Original Paper

Patients' Cognitive Status and Its Related Factors Before Coronary Artery Bypasses Grafting

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Citation Balaafkandeh AR, Paryad E, Ghanbari khanghah A, Kazemnezhad Leili E. Patients' Cognitive Status and Its Related Factors Before Coronary Artery Bypasses Grafting. J Holist Nurs Midwifery. 2019; 29(4):184-191. https://doi.org/10.32598/JHNM.29.4.184

Running Title Patients' Cognitive Status Before Coronary Artery Bypasses Grafting

https://doi.org/10.32598/JHNM.29.4.184

Article info:
Received: 22/07/2019
Accepted: 15/08/2019
Available Online: 01/10/2019

Keywords:
Coronary artery disease, Coronary artery bypass graft surgery, Cognitive impairment

ABSTRACT

Introduction: Cognitive status of patients before Coronary Artery Bypass Grafting (CABG) affects their activities of daily living. Evaluation of cognition status and its related factors can help caregivers to plan suitable care programs.

Objective: This study aimed to evaluate the patient's cognition status and its related factors before CABG.

Materials and Methods: This cross-sectional study was done in 2016 on 139 patients before CABG who were selected by convenience sampling method. The study data were collected by Cognition Failure Questionnaire (CFQ), Hospital Anxiety and Depression Scale (HADS), and a sociodemographic questionnaire. CFQ scores range from 0-100, and higher score shows the weaker status of cognition. The obtained data were analyzed by descriptive and inferential statistics of the Man-Whitney U test, the Chi-squared test, and logistic regression.

Results: The Mean±SD score of cognitive status of the samples was 12.92±12.73. The findings showed significant relationship between cognitive status and age (P=0.002) and anxiety (P<0.05). The results of logistic regression showed that age (P=0.020, OR =1.070, 95%CI=1.011-1.133), moderate anxiety (P=0.007, OR =6.067, 95%CI=1.62-22.60), and case of anxiety (P=0.001, OR=14.331, 95%CI=2.82-72.72) are the patients' cognitive status predictors before CABG.

Conclusion: Based on the findings, age and preoperative anxiety are related to the cognitive status before CABG. These variables should be emphasized in preoperative nursing care in cardiac surgery wards.

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Highlights

- Coronary artery disease is one of the most common non-communicable diseases in the world.
- An ineffective circulatory system increases the likelihood of impaired cerebral blood supply.
- Patients undergoing coronary artery bypass graft surgery may have some degree of cognitive impairment.
- According to the results of this study, age was the most critical factor related to cognitive impairment in patients with coronary artery disease who were candidates for coronary artery bypass grafting.

Plain Language Summary

Coronary artery disease is one of the most common diseases in the world. When the ability of the heart to supply blood to the body's tissues decreases due to coronary artery disease, blood flow to the brain also reduces. These conditions may affect the patient's brain function and hence, his or her cognitive ability. In this study, we attempted to identify the cognitive status of patients with coronary artery disease who were admitted for coronary artery bypass graft surgery. Given that many of these patients have other underlying conditions besides heart disease, each of these diseases may affect the occurrence of cognitive impairment. For this reason, this study intends to identify factors related to the patient's current cognitive status in addition to determining their cognitive status. According to the results of this study, age and then the anxiety were the most critical factors related to cognitive status of these patients. According to this study results, more attention to elderly and anxious patients can help bring more successful treatment in these patients.

Introduction

Lifestyle changes and risky behaviors have led to the spread of Coronary Artery Diseases (CADs) all over the world. CAD results in people's disability and incurs substantial health costs. The World Health Organization (WHO) reported CAD as the leading cause of death in the world, and (82%) of death related to CAD occurs in developing countries [1]. Due to increasing CAD rate, the number of Coronary Artery Bypass Grafting (CABG) has increased too. In the USA, 353000 CABGs are operated annually [2]. In Iran, (60%) of all open-heart surgeries are CABG [3]. Many patients admitted to the surgical ward, show cognitive impairment in the preoperative period [4].

Vascular diseases can destroy vessel walls that lead to cerebral perfusion impairment [5, 6]. CAD history may be a marker for clinically significant atherosclerosis, which also affects the brain. Findings of Zheng et al. study demonstrated some associations between CAD with verbal memory and global cognition status [7]. Many patients have underlying diseases such as diabetes that can destroy microvessel walls that decrease the perfusion of the brain in these patients [8, 9]. Diabetes and other vascular diseases can affect brain nutrition too that may lead to cognitive impairment [10].

