Journal of Surgery and Trauma 2024; 12(2):73-78.
jsurgery.bums.ac.ir

ORIGINAL ARTICLE

A Cross-sectional Study of Depression and Associated Factors in Pre- and Post-operative Coronary Artery Bypass Graft Patients

Ahmad Amouzeshi[1], Somaye Jomefourjan[2], Zahra Amouzeshi[3] ✉, Abbas Javadi[4], Yahya Mohammadi[5], Manizhe Nasirizade[3]

[1] *Department of Cardiology, School of Medicine, Cardiovascular Diseases Research Center, Birjand University of Medical Sciences, Birjand, Iran*

[2] *Clinical Psychology, Birjand University of Medical Sciences, Birjand, Iran*

[3] *Department of Nursing, School of Nursing and Midwifery, Birjand University of Medical Sciences, Birjand, Iran*

[4] *Department of Health Promotion and Education, School of Health, Social Determinants of Health Research Center, Birjand University of Medical Sciences, Birjand, Iran*

[5] *Education Development Center (EDC), Birjand University of Medical Sciences, Birjand, Iran*

Received: June 14, 2024 ***Revised: Sep 27, 2024*** ***Accepted: Oct 13, 2024***

Abstract

Introduction: Many patients face anxiety and depression after Coronary Artery Bypass Graft, which affects mortality, morbidity, and re-hospitalization. Therefore, this study was conducted to determine the level of depression and associated factors in pre- and post-operative coronary artery bypass graft patients.

Methods: This cross-sectional descriptive-analytical study was conducted on open heart surgery patients in educational hospitals affiliated with Birjand University of Medical Sciences from April 2017 to December 2018. It was carried out on 101 patients who were hospitalized in the cardiac surgery ward of the hospital. Data collection tools consisted of a demographic characteristics form, a medical information survey of patients, and Beck Depression Inventory-II. Then, the collected data were analyzed using SPSS software (version 16) through Chi-Square, Mann-Whitney, Kruskal-Wallis, and Spearman's correlation coefficient tests. The significance level was considered at P=0.05.

Results: The majority of people did not have depression before the operation (40.6%); however, after the operation, the majority of them had a mild level of depression (42.6%). There was a statistically significant difference between the mean score of depression before and after the operation (P=0.001). There is a weak and significant direct correlation between the level of white blood cells and depression score before surgery (P=0.032, r=0.214). There was a weak inverse correlation between hemoglobin level (P=0.011, r=-0.253) and hematocrit (P=0.041, r=-0.203) with preoperative depression score. There was a weak inverse correlation between creatinine (P=0.001, r=-0.328) and blood urea nitrogen (P=0.048, r=-0.197) levels with postoperative depression scores.

Conclusion: There was a statistically significant difference between the mean score of depression before and after the operation; accordingly, with the pre-operation evaluation, it is possible to identify the patients at risk of post-operation depression, and with preventive psychiatric counseling and psychological interventions, emotional stress can be reduced, thereby minimizing the economic and medical costs.

Key words: Coronary Artery Bypass, Depression, Patient, Surgery

Tel: +985632381203
Fax: +985632440488
Po Box 97175-379
Email: jsurgery@bums.ac.ir

✉ **Correspondence to:**
Zahra Amouzeshi, Department of Nursing, School of Nursing and Midwifery, Birjand University of Medical Sciences, Birjand, Iran;
Telephone Number: 05632381419
Email Address: amouzeshiz9039@bums.ac.ir

[DOI: 10.61186/jsurgtrauma.12.2.73]

Introduction

Coronary artery bypass graft surgery (CABG) is one of the most common surgeries in developed countries (1). The incidence rate of CABG in Iran has increased mainly due to lifestyle changes (2). Although CABG surgery increases life expectancy, it is associated with numerous physical complications, including myocardial infarction, stroke, and even kidney failure, as well as psychological consequences, such as mood disorders, fatigue, weakness, stress, anxiety, and depression (3). Depression affects 30%-40% of patients undergoing CABG and is a consistent risk factor for cardiovascular complications and mortality (4).

