Barriers for the Referral to Outpatient Cardiac Rehabilitation: A Predictive Model Including Actual and Perceived Risk Factors and Perceived Control

Abstract

Objective: To assess the roles of demographic factors, actual and perceived risk factors, and perceived control in the referral to cardiac rehabilitation (CR) after coronary artery bypass graft (CABG). **Methods:** In this cross-sectional study, data related to 312 CABG patients in a hospital of the Western part of Iran, gathered through demographics and actual risk factors' checklist, open single item of perceived heart risk factors, life stressful events scale, and perceived control questionnaire. Data analyzed by binary logistic regression. **Results:** The results showed that only 8.3% of CABG patients refer to CR. The facilitators of this referral included official employment ($P < 0.05$), coronary history ($P = 0.016$), and hyperlipidemia ($P = 0.030$) but more distance to the CR center ($P = 0.042$) and perceived physiological risk factor ($P = 0.025$) are concerned as the barriers for the referral to CR. **Conclusion:** Providing appropriate awareness about the benefits of CR for patients with regard to their job status, coronary history, and perception about the illness risk factors can be effective in referral to CR. In addition, the presence of CR centers in towns and facilitated achievement to these centers can play a significant role in patients' participation.

Keywords: *Cardiovascular diseases, referral, rehabilitation, risk factors, surgery*

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Introduction

Despite nowadays cardiovascular diseases (CVDs) concerned as the main factor of mortality among the USA and industrial countries and approximately one-third of adults die because of CVDs, the development of cardiac rehabilitation (CR) has not been noticeable compared to the developments in treatment and cardiac intensive care programs in the recent decades.[1] The CR is one of the most important interventions which recommended after a cardiac event or surgery for reduction of complications. It includes activities such as comprehensive medical evaluation, exercise, training, and modification of the risk factors.[2] CR can reduce the cardiac mortality rate about 25% with goals focused on exercise, lipid and hypertension control, and quit smoking.[3,4]

Despite to efficacy and advantages of CR program, the result of different studies reported the referral rate to CR after a cardiac event as 36.2%–64%.[5-8] In Iran, only 15% of patients refer to CR.[9] Hence, it is clear that there are barriers and problems to beginning CR. Different studies suggested problems such as gender, higher age, low level of education, job, poor socioeconomic status, poor family support, distance and cost, comorbidities, cardiac history, risk factors such as hyperlipidemia, hypertension, body mass index, and smoking.[5,6,8-11]

Although clinical and demographic variables are the progressive factors that probably affect the participation behavior in CR, it seems that behaviors affected by thoughts, beliefs, and attitudes.[12] It is clear that patients; cognitions are superior to their behaviors, and naturally, any type of behavior derivates from patients' thoughts and attitudes. Patients' attitudes about risk factors are effective in increasing anxiety and depression,[13] poor physical function,[14] and health-related behaviors.[15] Based on a report,[16] patients' knowledge and perception of symptoms in all stages of the disease, finding a cause for symptoms and change of individual behaviors, have an important role in the progression of disease. The patients' etiological attitudes included 5 categories of biological, environmental, physiological, behavioral, and psychological perceived risk factors[17] directly affect on patients' health behavior. Despite this issue, in the past studies,

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patients' beliefs and attitudes as prior behavior have been less concerned in the field of referral to CR. Thus, regarding the necessity of patients' participation in CR to benefit from its advantages, it is necessary that the role of other psychological barriers identified. Hence, the study aimed to assess the role of demographic factors, actual and perceived risk factors, and perceived control in coronary artery bypass graft (CABG) patients' referral to CR.

Methods

Design and context

In this cross-sectional study, patients (June–September 2015) after CABG and before discharge admitted to CR Center of Imam Ali Hospital of Kermanshah city (Iran). In this phase, the aim of invitation is to make patients' knowledge about CR and provide adequate motivation to the following treatment. The members of CR team explain the process and benefits of this program, and they provide a time schedule for patients in the introduction session. Furthermore, patients fulfilled the questionnaires and their demographics and actual risk factors registered by the CR team.

Inclusion and exclusion criteria

Inclusion criteria included (1) 30–80 year age, (2) appropriate perception and emotional-physical abilities, and (3) lack of physical limitation for participation in an exercise program. Exclusion criteria included (1) fatigue and lack of tendency for participation, (2) defects in questionnaires, and (3) nonperfect medical records.

