and length of hospitalization after open-heart surgery. They illustrated that social support was not associated with other variables. However, those who were depressed before the surgery and had low performances experienced longer postoperative hospital stay. The length of hospitalization in depressed women was more than

depressed men.^[27] Perceived social support is related to patients' viewpoints and perception of accessibility to sources of social support.^[27]

In a study by von Kanel, to evaluate heart rate recovery (HRR) on chronic heart disease and Type D personality patients, it was revealed that patients with this type of personality had lower HRR in comparison to other people.^[28] In a pilot study by Aquarius *et al.*, it demonstrated that type D personality could be a risk factor for an increase in mortality for all patients with peripheral vascular disease, which of course more research is essential in this field.^[30] From a clinical standpoint, people with type D personality are prone to anxiety, stress, feelings of sadness, and dark and negative view toward life.^[29]

Kupper *et al.* conducted a study on patients with chronic heart disease and concluded that patients with type D personality experienced an increase in both oxidative stress burden and oxidative stress ratio. An apparent reduction in the level of patients' antioxidants was another outcome of their study.^[30]

In another study by Li XM *et al.* (2012), the impact of depression in prognosis of patients with coronary disease who have done repetitive vascularization was assessed. It was demonstrated that major adverse cardiovascular events, including overall mortality, nonfatal myocardial infarction (MI), repeated revascularization, and readmission were higher in those patients who were depressed than others^[31] were. Chocron *et al.* found out that antidepressant treatments could result in rapid recovery, increase in patients' mental health, improvement in quality of life, and reduction of postoperative pain. However, these treatments had no effect on morbidity and mortality rate in a year after surgery and it is advised to treat depressed patients before the surgery.^[32]

Psychological problems before CABG surgery are common, and it seems that they are accompanied with an increase in health-care costs.^[9] These problems, especially depression, have been observed in about 60% of patients undergoing open-heart surgery.^[10] According to the results of the study of health and disease in Iran in 2001, 21% of people were suffering from mental disorders in general.^[11] Personal control in this research includes belief, the assessment of patients' perception about their ability to control the symptoms, treatment process, and the consequences of the disease.

Illness perception involves patient's belief and cognitive assessment and interpretation of severity of ailment, duration of the disease, extent of the disease complications, and chance of healing.

Considering the prevalence of CVDs and psychiatric disorders, the increase of the CABG cases, the burden of each of them, and the heavy expenses are imposed on health-related resources. Hence, identifying the predicting variables in developing the protocols to facilitate the recovery process and rehabilitation of patients seems necessary. Therefore, an effective step would be taken is to improve the quality of life of these patients. In most studies, depression has been investigated, but the other psychological factors such as self-control, illness perception, social support, personality type, and its impact on recovery have not been examined. Therefore, the identification of mentioned factors can be used to produce guidelines on the intervention for these patients.

Materials and Methods

This study was a prospective descriptive correlational study and 250 patients undergoing coronary artery bypass graft (CABG surgery from public and private hospitals were enrolled in this study). The inclusion criteria were (1) candidate for CABG surgery according to the diagnosis of a cardiologist, (2) knowledge of Persian language in a way that they would be able to express the necessary information and complete the questionnaires and interviews, (3) Iranian nationality, (4) patient's availability, (5) patients' consent to participate in the study, and (6) ability to read and write.

Exclusion criteria were as follows: (1) simultaneous heart surgery, (2) emergency CABG surgery, (3) non-Iranian nationals, (4) being illiterate, (5) suffering from MI during or before the surgery, (6) lack of patients' consent to participate in the project, and (7) noncardiac serious life-threatening disease.

The reason for selecting patients from public and private hospitals was to expedite the collection of samples as well as to gather data from all groups of society for socioeconomic reasons. The preoperative questionnaires (as a baseline at home and with conditions away from hospital) included demographic, medical, and psychological information (such as depression, anxiety, illness perception, perceived social support, personal control, life events, and personality type D). They were completed and the data were collected before the surgery.

The indicators of the recovery after CABG surgery included total Intensive Care Unit (ICU) stay with a cutoff point of 2 days, total hospital stay with a cutoff point of 6 days, 6 min walking test (6MWT) with a cutoff point of 140 m, the use of oral analgesics with a cutoff point of four doses, and injectable analgesics with a cutoff point of three doses. The cutting points of each of

these indicators for recovery and delayed recovery phase were received by examining 250 patients underwent CABG surgery.

Complications during hospitalization (including wound infection and death during hospital admission, pneumonia, heart failure, dysrhythmias, sepsis, lack of fusion of the sternum, infarctions, neurologic events, and thromboembolism) with a weighted arithmetic mean cutoff point value of 0.1 were rated between 1 and 10. This classification was based on the recommendation of four cardiologists and two heart surgeons. The means for weighting each disorder was considered and evaluated by nurses with appropriate questionnaires. Patients' recovery were determined by assessing each of the relevant indices alone from the time of being discharged from ICU to the general ward and 4 weeks after discharging (through telephone follow-ups or computerized recording of patient's readmission in hospitals under study).