Preoperative depression increases the risk of readmission, heart failure, stroke, infarction, myocardial infarction, and associated death after CABG. Depression after heart surgery also increases the risk of poor physical and emotional recovery; it also increases cardiac rehospitalization up to 6 months after surgery and the rate of cardiac events up to 8 years. Depression is also the strongest predictor of poor quality of life in patients with coronary artery disease (4). Since patients after CABG are susceptible to mental disorders (i.e., stress, anxiety, and depression) after discharge from the hospital, they often need support and follow-up after discharge (1). These patients are separated from their family, friends, and professional life before and after the operation. The inability to adapt to these conditions increases anxiety and depression (5). Therefore, identifying the level of depression after CABG surgery will be the first step in taking preventive measures and then improving the quality of life and enhancing the surgical outcomes. Therefore, nurses should continue to investigate the nature of depression and discover the significant influence of privileged variables on depression. This study was conducted to determine the status of depression and the associated factors in pre- and post-operative CABG patients.

Methods

This cross-sectional descriptive-analytical study was conducted on open heart surgery patients in teaching hospitals affiliated with Birjand University of Medical Sciences from April 2017 to December 2018. During this time, 101 patients with a history of open heart surgery were examined.

All cardiac surgery patients admitted to the hospital were included in the study if they met the inclusion criteria. Inclusion criteria included admission at least one day before CABG surgery, full consciousness and ability to answer questions, and willingness to participate in the study. On the other hand, those who were unwilling to continue cooperation were excluded from the study. Moreover, those with a concurrent surgical procedure or active neurological or psychiatric diagnosis that might influence the distortion of the subjects were excluded from the study. All participants signed written informed consent after enrolling in the study. The research protocol was approved by the Ethics Committee affiliated with Birjand University of Medical Sciences with the identifier IR.BUMS.REC.1395.259.

The researcher completed the questionnaires by interviewing the patients one day before surgery and after their transfer from the cardiac surgery intensive care unit to the cardiac surgery ward. Demographic form (including gender, age, education level, and marital status) and a form of clinical characteristics (including the type of operation, number of seizures, length of operation, pump length, Complete Blood Count [CBC], Erythrocyte Sedimentation Rate [ESR], C-reactive protein [CRP], Premature Ventricular Contractions [PVC], Ventricular Tachycardia [V.TACH], Atrial Fibrillation [AF], Ventricular Fibrillation [VF], Creatinine [Cr], and Blood Urea Nitrogen [BUN]) were completed for each patient.

The Beck Depression Inventory-II (BDI-II) is a 21-item self-report rating scale that measures characteristic attitudes and depressive symptoms. The BDI-II consists of 21 items on a 4-point scale ranging from 0 (no symptoms) to 3 (severe symptoms). Scoring is obtained by adding the highest ratings for all 21 items. The minimum score is 0, and the maximum score is 63. Higher scores indicate greater symptom severity. In this questionnaire, scores from 0 to 9 indicate no or minimal depression. Scores of 10 to 18 indicate mild to moderate depression. Scores from 19 to 29 indicate moderate to severe depression, and scores from 30 to 63 indicate severe depression (6).

The BDI-II in a study by Hamidi (2015) showed significant positive internal consistency (Alpha=0.92) and test-retest reliability (r=0.64). In addition, the intra-class correlation coefficient (ICC=0.81) and convergent validity with the General Health Questionnaire (GHQ-28) (n-209) were significantly positive (r=0.80) (7).

Data were analyzed in SPSS software (version 16) using descriptive statistics (frequency, mean, and standard deviation) and inferential statistics (Chi-square, Mann-Whitney, Kruskal-Wallis, and Spearman correlation coefficient). In the conducted tests, a confidence factor of 95% was considered. The assumption of normality was evaluated based

[DOI: 10.61186/jsurgtrauma.12.2.73]

on the Kolmogorov-Smirnov test, and due to the non-normality of the data distribution, non-parametric tests (Mann-Whitney and Kruskal-Wallis) were used.