Participants

Among 357 CABG patients who admitted to the department of cardiac surgery (during June–September 2015), 312 patients had inclusion criteria participated in this research. According to the formula ($N > 50 + 8$ m), the sample size is appropriate.[18]

Data collection

According to the routine program, the CR team presented in men and women surgery wards of the hospital, and they informed patients daily about the date of CR program before discharge. At first, this team carried a short interview with patients for control of inclusion criteria. The written consent form, demographics, actual and perceived risk factors were registered. Furthermore, the psychologist reads the questions of inventories and registered answers for patients with age of higher than 50 years and illiterate patients. In addition, the team referred to the medical records to gain more accuracy. In the later phase, approximately 2 months after initial assessment (1 month after presented schedule for exercise), the list of all participants obtained from the CR statistics unit. Hence, the patients were coded in two groups (without refer = 1, referred = 2).

Instruments

Sociodemographics and actual risk factors checklist

This checklist fulfilled through cardiologist's interview with each patient, and it includes information about sociodemographic variables (age, gender, education level, job, medical insurance, and distance to CR) and actual risk factors (diabetes, hypertension, hyperlipidemia, body mass index, smoking, opiates, drinking, coronary, and family history).[1] Body mass index was measured by the CR nutritionist.

Perceived risk factors

According to the new category in Iran[19-21] about the perceived risk factors for CVDs,[2] we applied open single item that the "Which item you know as the main factor for your disease?" Based on the mentioned method, the responses were divided into five categories including biological (gender, age, and genetic), environmental (smoke and toxic substances, polluted weather, and passive smoking), physiological (hypertension, diabetes, hyperlipidemia, and obesity), behavioral (malnutrition, smoking and substance abuse, and lack of exercise), and psychological (stress, anxiety, depression, anger, and hostility) risk factors.[13,17,19-22]

Perceived control questionnaire

The scale of control attitudes that designed by Moser and Dracup evaluates the control on disease among cardiac patients through four questions which two of them related to personal control and other two questions related to familial control. These items are scored based on the Likert system from zero (absence of control) to seven (complete control). In addition, the scoring of two items is indirectly. A higher score indicates more personal and familial control on cardiac disease.[23]

Holmes and Rahe scale of life events stress

This questionnaire was made in 1963 for the evaluation of 41 stressful events. Based on this scale, the life changes in the past 6–12 months were evaluated and the total score obtains through the sum of the scores. The total score in a range of 150–200 means that the probability of disease in the future year estimated as 37% while this probability increases to 50% or 80% in scores in the ranges of 200–300 or higher than 300.[24] The Iranian version validity and reliability of this scale reported acceptable.[25]

Analysis

For assessment of effective variables in referring to CR, data analyzed through Chi-square, *t*-test, and binary logistic regression analysis. At baseline, Chi-square and independent *t*-test were used for comparison between notcontinuous and continuous variables, respectively. In main analysis, binary logistic regression analysis was used for identification of barriers to lack of referral to the CR.

All variables together entered into the analysis. SPSS ver. 20.0 for Windows (IBM SPSS, Armonk, NY, USA) software was used for analysis and $P < 0.05$ concerned as the significance level. Before analysis, the lack of overruns from assumptions was assessed and approved.[18]

Results

Among the total of 312 patients (male: 63.8%) who entered to analysis, 26 persons (8.3%) referred to CR. The barriers related to the referral to CR were presented in Table 1. According to the results, hyperlipidemia is a facilitator for participating in the program ($P = 0.049$). Although, the higher level of stress is one of the barriers for the referral to CR ($P = 0.048$).

About the regression model, Hosmer–Lemeshow test indicated that this model is acceptable ($P = 0.307$). The indexes of power effect size have an appropriate explanative ability in patients referrals (Cox and Snell $R^2 = 0.183$; Nagelkerke $R^2 = 0.419$), so it is suggested that our model can explain 18.3%–41.9% of the variance of referral to CR. Table 2 includes the portion of modified chance (confidence interval: 95%) and significance level for each covariate in the model. Table 2 indicates the predictor role of variables after control of demographics in the lack of referral to CR. According to the results, occupation, distance to CR, coronary history, hyperlipidemia, and physiologically perceived risk factor can predict the referral to CR. It means that there is a fewer probability that patients with a personal job ($P = 0.001$), emeriti ($P = 0.020$), or jobless patients ($P = 0.006$) refer to CR compared to the employees. Coronary history ($P = 0.016$) and hyperlipidemia ($P = 0.030$) are concerned as the facilitating factors in referral to CR. Finally, longer distance to CR ($P = 0.042$) and physiological perceived risk factors ($P = 0.025$) are barriers of referral to CR.