Operation schedule and severity of the disease can create stress and tension for the patients, and admission to the surgery ward for CABG can also be added to the patients' stress [11]. The patient's anxiety may also increase cognitive deterioration [12-15]. CABG is a complex procedure and needs careful attention before the operation [16, 17]. This situation can affect patients' stress and anxiety that may lead to cognitive impairment. Preoperative cognitive impairment is a well-established predisposing factor for delirium after heart surgery, which is of particular concern because its prognosis will be greater mortality, higher readmission rate, postoperative complications, and overall functional decline [18].

Preoperative cognitive impairment may further predispose patients to reduced long-term behavioral, functional capacity, and outcomes by reducing the patient's ability to concentrate or to pay attention, which, in turn, may result in patient's psychological distress and complaints [19]. Many factors can change the cognitive status of patients before CABG. This procedure is a crisis for patients, and their abilities may diminish related to this crisis [20, 21]. Results of Kuzma et al. study show the haz-

ard ratio for all-cause dementia was 1.93(95%CI=1.36-2.74) for those with CABG history compared with those with no CABG history after adjustment for potential confounders [22]. These findings show the importance of cognitive status before CABG.

It is noticeable that many studies report that patients' cognitive disorder is an important issue related to the cardiopulmonary bypass pump that uses in open-heart surgery and only cognitive status before surgery cannot predict [23-24]. This controversy is one of the reasons to study the cognitive status and its related factors before CABG. Patients with impaired preoperative cognitive status may have a longer postoperative length of stay and require additional care upon discharge [25]. Detection of the most critical factors related to cognitive impairment before CABG can help nurses to plan a suitable program for these patients' preoperative and postoperative care. This study aimed to evaluate patients' cognitive status and its related factors before CABG.

Materials and Methods

This study had a cross-sectional design. The samples were selected by convenience sampling method form the patients admitted for elective CABG in the surgery ward of a hospital affiliated to Guilan University of Medical Sciences. The sampling was done in four months (from June to September 2016). The inclusion criteria were lack of neurovascular disorder, psychiatric disorder, or musculoskeletal disorder; no history of using psychiatric drugs; scheduled only for CABG and no another current surgery; and providing a consent form. The sample size was calculated based on the finding of Lapiar study (The relationship between quality of life and the Duke Activity Index, r=0.69 and the relationship between quality of life and recognition memory test, r=0.41) with (25%) attrition rate. Based on these criteria, 139 samples were calculated for this study [27].

The study data were collected by a questionnaire consisting of four parts. The first part was about patients' sociodemographic variables (age, sex, marital status, educational status, job, living status, BMI, and history of smoking). In the second part, the questions were about Ejection Fraction (EF) of the left ventricle, carotid stenosis, history of hypertension, hyperlipidemia, and diabetics. The third part was the Hospital Anxiety and Depression Scale (HADS) with 14 items. Answers to these items were rated based on a four-point Likert-type scale from 0-3. The range of anxiety and depression score was from 0-21. Achieving 11-21 score indicates an abnormal case of anxiety or depression. The scores from 8-10 indicate the borderline case, and the score from 0 to 7 means no anxiety and depression. HADS psychometric study was done in Iran in 2009 [28]. The fourth part of the questionnaire was Cognitive Failure Questionnaire (CFQ). CFQ has 25 questions answering score from 0 (never) to four (occasionally). Thus the range of score is from 0-100, and achieving a higher score shows more cognitive failure.

CFQ has been used in many studies, but the psychometric study was not done for it in Iran [29-32]. Thus in the first step, it was translated forward and backward by two English language experts. After that, the translated tool was assessed by the researchers. The questionnaire was read to many patients who were admitted in the cardiac surgery ward to evaluate its feasibility. Then it was offered to 11 faculty members and nurses who were expert in the care of the patients after surgery, especially in cardiac surgery to confirm items after forward and backward translating. CVR score for CFQ was (83%), and CVI was (97.2%). A pilot study was done on 20 patients who were elected for CABG to detect internal consistency of CFQ to calculate the Cronbach alpha coefficient of CFQ that was found as 0.9.