Results

This study included 101 open-heart surgery patients hospitalized in teaching hospitals affiliated with Birjand University of Medical Sciences. Regarding gender, the majority of the patients were male (n=52, 51.5%), and the mean age of patients was 59 ± 13.50 years. In terms of education level, 40.6% and 44.6% of the cases were illiterate and had diplomas, respectively, and the rest had higher academic degrees. Moreover, 68.3% of surgeries are CABG and 12.8% are valve surgeries. Also, considering the pumping situation, 72.2% of surgeries were performed on the pump. Regarding the depression score before and after the surgery, the results showed that the majority of people did not have depression before the surgery (40.6%); however, after the surgery, the majority of them had a mild level of depression (42.6%). Also, there was a statistically significant difference between the mean score of depression before and after the operation (P=0.001) (Table 1).

Comparing the mean depression score before and after surgery according to gender, the results of the Mann-Whitney test showed that there is a statistically significant difference between the mean depression score before surgery and gender (P=0.001). However, no significant difference was observed between the mean depression score after surgery and gender (P=0.149) (Table 2).

Comparing the mean depression score before and after surgery according to education, the results of the Kruskal-Wallis test showed that there is no statistically significant difference between the mean depression score before surgery and education level (P=0.274). Additionally, there is no statistically significant difference between the mean post-operative depression score and the level of education (P=0.759) (Table 2).

In relation to the comparison of the frequency of the type of operation and pumping status based on the mean depression score, the results showed no statistically significant difference in the mean depression score before and after the operation with the type and status of the pump in surgery (Table 3).

The results of Spearman's correlation coefficient showed that there is a weak and significant direct correlation between the level of white blood cells (WBC) and depression score before surgery (P=0.032, r=0.214). Also, there is a weak inverse correlation between hemoglobin level (P=0.011, r=-0.253) and hematocrit (P=0.041, r=-0.203) with

Table 1: Frequency distribution of depression in patients before and after surgery

Variable		Time of Operation		P-value
		Before	After	
Depression n (%)	No depression	41 (40.6)	20 (19.8)	
	Mild	31 (30.7)	43 (42.6)	
	Moderate	17 (16.8)	19 (18.8)	
	Severe and very severe	12 (11.9)	19 (18.8)	
Mean of Depression Score (±SD)		13.75 (±10.14)	18.27 (±10.23)	0.001[a]
Median of Depression Score (Q1 – Q3)		50 (5-22)	16 (12-24)	

[a]Mann-Whitney test

Table 2: Comparison of the patients' mean depression score based on gender and level of education

		Gender	Mean Rank	Median (Q1-Q3)	P-value
Time of Operation	Before	Male	41.47	12 (5-22)	0.001[a]
		Female	61.11		
	After	Male	46.90	16 (12-24)	0.147[a]
		Female	55.35		
		Level of Education	**Mean Rank**	**Median (Q1-Q3)**	P-value
Time of Operation	Before	Illiterate	56.10	12 (5-22)	0.274[b]
		Diploma	49.06		
		University	42.90		
	After	Illiterate	52.61	16 (12-24)	0.759[b]
		Diploma	48.62		
		University	53.73		

[a]Mann-Whitney test
[b]Chi-square test

[DOI: 10.61186/jsurgtrauma.12.2.73]

preoperative depression score. There is a weak inverse correlation between Cr (P=0.001, r=-0.328) and BUN (P=0.048, r=-0.197) levels with postoperative depression scores (Table 4).

In comparing the frequency of PVC, AF, VF, and V. TACH based on the mean depression score, there was no statistically significant difference between the mean depression score before and after the operation and the frequency of these variables (Table 5).