Discussion

The study aimed to assess the role of demographic factors, actual and perceived risk factors, and perceived control in CABG patients' referral to CR. In confirmation of the results of a study in Iran which suggested the rate of referral to CR lower than 15%,[9] the results of our study indicated that only 8.3% of CABG patients refer to CR. Whereas the numerous studies[2,13,26] have referred the importance of CR, they have mentioned that most health benefits of CR are related to the patients' commitment and participation for at least 12 weeks.[1] In this regard, nearly 80% of Iranian cardiologists suggested that the main cause of this problem is the lack of awareness about the benefits of CR. Furthermore, physicians noted that factors such as the lack of medical insurance, high costs, and the lack of access to CR.[9]

Based on the results, employment, coronary history, and hyperlipidemia are concerned as the facilitating factors in referral to CR. While longer distance and physiologically perceived risk factors are barriers of referral to CR. Sanderson *et al*.[27] suggested that the nonmedical problems are the causes for lack of referrals among 63% who did not refer, and one of the major problems is patients' occupational status. The employees generally have a higher educational level and health literacy. Based on the theory of accumulative advantage in the health field, more educated people have more health sources (such as more ability to avoidance of chronic stressors and healthier lifestyle) that each of sources is advantageous, and they accumulatively have positive effects on person's health.[28] Among the positive effects, more cooperation in treatment, appropriate physical function, higher quality of life, more control of cardiac signs, and active and continuous participation in sessions of CR can be mentioned.[1]

Regarding the role of coronary history in referral to CR, it may be suggested that uncontrollability aspect of biologic and hereditary nature of disease among patients with coronary artery diseases lead to these patients believe that they are more at risk for future cardiac events[29] and they have higher perceived risk.[30] This may also be true about patients with hyperlipidemia. However, some studies suggest that hyperlipidemia is a barrier for the referral to CR;[5,6] it seems that patients with hyperlipidemia and coronary disease have more perceived risk compared to other patients, and it is more probability that these patients predict the cardiac event. Hence, they try to control these high-risk conditions through referral to the CR. The results of a study introduced hyperlipidemia as one of the facilitating factors in referral to CR.[31]

Concordant to some studies,[8,32] we found that longer distance to CR center is one of the main barriers of referral. Patients who live in villages and faraway regions usually confront with transporting problems, and their traffic requires significant time and cost so that in some cases, the time and cost of traffic are more than the time and cost expense in the registration of CR. In addition, the routine exercise begins at 8:30 AM and long distance can convince patients that it is not possible for on time presence in CR.

Finally, it is indicated that the physiologically perceived risk factor is one of the barriers for the referral to CR. According to health beliefs model, the patient's attitudes[33] and their cognitive and emotional reactions to disease and treatment[34] can predict health behaviors independently. It seems that patients, who believe that one physiological risk factor such as diabetes or hypertension as the cause of their disease, do not worry about possible consequences of these risk factors because they relate their cardiac disease to these risk factors[19] and perception of controlling them by medication, diet, and appropriate exercise after CABG.[35] These patients have a sense of control on the main cause

Table 1: Baseline data in the overall population and in those referral and nonreferral to cardiac rehabilitation

Characteristic	Overall population (n=312)	Referral to CR (n=26; 8.3%)	Nonreferral to CR (n=286; 91.7%)	$P^{a,b}$
Sociodemographics				
Age (year)	61.3±10.8	61.5±9.2	61.3±11.0	0.935
Sex, male (%)	63.8	73.1	62.9	0.303
Education degree (%)				
Illiterate	50.6	42.3	51.4	0.433
Less than diploma	30.4	34.6	30.1	
Diploma	10.9	7.7	11.2	
Academic	8.1	15.4	7.3	
Occupation (%)				0.058
Employee	6.7	19.2	5.6	
Self-employee	34.0	26.9	34.6	
Housekeeper	34.6	26.9	35.3	
Retired	16.0	23.1	15.4	
Unemployed	8.7	3.9	9.1	
Insurance (%)	93.9	100	93.3	0.175
Distance to CR (km)	80.3±86.8	50.0±55.0	83.1±88.7	0.063
Actual risk factors				
BMI	26.7±3.9	25.7±3.8	26.7±3.9	0.205
Stress	158.7±111.5	117.3±82.2	162.5±113.1	0.048*
Coronary history (%)	51.3	69.2	49.6	0.056
MI history (%)	28.5	30.8	28.3	0.791
Family history (%)	39.7	42.3	39.5	0.780
Hypertension (%)	54.2	61.5	53.5	0.431
Diabetes (%)	32.4	34.6	32.2	0.798
Hyperlipidemia (%)	32.7	50.0	31.1	0.049*
Smoking (%)				
No	68.6	69.2	68.5	0.907
Cessation	17.3	19.2	17.1	
Active	14.1	11.6	14.3	
Drug abuse (%)				
No	86.5	88.5	86.4	0.908
Cessation	5.8	3.8	5.9	
Active	7.7	7.7	7.7	
Drinking (%)				
No	90.4	92.4	90.2	0.665
Cessation	7.4	3.8	7.7	
Active	2.2	3.8	2.1	
Perceived risk factors (%)				
Unknown	13.5	26.9	12.2	0.213
Biological factor	4.2	7.7	3.8	
Environmental factor	2.2	0.0	2.4	
Physiological factor	16.7	7.7	17.5	
Behavioral factor	29.5	30.8	29.4	
Psychological factor	33.9	26.9	34.6	
Perceived control				
Personal control	7.47±2.56	8.07±2.68	7.42±2.55	0.208
Familial control	7.54±3.51	7.85±2.54	7.51±3.59	0.645