The index was based on studying the literature as well as studying the records of 25 CABG patients. It was extracted and then organized as a list of items available to four cardiologists, two surgeons, and one research team including a biostatistician, a cardiologist and health psychologist, and a resident of cardiology. After organizing two consecutive expert panel sessions, the need for each of these items was discussed, and finally, they were considered as recovery indices [Figure 1 shows a flowchart of steps in the study].

Tools

Type D personality scale (DS 14)

This measure which has been obtained through studying patients with heart disease in Belgium, is specifically for evaluating the following: (1) The negative emotions (neuroticism) containing seven questions with five options ranging from 0 to 4 points; (2) social

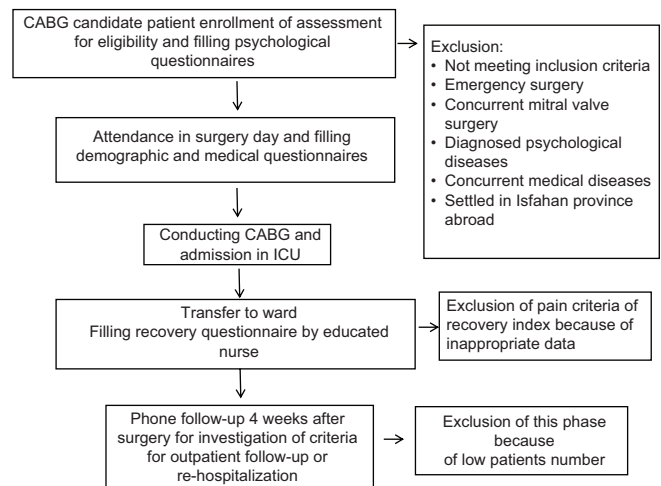


Figure 1: Flow chart of study

inhibition (SI) (introversion) containing seven questions with five options ranging from 0 to 4 points, and finally, (3) type D personality assessment with a cutoff point of 10. This scale has been developed in a way to be stable and comfortable to use by physically challenged patients.^[34] It includes two subscales, namely negative affects (NAs) and SI, to assess the overall personality characteristics (neuroticism and extraversion) of patients with type D personality.

Cronbach's alpha for 176 Iranian patients with MI was calculated for the NA subscale at 0.84 and the SI subtest at 0.86. Furthermore, the validity of these subscales compared to neuroticism subscales and Eysenck's extraversion (Molavi, 1993) of the same sample was studied. The correlation coefficient between NA subscales and Eysenck's neuroticism and between SI subtests and extroversion subscales was calculated as 0.65 and -0.62, respectively.

These results indicated that this scale has a satisfactory credibility to assess the personality traits mentioned in Iranian samples. The content validity of this scale was analyzed by 15 psychologists and psychiatrists using a 6-point Likert scale for items and a 10-point scale for total scale. All in all, the results obtained from this evaluation indicate high reliability and the satisfactory credibility of the scale.^[35]

Multidimensional scale of perceived social support

The questionnaire is a self-report scale consisted of 12 items, including three subtests and four items. Items are answered in 7-point Likert scale responses (from strongly agree to strongly disagree). This scale was designed by Zimet *et al.* in 1988 to assess perceptions of support of the adequacy of social support sources, such as family, friends and the most important person in one's life. One of the remarkable features of this scale is the existence of three sub-tests, which show various aspects of social support. Validity and reliability of this test have been studied for multiple populations, including students, women, young people, and psychiatric patients. Cronbach's alpha for the total scale and subscale has been calculated from 0.85 to 0.91, and reliability of this scale through test-retest has been reported from 0.72 to 0.85. The construct validity has been also approved.^[36,37]

Revised illness perception questionnaire subscales for personal control

This questionnaire is based on Leventhal's self-regulation theory to evaluate the cognitive aspects of the disease. According to this theory, illness perception consists of five different components. These components include the patient's perception of the identity, causes, controllability, timeline of disease, and its consequences. Revised illness perception questionnaire (IPQ-R) has five scales and

each scale evaluates one of these aforementioned five components.^[38]

Cronbach's alpha for the Persian version of this scale for a sample of 176 Iranian MI patients was 0.88. The test-retest reliability of this scale for a sample of 62 heart disease patients within 3 weeks was also determined as 74.0. Furthermore, the construct validity of these subscales was studied in comparison to Pearlin (1978) subscale of personal skills.

Moreover, the content validity of this scale was investigated according to the comments of 15 psychologists and psychiatrists and using a 6-point Likert scale for items and a 10-point scale for total scale. Largely, the result obtained from this evaluation indicates the satisfactory validity of this scale.^[37,39]

The brief illness perception questionnaire

This scale is an abridged version of the IPQ which covers all the cognitive dimensions provided in Leventhal's theory of self-regulation. In addition to being comprehensive and brief, this scale provides opportunities to evaluate patients' perception of their disease severity among its other advantages. The main purpose for using this questionnaire is to evaluate patients' perception of the severity of their heart attack. Each of the items on this questionnaire except the item number 9 is answered on a grading scale of 0-10. In addition, the graded scales have been defined between 0 and 10 for participants' more understanding.