The obtained data were analyzed by descriptive and inferential statistics (Man-Whitney, Chi-squared, logistic regression backward method) in SPSS V. 16. The significance level was set at less than 0.05. The Kolmogorov-Smirnov test evaluated the normality of data distribution.

Results

The study results showed that the majority of subjects were male (61.9%), married (97.7%), below 65 years old (77%), with primary education level (33.8%), housewife (35.5%), without carotid artery stenosis (73.4%), living with spouse and children (66.2%), with BMI within normal range (38.1%) and without cigarette smoking history (60.4%). The Mean±SD age of the samples was 59.84±8.45 year (Table 1). The mean score of the cognitive status failure was 12.92±12.73. The range of CFQ score was 0-100, and a higher score showed the weaker status of cognition. Based on the findings, the relationship between the cognitive condition and sociodemographic factors were not significant.

Table 2 presents the distribution of HADS scores of the samples. Findings of Table 2 shows that the Mean±SD score of hospital anxiety was 1.28±0.62, and the Mean±SD score of hospital depression was 1.20±0.53. The findings indicate (10.1%) of the samples had mild anxiety, (9.4%) moderate anxiety, and others without hospital anxiety. Based on other findings, (9.4%) of the

Table 1. Distribution of the patients' sociodemographic characteristics and mean of cognitive status

Variables	Mean Score Cognitive Status	N (%)		Sig.
		≤ Mean	> Mean	
Age(y)	≤65	66(62)	41(38)	0.238**
	>65	16(50)	16(50)	
Marital status	Single	1(100)	0(0)	0.403*
	Married	81(59)	57(41)	
Job	Free	19(68)	9(32)	0.431*
	Working	2(67)	1(23)	
	Housewife	24(48)	26(52)	
	Farmer	14(61)	9(49)	
	Retired	15(66)	6(34)	
	Other	8(57)	6(43)	
Level of education	Illiterate	24(52)	22(48)	0.815*
	Primary education	29(62)	18(38)	
	High school diploma	11(61)	7(39)	
	Diploma	17(66)	9(34)	
	Academic	1(50)	1(50)	
Sex	Male	56(65)	30(35)	0.062*
	Female	26(49)	27(21)	
Carotid artery stenosis	Yes	22(60)	15(40)	0.946*
	No	60(59)	42(41)	
BMI	Thin	2(100)	0(0)	0.402*
	Normal	29(55)	24(45)	
	Overweight	33(83)	17(17)	
	Obesity I	12(48)	13(52)	
	Obesity II	4(58)	3(42)	
Living condition	Single	4(50)	4(50)	0.439*
	With spouse	22(67)	11(34)	
	With children	2(34)	4(66)	
	With his/her wife and children	54(59)	38(41)	
Smoking	Non-smoking	48(57.1)	36(42.9)	0.709*
	Light smokers	25(59.5)	17(40.5)	
	Heavy smokers	9(69.2)	4(30.8)	

*Chi-square test; **Mann-Whitney test

Table 2. Distribution of Hospital Anxiety and Depression Score of the patients

Mean Score Cognitive Status / Variable		N (%)		Sig.*
		≤ Mean	> Mean	
Hospital anxiety	Normal	76(68)	36(32)	0.0001
	Borderline case	4(40)	10(60)	
	Abnormal (case)	2(15.4)	11(84.6)	
Hospital depression	Normal	74(63)	44(37)	0.068
	Borderline case	6(46)	7(54)	
	Abnormal (case)	2(25)	6(75)	

*Chi-square test

Table 3. Factors associated with the cognitive state of the patients before coronary artery bypass graft surgery

Variables	B	S.E.	Wald	df	Sig.	Exp(β)	95%CI for Exp(β)	
							Lower	Upper
Age	0.068	0.029	5.406	1	0.020	1.070	1.011	1.133
Anxiety	-	-	15.992	2	0.0001	-	-	-
Borderline anxiety	1.803	0.671	7.219	1	0.007	6.067	1.629	22.601
Case of anxiety	2.662	0.829	10.321	1	0.001	14.331	2.824	72.725

samples had mild depression, and (5.8%) had moderate depression before CABG. The Chi-squared test showed that the relationship between cognitive status and pre-operative anxiety was significant (P=0.0001).