Significant difference between patients completed and not completed CR for each characteristic *P<0.05. [a]Chi-square test performed for nominal and categorical variables, [b]t-test performed for continuous variables. BMI: Body mass index, CR: Cardiac rehabilitation, MI: Myocardial infarction

of their disease, so this sense decreases the worry. Michie *et al*.[36] suggested the concept of sense of mastery on health consequences, and the increase of this sense on cardiac conditions can decrease the worry. Lack of worry about negative future outcomes and self-efficacy[11] can confront referral to CR with the challenge.

Table 2: Predictors of referral to cardiac rehabilitation in the overall population

Characteristic	Referral to CR (%)	Adjusted OR	$P^{a,b}$
Sociodemographics			
Age (year)	-	1.00 (0.94-1.07)	0.980
Sex, male (%)	9.5	7.06 (0.05-959.98)	0.436
Education degree (%)			
Illiterate	7.0	Referent	
Less than diploma	9.5	2.35 (0.21-25.92)	0.485
Diploma	5.9	0.00 (0.00-na)	0.980
Academic	16.0	0.04 (0.00-2.19)	0.113
Occupation (%)			
Employee	23.8	Referent	
Self-employee	6.6	0.01 (0.00-0.11)	0.001*
Housekeeper	6.5	0.01 (0.00-4.47)	0.148
Retired	12.0	0.01 (0.00-0.47)	0.020*
Unemployed	3.7	0.01 (0.00-0.17)	0.006*
Insurance (%)	8.9	4.07 (0.00-na)	0.998
Distance to CR (km)	-	0.99 (0.98-1.00)	0.042*
Actual risk factors			
BMI	-	0.87 (0.74-1.03)	0.109
Stress	-	1.00 (0.99-1.01)	0.265
Coronary history (%)	11.3	5.22 (1.37-19.96)	0.016*
MI history (%)	9.0	1.42 (0.40-5.05)	0.587
Family history (%)	8.9	0.53 (0.17-1.64)	0.271
Hypertension (%)	9.5	2.51 (0.66-9.61)	0.177
Diabetes (%)	8.9	0.59 (0.16-2.16)	0.428
Hyperlipidemia (%)	12.7	3.79 (1.13-12.67)	0.030*
Smoking (%)			
No	8.4	Referent	
Cessation	9.3	1.65 (0.29-9.33)	0.571
Active	6.8	0.30 (0.04-2.44)	0.258
Drug abuse (%)			
No	8.5	Referent	
Cessation	5.6	0.87 (0.07-11.63)	0.918
Active	8.3	0.83 (0.10-6.79)	0.862
Drinking (%)			
No	8.5	Referent	
Cessation	4.3	0.17 (0.01-4.60)	0.292
Active	14.3	7.61 (0.38-151.5)	0.184
Perceived risk factors (%)			
Unknown	16.7	Referent	
Biological factor	15.4	2.28 (0.19-27.60)	0.518
Environmental factor	0.0	0.00 (0.00-na)	0.999
Physiological factor	3.8	0.07 (0.01-0.71)	0.025*
Behavioral factor	8.7	0.38 (0.07-2.02)	0.258
Psychological factor	6.6	0.35 (0.08-1.62)	0.179
Perceived control			
Personal control	-	1.06 (0.82-1.39)	0.673
Familial control	-	0.94 (0.73-1.20)	0.616

The sociodemographic and clinical characteristics listed in this table were all included as covariates in the generation of the binary logistic regression model. Statistically significant odds ratio for each characteristic *P<0.05. BMI: Body mass index, CR: Cardiac rehabilitation, OR: Odds ratio, MI: Myocardial infarction

Conclusion

According to Iranian physicians' research which suggested the rate of referral to CR lower than 15%, the results of the present study indicated that only 8.3% of CABG patients refer to CR. Based on the results, employment, coronary history, and hyperlipidemia are concerned as the facilitating factors for a referral, but the longer distance to CR and perceived physiological risk factor are the barriers for the referral to CR. Providing appropriate awareness, about the benefits of CR for patients with regard to their job status, coronary history, and perception about the illness risk factors can be effective in referral to CR. In addition, the launch of CR centers in cities and facilitate access to CR can play a significant role in increasing patients participation.

Conflicts of interest

There are no conflicts of interest.

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