Using this tool can be an indicator of the perception of patients about their disease severity. Considering patients' perception of their disease severity, this scale demonstrates higher validity and reliability than other methods used in the study.^[40] To the Persian version, Cronbach's alpha for this scale in a sample of 176 people of Iranian MI patients was 84.0.

In addition, the construct validity of this subscale in comparison with modified Iranian version of IPQ (Oreizi *et al.*, 2005) was tested on a sample of 62 cases of patients with heart disease.^[41] The correlation coefficient between the two scales was calculated at 0.71. These results indicated that this scale has a satisfactory credit for evaluating personal control in Iranian cardiac patients. The content validity of this scale was also assessed by 15 psychologists and psychiatrists' recommendations using a 6-point Likert scale for items and a 10-point scale for total scale. In general, the results obtained from this evaluation confirmed the satisfactory validity and reliability of this scale.

Statistical analysis

After collecting the data, statistical analysis by multivariate regression analysis, logistic regression,

canonical regression, and MANOVA were performed using SPSS version 20. manufactured by SPSS Inc. (IBM corporation, Armonk, USA).

Results

A number of 250 patients who underwent CABG remained in the hospital until the end of the study and researchers assessed their data. Among them, 94% of patients were men and 6% were women. Moreover, 44.8% of the patients were in the age range of 51–60 years, 30.4% were in the 61–70 years of age range, 18.8% were in the 41–50 years of age range, 2.4% were in the age 20–40 years, and 2.4% were over 70 years of age. Among them, 94% of the patients had medical insurance and 6% were not covered by insurance. In addition, 99.2% of patients were married and 0.8% were single.

According to admission variables during all the ICU and hospital stay, 58% of patients showed signs of recovery and 41.6% did not show any sign. Based on 6MWT variable, 22.4% of patients recovered and 77.2% did not. Injectable analgesic variable represented 96.8% recovery in the patients while 2.8% did not show any recovery. According to oral analgesic variable, 76.8% showed recovery and 22.8% did not. Finally, based on all the items of recovery (total recovery) 8.8% of patients showed recovery and 91.2% did not show any recovery.

To determine the statistical probability for quantitative variables, *t*-test and mean and standard deviation statistics were applied, and to determine the statistical

probability for categorical variables, χ^2 test and the number and percentage (N [%]) were used.

As Table 1 represents, with a one-unit increase in age, no change was observed in patients' not recovering and in the length of their stay in the ICU. In addition, among the demographic variables, none was statistically significant. All the psychological factors had protective effect (odds ratio under 1), but they were not statistically significant (i.e., they had less nonrecovery). Moreover, having a type D personality characteristics has been accompanied by a decrease in the chance of nonrecovery (shorter hospitalization in ICU), but this difference was also not statistically significant.

On the other hand, although the chance of nonrecovery has decreased 1% for each unit increase in social support, this reduction was not statistically significant. In addition, for each unit improvement in personal control over the disease and illness perception, the probability of nonrecovery has decreased 8% and 1%, respectively, and for each unit increase in overall personal control, 0.9% chance of nonrecovery has increased, which none were statistically significant. Using logistic model, for every one-unit increase in the mean score of patient control over disease, nonrecovery has decreased 8%, but it is not statistically significant (protective effect).

Among the demographic variables of recovery, in terms of total length of hospital stay, none of the contributing factors were statistically significant. The nonrecovered women were 2.6 times more than men were, but it

Table 1: Studied variables in recovery based on duration of ICU stay (quantitative variables showed in mean (SD) and categorical variables showed in N (%))

	Classified	Recovered	Non Recovered	<i>P</i>	Logestic model OR (95% CI)	<i>P</i>
Demographic Variable						
Sex	Male	199 (4.93)	35 (2.97)	331.0		
	Female	14 (6.6)	1 (8.2)			
Marital status	Married	209 (2.98)	36 (100)	187.0		
	Not Married	2 (9.0)	0 (0)			
Insurrance Status	Insurance	198 (93)	35 (2.97)	Not valid		
	Non Insurance	14 (6.6)	1 (8.2)			
Socioeconomic Status	Low	65 (5.30)	10 (8.27)	845.0		
	Moderate	148 (4.69)	26 (2.72)			
Age	–	38.56 (13.8)	02.57 (61.9)	580.0	(050.1- 952.0) 1	987.0
Psychologic Variable						
Depression	No Depression	1 (5.0)	0 (0)	fisher		
	Depressed	212 (5.99)	36 (100)	855.0		
Anxiety	No Anxiety	4 (9.1)	0 (0)	fisher		
	Anxiety	209 (1.98)	35 (100)	542.0		
Type D Personality	No Type D	70 (9.32)	11 (2.30)	392.0	(42.2-386.0) 967.0	944.0
	Type D	143 (1.67)	25 (4.69)			
Perceived Social Support	–	82.67 (26.13)	65.65 (18.16)	612.0	(022.1-963.0) 992.0	597.0
Illness Personal Control	–	95.19 (7.3)	13.20 (13.5)	007.0	(091.1-787.0) 927.0	362.0
Total Personal Control	–	67.19 (86.3)	41.19 (23.4)	396.0	(13.1 -898.0) 009.1	880.0
Illness Perception	–	64.53 (67.10)	50.52 (69.13)	129.0	(026.1 - 955.0) 990.0	572.0