The relationship between cognitive status and depression was not significant. Table 3 presents the findings of the regression model. Logistic regression by backward method showed that age (P=0.020, OR=1.070; 95%CI=1.011-1.133), moderate anxiety (P=0.007, OR=6.067, 95%CI=1.62-22.60) and case of anxiety (P=0.001, OR=14.331, 95%CI=2.82-72.72) are the patient's cognitive status predictors before CABG. The Hosmer-Lemeshow test showed the goodness of fit of the logistic regression model (P>0.05).

Discussion

The primary objective of this study was to detect the essential factors related to cognitive status of patients before CABG.

The results showed that the majority of patients did not have severe cognitive failure before CABG. This finding is similar to findings of Tully et al. and Fontes et al. [14, 33]. But Ampadu and Morley based on Trojano et al. results reported that cognitive impairment was seen in (57.9%) of the New York Heart Association (NYHA) classes III-IV group and (43%) of the NYHA class II group of patients with heart failure [34]. If we accept CAD as a chronic status of the heart and when a patient is scheduled for CABG, he or she is surely in classes III-IV, we expect that about half of our subjects would have cognitive failure before surgery. It should be noted that this prevalence in Ampadu and Morley study is related to elderly patients while the Mean±SD age of our study participants was 59.84±8.45 years [34]. This difference in findings may be related to the age difference in various studies. In our study, the logistic regression model showed that age was a related factor to cognitive failure before CABG.

The majority of our subjects were in the middle age range, and this finding of lack of severe cognitive failure may be related to this predictor factor. The results of a study show that age is an essential factor related to cognitive impairment before surgery. CAD is a progressive disease as age increases. Aging is usually accompanied by decreasing brain blood flow that it can cause cognitive impairment [35].

CABG is accompanied by severe stress for patients. Besides, many patients with cardiovascular diseases suffer from different degrees of blood supply deficiency in the nervous system. Neurovascular stenosis may lead to a decrease in brain blood flow and decline in cognitive functions, too. This situation can lead to cognitive impairment in the preoperative period. Many studies show findings similar to the results of this study. However, Harrington et al. reported in their research that only about one-third of their samples experienced cognitive failure before heart surgery [26].

CABG is a crisis for patients, and lack of knowledge about CABG procedure is added to the patient' stress and results in anxiety [19, 36]. Our finding based on a regression model shows that preoperative anxiety is a predictor factor for cognitive failure before CABG. Results of Polikandrioti et al. show that half of the patients experience anxiety before CABG [37]. Results of Navarro-García et al. show that one-third of the patients experience anxiety before CABG [38]. This finding is similar to the results of Zhang et al. and Patron et al. studies [11, 13]. Anxiety causes catecholamine agents release. The higher level of these substances in the blood can exacerbate the condition.

Age and anxiety are predictors of cognitive impairment before CABG. Caregivers must notice this finding and prepare suitable plans for the preoperative period to decrease the effect of cognitive impairment on postoperative cognitive disability because open-heart surgery affect brain blood flow and preoperative cognitive impairment may increase brain flow disorder after CABG. Our sampling was not done by the randomized method; thus, future studies are recommended to recruit samples by random method. In addition, based on the result of this study about age effect on cognitive status before CABG, the study of different age groups concerning cognitive status before CABG is recommended in the future.

Ethical Considerations

Compliance with ethical guidelines

One of the researchers collected the data one day before CABG from all samples after taking ethical approval of Guilan University of Medical Sciences by IR.GUMS.REC.1395.86. All subjects entered in study after signing a consent form.

Funding

This article was part of the Master's thesis of the first author, and the research project was approved (No. 93242) in the Social Determinants of Health Research Center (SDHRC) of Guilan University of Medical Sciences (GUMS). This study was conducted with the financial support of the Social Factors Research Center of Guilan University of Medical Sciences.

Authors contributions

Conceptualization and funding acquisition: Ali Reza Balaafkandeh, Ezzat Paryad; Data collection: Ali Reza Balaafkandeh; Preparing the draft: Ezzat Paryad, Ali Reza Balaafkandeh, Atefeh Ghanbari Khanghah; Data analysis: Ehsan Kazemnezhad Leili and Ezzat Paryad; Reviewing and editing: All authors.

Conflict of interest

The authors declared no conflict of interests.

Acknowledgments

The authors of this article would like to express their gratitude to the staff of that research center and the patients who collaborated with the researchers.

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