was not statistically significant [Table 2]. Between the psychological factors, those with type D personality had more hospital stay (increase in nonrecovery), but it was not statistically significant too. Patients with higher personal control over their disease had shorter hospital stay. In other words, for every one-unit increase in the personal control over the disease there has been 25% decrease in nonrecovery (shorter hospitalization); moreover, this has been statistically significant.

Among demographic factors, patients with moderate socioeconomic status walked a shorter distance during 6MWT test in comparison to those with lower socioeconomic positions (higher nonrecovery rate). There was a 1.5% nonrecovery decrease for every one-unit increase in patients' age, which means that this factor has had a protective effect [Table 3]. In the group of psychological factors, personal control over the disease is the only variable which according to the walked distances on 6 min has had a significant difference between recovered and nonrecovered patients ($P = 0.023$). However, the results of logistic regression indicated that, for each unit increase in the mean score of personal control over the disease, there is 3% reduction in our nonrecovery (protective effect). In other words, the person who has higher personal control over the disease might walk a longer distance in 6 min, but the difference was not statistically significant [Table 3].

In the case of complications during hospital stay, as showed in Table 4, those who had insurance

experienced less complications than other patients (an increase in recovery). In demographic factors, women had 11.6% more complications during hospitalization than men (fewer complications) [Table 4]. Among the psychological factors, those with type D personality suffered complications 1.16 times more than other patients, which was not statistically significant. The patients with higher illness perception of the disease had experienced significantly more complications.

Among the demographic factors, those with insurance received less injectable analgesics and had a higher recovery rate in comparison to those who were not covered by insurance (≤ 2 doses), [Table 5]. None of the psychological factors was statistically significant.

One noteworthy issue about demographic factors is that women took oral analgesics two times more than men did. Those with insurance consumed less analgesic; in other words, they had 75% less nonrecovery. The patients who took more analgesic had a higher average age [for every one-unit increase in age, oral analgesic consumption was raised 2%, Table 6]. Among the psychological factors, the patients who had higher personal control over their illness consumed more oral analgesics (1.1 times). The patients with higher illness perception also took more oral analgesics.

Among demographic variables, marital and insurance status leads to significant differences between recovered and unrecovered patients based on total recovery. However, these two variables are not recognized

Table 2: Studied variables in recovery based on total length of hospital stay (quantitative variables showed in mean (SD) and categorical variables showed in N (%))

	Classified	Recovered	Non Recovered	P	Logestic model OR (95% CI)	P
Demographic Variable						
Sex	Male	139 (9.59)	95 (3.91)	07.0	(501.9-728.0) 6.2	140.0
	Female	6 (1.4)	9 (7.8)			
Marital status	Married	142 (6.98)	104 (100)	Not valid		
	Not Married	2 (4.1)	0 (0)			
Insurrance Status	Insurance	137 (5.94)	96 (3.92)	277.0		
	Non Insurance	7 (8.4)	8 (7.7)			
Socioeconomic Status	Low	49 (8.33)	26 (25)	162.0	(471.3-878.0) 74.1	112.0
	Moderate	96 (2.66)	78 (75)			
Age	–	73.55 (75.7)	54.57 (046.9)	062.0	(051.1-973.0) 011.1	567.0
Psychologic Variable						
Depression	No Depression	0 (0)	1 (1)	fisher		
	Depressed	145 (100)	103 (99)			
Anxiety	No Anxiety	3 (1.2)	1 (1)	fisher		
	Anxiety	142 (9.79)	102 (99)			
Type D Personality	No Type D	48 (1.33)	33 (7.31)	410.0	(467.2-626.0) 24.1	534.0
	Type D	97 (9.66)	71 (3.68)			
Perceived Social Support	–	28.67 (05.14)	86.67 (42.12)	386.0	(023.1-975.0) 999.0	937.0
Illness Personal Control	–	00.21 (30.3)	56.18 (49.4)	002.0	(871.0-656.0) 755.0	000.0
Total Personal Control	–	20 (45.3)	11.19 (44.4)	000.0	(146.1-949.0) 043.1	385.0
Illness Perception	–	56.52 (12.11)	75.54 (09.11)	866.0	(039.1-981.0) 01.1	509.0

Table 3: Studied variables in recovery based on 6 minutes walking test (quantitative variables showed in mean (SD) and categorical variables showed in N (%))

	Classified	Recovered	Non Recovered	P	Logestic model OR (95% CI)	P
Demographic Variable						
Sex	Male	54 (4.96)	180 (3.93)	195.0		
	Female	2 (6.3)	13 (7.6)			
Marital status	Married	56 (100)	191 (9.98)	114.0		
	Not Married	0 (0)	2 (1)			
Insurrance Status	Insurance	51 (1.91)	182 (3.94)	081.0	(477.7-559.0) 045.2	280.0
	Non Insurance	4 (1.7)	11 (7.5)	012.0	(246.3-841.0) 653.1	145.0
Socioeconomic Status	Low	25 (6.44)	50 (9.25)	805.0	(991.0-908.0) 949.0	0170.0
	Moderate	31 (4.55)	143 (1.74)	fisher		
Age	–	85.58 (14.8)	77.55 (28.8)	225.0		
Psychologic Variable						
Depression	No Depression	1 (8.1)	0 (0)	fisher		
	Depressed	55 (2.98)	193 (100)	357.0		
Anxiety	No Anxiety	0 (0)	4 (1.2)	944.0	(690.1-351.0) 770.0	515.0
	Anxiety	56 (100)	188 (9.97)	070.0	(012.1-960.0) 986.0	292.0
Type D Personality	No Type D	18 (1.32)	63 (6.32)	023.0	(118.1-851.0) 976.0	721.0
	Type D	38 (9.67)	130 (4.67)	625.0	(205.1-985.0) 090.1	095.0
Perceived Social Support	–	3.67 (08.11)	5.67 (02.14)	548.0	(024.1-962.0) 992.0	629.0
Illness Personal Control	–	60.19 (60.3)	09.20 (13.4)			
Total Personal Control	–	07.19 (74.3)	7.19 (95.3)			
Illness Perception	–	07.55 (27.11)	01.53 (08.11)			

Table 4: Studied variables in recovery based on complication during hospitalization (quantitative variables showed in mean (SD) and categorical variables showed in N (%))

	Classified	Recovered	Non Recovered	P	Logestic model OR (95% CI)	P
Demographic Variable						
Sex	Male	225 (2.96)	5 (5.45)	001.0>	(030.93-459.1) 64.11	021.0
	Female	9 (8.3)	6 (5.54)	Not valid		
Marital status	Married	232 (1.99)	11 (100)	001.0>		
	Not Married	2 (9.0)	0 (0)			
Insurrance Status	Insurance	224 (7.95)	5 (5.45)	180.0		
	Non Insurance	9 (8.3)	6 (5.54)			
Socioeconomic Status	Low	74 (6.31)	1 (1.9)	591.0	(163.1-921.0) 035.1	563.0
	Moderate	160 (3.68)	10 (9.90)			
Age	–	42.56 (42.8)	15.56 (83.6)	fisher		
Psychologic Variable						
Depression	No Depression	1 (4.0)	0 (0)	955.0		
	Depressed	233 (6.99)	11 (100)	fisher		
Anxiety	No Anxiety	4 (7.1)	0 (0)	415.0	(339.8-164.0) 168.1	877.0
	Anxiety	229 (3.98)	11 (100)	153.0		
Type D Personality	No Type D	77 (9.32)	2 (2.18)	575.0	(114.1-963.0) 036.1	342.0
	Type D	157 (1.67)	9 (8.81)	268.0	(257.1-717.0) 950.0	718.0
Perceived Social Support	–	1.67 (39.13)	3.75 (37.11)	998.0	(351.1-875.0) 087.1	452.0
Illness Personal Control	–	06.20 (01.4)	45.20 (29.3)	036.0	(186.1-988.0) 083.1	089.0
Total Personal Control	–	6.19 (85.3)	4.21 (83.3)			
Illness Perception	–	07.53 (21.11)	62 (44.7)			

as predictor variables in logistic model. Among the psychological variables, for every one-unit increase in personal control overall score, there is 1.2 times nonrecovery [Table 7]. Among the demographic variables affecting recovery, age, gender, and insurance were more effective than socioeconomic and marital status.

The personal control over the disease and illness perception, respectively, had the greatest impact on recovery process among the psychological factors. On the other hand, the type D personality and perceived social support had no impact on recovery. Among the items studied for recovery, considering a significant frequency, the best items are complications during hospitalization,

Table 5: Studied variables in recovery based on injectable analgesis (quantitative variables showed in mean (SD) and categorical variables showed in N (%))

	Classified	Recovered	Non Recovered	P	Logestic model OR (95% CI)	P
Demographic Variable						
Sex	Male	227 (8.93)	7 (100)	497.0		
	Female	15 (2.6)	0 (0)			
Marital status	Married	240 (1.99)	7 (100)	Not valid		
	Not Married	2 (8.0)	0 (0)			
Insurance Status	Insurance	228 (2.94)	5 (4.71)	039.0	(298.1-025.0) 179.0	089.0
	Non Insurance	13 (4.5)	2 (6.28)			
Socioeconomic Status	Low	73 (2.30)	2 (6.28)	000.1		
	Moderate	169 (9.69)	5 (4.71)			
Age	–	46.56 (42.8)	71.56 (05.5)	094.0	(149.1-912.0) 023.1	694.0
Psychologic Variable						
Depression	No Depression	0 (0)	1 (3.14)	fisher		
	Depressed	242 (100)	6 (7.85)	023.0		
Anxiety	No Anxiety	4 (7.1)	0 (0)	fisher		
	Anxiety	237 (3.98)	7 (100)	891.0		
Type D Personality	No Type D	79 (6.32)	2 (6.28)	fisher	(721.5-136.0) 882.0	895.0
	Type D	163 (4.67)	5 (4.71)	589.0		
Perceived Social Support	–	48.67 (38.13)	71.68 (62.14)	716.0	(065.1-942.0) 002.1	955.0
Illness Personal Control	–	98.19 (03.4)	000.20 (65.3)	436.0	(335.1-648.0) 930.0	695.0
Total Personal Control	–	66.19 (91.3)	71.18 (07.4)	797.0	(161.1-707.0) 906.0	435.0
Illness Perception	–	39.53 (16.11)	42.56 (70.10)	660.0	(096.1-932.0) 011.1	794.0

Table 6: Studied variables in recovery based on oral analgesic (quantitative variables showed in mean (SD) and categorical variables showed in N (%))

	Classified	Recovered	Non Recovered	P	Logestic model OR (95% CI)	P
Demographic Variable						
Sex	Male	185 (4.96)	49 (86)	004.0	(934.7–548.0) 085.2	281.0
	Female	7 (6.3)	8 (14)			
Marital status	Married	190 (99)	57 (100)	751.0		
	Not Married	2 (1)	0 (0)			
Insurance Status	Insurance	185 (4.96)	48 (2.84)	002.0	(874.0–076.0) 257.00	030.0
	Non Insurance	6 (1.3)	9 (8.15)			
Socioeconomic Status	Low	58 (2.30)	17 (8.29)	000.1		
	Moderate	134 (8.69)	40 (2.70)			
Age	–	30.56 (04.8)	05.57 (30.9)	023.0	(067.1–982.0) 024.1	265.0
Psychologic Variable						
Depression	No Depression	1 (5.0)	0 (0)	fisher		
	Depressed	191 (5.99)	57 (100)	771.0		
Anxiety	No Anxiety	4 (1.2)	0 (0)	fisher		
	Anxiety	187 (9.97)	57 (100)	349.0		
Type D Personality	No Type D	63 (8.32)	18 (6.31)	861.0	(136.2–453.0) 984.0	967.0
	Type D	129 (2.67)	39 (4.68)			
Perceived Social Support	–	45.67 (25.13)	76.67 (63.13)	799.0	(025.1–974.0) 999.0	965.0
Illness Personal Control	–	78.19 (18.4)	66.20 (33.3)	010.0	(305.1–985.0) 134.1	080.0
Total Personal Control	–	19 (93.3)	50.20 (72.3)	367.0	(187.1–968.0) 072.1	180.0
Illness Perception	–	37.52 (23.11)	19.57 (02.10)	470.0	(083.1–014.1) 048.1	005.0

the use of oral analgesics, and 6MWT test in the second place [Table 8].

Discussion

This study aimed to determine the demographic and significant psychological variables to predict recovery status in the patients undergoing CABG surgery. To

achieve the goal of this study, the relationship of each of the demographic and psychological variables, with each of the items related to the recovery and total recovery with regard to all items, was separately evaluated. Based on logistic model, the demographic variables which could affect patient's recovery, such as age, gender, insurance, personal control over the disease, and illness perception, showed significant association with different

Table 7: The effect of demographic and psychological variables on recovery index based total recovery status considering all recovery items using logistic regression model

	Classified	Recovered	Non Recovered	P	Logistic model OR (95% CI)	P
Demographic Variable						
Sex	Male	20 (9.90)	209 (1.94)	54.0	-	
	Female	2 (1.9)	13 (9.5)		-	
Marital status	Married	22 (100)	220 (1.99)	015.0	-	
	Not Married	0 (0)	2 (9.0)		-	
Insurance Status	Insurance	19 (4.86)	209 (1.94)	005.0	97.1 (4.10-37.0)	42.0
	Non Insurance	2 (1.9)	13 (9.5)			
Socioeconomic Status	Low	10 (5.45)	65 (3.29)	25.0	-	
	Moderate	12 (5.54)	157 (8.70)		-	
Age	-	77.56 (82.6)	34.56 (53.8)	82.0	0.97 (0.92-1.03)	45.0
Psychologic Variable						
Depression	No Depression	0 (0)	1 (5.0)	91.0	-	
	Depressed	22 (100)	221 (5.99)		-	
Anxiety	No Anxiety	0 (0)	4 (8.1)	68.0	-	
	Anxiety	22 (100)	217 (2.98)		-	
Type D Personality	No Type D	5 (7.22)	74 (3.33)	31.0	0.0 (03.2-20.0)	45.0
	Type D	17 (3.77)	148 (7.66)			
Perceived Social Support	-	31.68 (29.10)	33.67 (67.13)	74.0	98.0 (02.1-.0.0)	36.0
Illness Personal Control	-	68.19 (41.2)	43.19 (67.2)	67.0	0.0 (06.1-73.0)	19.0
Total Personal Control	-	18.18 (14.4)	91.19 (78.3)	04.0	20.1 (39.1-04.1)	01.0
Illness Perception	-	22.52 (39.11)	58.53 (23.11)	59.0	01.1 (06.1-97.0)	42.0

Table 8: Studied significant variables and recovery based on recovery index

	ICU Stay	Total Hospital Stay	6 MWT	Complication	Analgesic (IV)	Analgesic (PO)
Demographic Variable						
Sex	-	-	-	001.0>	-	004.0
Marital status	-	-	-	-	-	-
Insurance status	-	-	-	001.0>	039.0	002.0
Socioeconomic Status	-	-	012.0	-	-	-
Age	-	-	017.0	-	-	023.0
Psychologic Variable						
Type D Personality	-	-	-	-	-	-
Perceived Social Support	007.0	000.0	023.0	-	-	010.0
Illness Personal Control	-	000.0	-	-	-	-
Total Personal Control	-	-	-	036.0	-	005.0

items of recovery. Moreover, it seems that these items could be used as predictors of recovery in patients after CABG surgery.

Almost all of the participants in this study had experienced anxiety and depression, because of the prevalence of these disorders in both groups of recovered and unrecovered patients; these variables were excluded from the logistic model. However, this matter could be seen as a significant finding that is consistent with Doering *et al.* (2005). They showed that depression is associated with a high rate of cardiac events and hospital readmissions after bypass surgery. Furthermore, delayed wound healing and infection are related to high rates of depression.^[25] These findings are consistent with Chocron *et al.* studies which concluded that antidepressant

treatment could result in rapid recovery of the patients after CABG surgery.^[33]

The length of stay in the ICU is one of those variables that along with total recovery of patients undergoing cardiac surgery has been examined in other studies and it is treated as an indicator of overall survival of these patients.^[42,43] Among the demographic variables, none of them had a significant correlation with duration of hospitalization in ICU. These results are different from the retrospective study by Hein *et al.*, which was conducted on 2563 cardiac patients in Berlin. They concluded that patients with over 69 years had been hospitalized in ICU more than the others (more than 3 days). While such findings were not observed in this study, for every unit increase in the participants' age, nonrecovery variable was not altered.

Among the variables studied in this study, the personal control over the disease is the only variable that has been accompanied with increases in recovery. However, this association was not significant in the logistic model. In a study by Fontes Novaes *et al.* (1999), the loss of personal control and lack of knowledge about the procedures have been among those variables which were associated with a longer stay in the ICU and severe stress in the cardiac ICU.^[44]

None of demographic variables were associated with duration of hospital stay, although women were hospitalized more than men, this difference was not statistically significant. In a study by Argulian *et al.*, women, particularly younger ones, experienced more complications following percutaneous coronary intervention (PCI), and therefore, their hospitalization was increased.^[45]

Among the psychological variables, the personal control over the disease and total control over the disease had a significant association with the recovery variable. In other words, the increase in total personal control and personal control over the disease has resulted in the reduction of hospital stay after CABG surgery. According to the study by Levine *et al.*, depression has been a decisive variable in determining length of hospital stay for heart patients,^[46] while the present study did not achieve such a result.

Although all the patients in this study had experienced depression, increase in personal control over the disease has been accompanied with reduction in the length of hospitalization and higher recovery rates in patients. These findings are consistent with finding systematic reviews of Duits *et al.* They concluded in their study that psychological variables have predictive effects on duration of hospital stay and quality of life in patients after CABG surgery. In addition, anxiety and depression before the surgery are associated with a decrease in compatibility and an increase in social support and control over condition, optimism, and better compatibility after the operation.^[47]

Type D personality was a common finding in patients under the study. It was repeated among the patients who had not recovered based on two indices, i.e., hospitalization on ICU and the total hospital stay. However, there was no significant relationship between these two variables and this personality type, and its existence did not predict the rate of the mentioned variables. The high prevalence of this personality types among patients under the current study, and findings by Martens *et al.* show that type D personality is a common finding in patients during the 18-month period after MI.^[48] Therefore, the results of the current study and the

study conducted by Martens *et al.*, once again, emphasize the need for interventions to prevent cardiovascular events, in patients with type D personality.

Among demographic factors, patients with moderate socioeconomic status walked a shorter distance during 6MWT as compared to those with lower socioeconomic status (higher nonrecovery). For every unit increase in age of the patients, there was 1.5% lower nonrecovery. This factor has had a protective effect. These results are consistent with the findings of the study by Kyprianou *et al.* (2010), who showed that there is no significant correlation between age and gender and the distance walked in 6 min. The researchers in the mentioned study conducted a test on ten adult men, to evaluate the diagnostic value of 6MWT as a functional capacity test. No variable of the demographic variables had a significant correlation with functional capacity and recovery index of the patients.^[49]

Among demographic factors, gender and insurance status were the predictor variables of complications during hospital admission and recovery. Women and individuals without insurance coverage experienced more complications and higher rates of nonrecovery. These findings are consistent with the findings of a study conducted by Aldea *et al.* (1999), which illustrated that women experienced immediate surgical intervention more than men and had longer hospital stays. Hence, gender has been a predictor variable for the duration of hospitalization, the use of arterial grafts, and the need for higher rates of cardiovascular revascularization.^[50]

Moreover, this study is consistent with Argulian *et al.*'s findings which indicated that among the patients who have received PCI, coronary artery injuries and complications related to bleeding were higher in women, particularly the younger women.

Of psychological factors, those who had greater illness perceptions significantly experienced more complications. This result is consistent with findings of Alsén *et al.*, which in their study on 204 patients suffering from MI, concluded that people who have a more negative perception of their disease, following an MI, experienced lower quality of life and more exhaustion.^[51]

Among demographic variables, age, gender, and insurance status were significantly associated with consumption of oral analgesics. Gender and age were two factors, which increased nonrecovery rate. Insurance coverage had a protective effect against nonrecovery based on consumption of oral analgesics. By searching various databases, no study has been found to achieve this result.

The results of the current study showed that among the different variables, which according to the assumption of the study could determine total recovery, three factors could be applied as the most crucial indicators in evaluating patient recovery after CABG surgery. These factors are complications during hospitalization, use of oral analgesics, and distance walked in 6 min. These results are consistent with findings of a study by Doering *et al.* (2005), in which the distance walked in 6 min and physical recovery (no infection and wound healing) has been recognized among crucial indicators of recovery in patients after CABG surgery.^[25]

The prevalence of depression and anxiety, among the participants of this study, was high and associated with variables related to long-term recovery in other studies.^[52] These findings alongside with some psychological factors such as personal control over the disease indicate that the psychological variables and assessments of patient's mood are important points that should be considered by cardiologists. In addition, the high frequency of type D personality among the participants of this study emphasizes the importance of psychological assessment before and after cardiac surgical interventions.

A researcher-made scale was used in this study to determine patients' recovery rate. However, Gaudino *et al.* used Karnofsky Performance Scale to evaluate the dependency of patients in performing daily activities after bypass surgery. They concluded that only a quarter of patients were independent and were able to resume their normal lifestyle after leaving the ICU^[43]. In the present study, the large number of people who based on the researcher-made scale were viewed as not recovered could indicate that different variables including psychological and social support variables can affect patient recovery, which is usually not considered during medical interventions as well as in the follow-up visits.

Therefore, it is suggested that in designing guidelines, which address interventions for heart patients, evaluating psychological variables and relevant interventions should be considered in stages before deciding for any intervention by cardiologists.

The study had limitations including the fact that despite considering two items of repeated visits and readmissions up to 4 weeks after discharge, in the self-made scale as indicators of recovery, due to the small number of patients in follow-up visits, the researchers had less access to the patients than desired. One reason for this matter could be that at the time of discharge, the patients had been trained that only physical symptoms should be considered as signs for admission or readmission. Consequently, the patients who had

more illness perception perceived themselves as sick and considered mood, physical, and functional symptoms as a natural consequence of their disease and they were desensitized to them. Subsequently, they did not visit a medical center or a researcher. Therefore, the findings related to them are not available.

Conclusion

The results of this study indicated the high prevalence of depression and anxiety among patients after CABG surgery. The relationship between these two psychological variables and variables associated with long-term recovery in other studies, and the connection of some psychological factors such as personal control over the disease, could emphasize the importance of considering psychological variables and mood assessments in the design of guidelines related to interventions for patients undergoing cardiac surgery. Moreover, designing interventions that could increase personal control over the disease along with training measured defense mechanisms would be beneficial in short- and long-term recovery of patients.

We believe that the findings of this study could be useful for health care and service providers who work with patients undergoing CABG surgery. In addition, this study could be used to design and develop future studies in this area.

Although an educational method for increasing patients control over their condition was not presented in this study and we cannot generalize the findings, it could be assumed that the designing interventions in this field for patients with heart disease can be useful in increasing the rate of their recovery.

Acknowledgments

The researchers wish to extend their gratitude toward the respected personnel of the cardiac surgery ward of Chamran and Sina Hospitals. They also would like to thank all the patients participating in the study. In addition, the researchers are grateful to the research deputy of Isfahan University of Medical Sciences for collaborating in the adoption and implementation of this study.

Financial support and sponsorship

This article is a part of MD Cardiology thesis and has been approved by Behavioural Sciences Research Centre, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran (Code: 393471). The financial support provided by the university is highly appreciated.

Conflicts of interest

There are no conflicts of interest.

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