Table 3: Comparison of the patients' mean depression score based on pumping status and type of surgery

		Pumping status	Mean Rank	Mean (Q1-Q3)	Mann-Whitney U test results
Time of Operation	Before	On pump	51.66	12 (5-22)	P=0.713
		Off pump	49.27		z=0.36
	After	On pump	50.19	16 (12-24)	P=654
		Off pump	53.11		z=0.44
		Type of surgery	Mean Rank	Mean (Q1-Q3)	Mann-Whitney U test results
Time of Operation	Before	CABG	48.80	12 (5-22)	P=0.267
		Other	55.75		z=1.11
	After	CABG	48.30	16 (12-24)	P=0.174
		Other	56.81		z=1.35

Table 4: Correlation between depression score and variables such as age, Graft Number, operation time, and blood tests

Variable	Before of operation		After of Operation	
	r	P-value	r	P-value
Age	0.196	0.050	-0.149	0.136
Graft Number	0.065	0.521	0.037	0.717
Operation time	-0.008	0.939	-0.46	0.648
Ca	-0.117	0.245	-0/063	0.531
K	0.065	0.519	0.088	0.382
Na	0.046	0.649	0.039	0.698
Cr	-0.046	0.649	-0.328	0.001
BUN	0.161	0.108	-0.197	0.048
WBC	0.214	0.032	0.064	0.528
RBC	-0.138	0.169	0.002	0.983
PLT	-0.144	0.150	0.057	0.570
CRP	0.264	0.051	0.204	0.402
HB	-0.253	0.011	0.021	0.834
HCT	-0.203	0.041	-0.46	0.648
ESR	0.088	0.409	0.062	0.783

Table 5: Comparison of the patients' mean depression score based on AF, V.TACH, PVC, and VF

Variable				Mean Rank	Mean (Q1-Q3)	Mann-Whitney U test results
Time of Operation	Before	AF	No	48.96	12 (5-22)	P=0.107
			Yes	61.81		z=1.611
	After		No	50.48	16 (12-24)	P=0.682
			Yes	53.75		z=0.410
	Before	V.TACH	No	50.36	12 (5-22)	P=0.124
			Yes	82.50		z=1.537
	After		No	50.80	16 (12-24)	P=0.626
			Yes	61.00		z=0.488
	Before	PVC	No	48.21	12 (5-22)	P=0.122
			Yes	58.27		z=1.546
	After		No	50.57	16 (12-24)	P=0.541
			Yes	94.00		z=0.611
	Before	VF	No	50.57	12 (5-22)	P=0.140
			Yes	94.00		z=1.477
	After		No	50.58	16 (12-24)	P=0.149
			Yes	93.00		z=1.442

Discussion

The results of the present study showed that the majority of people did not have depression before the operation (40.6%); however, after the operation, the majority of them had a mild level of depression (42.6%). Also, there was a statistically significant difference between the mean depression

[DOI: 10.61186/jsurgtrauma.12.2.73]

score before and after the operation; therefore, the mean depression score after the operation was higher than the time before the operation. The results of a study by Amouzeshi (2015) in Mashhad also showed that the majority of people had low levels of depression (55.4%) before the operation; however, after the operation, the majority of them had a severe level of depression (46.4%). Accordingly, there was a statistically significant difference between the mean depression score before and after the operation (8). Although there was a statistically significant difference between the mean depression score before and after surgery in the two studies, the levels of depression before and after surgery were different in these studies. It can be said that in the current study, compared to the study conducted in Mashhad, doctors and nurses have more opportunities to communicate and educate patients, which in turn leads to a reduction in psychological symptoms, such as depression and anxiety. However, the results of a study performed by Sawalha (2024) showed high levels of depression before and after CABG (10), which was not consistent with the results of the present study. One of the reasons for the disparity can be the cultural differences and health care system. On the other hand, the increase in the rate of depression may be due to the lack of specialized support systems in hospitals. In many cases, the high prevalence of mood disorders cannot be explained by disease severity but by psychosocial factors, such as socioeconomic status, lifestyle (adherence to recommended diet or prescribed treatment), or level of social support it receives (3).

The results of the present study showed that there is a weak and significant correlation between the level of WBC, hemoglobin, and hematocrit with preoperative depression scores. There is also a weak inverse correlation between Cr and BUN levels with postoperative depression scores. In this regard, the results of a study conducted by Shafiei et al. (2017) showed that higher depression scores are associated with an increased inflammatory state, as assessed by higher blood inflammatory markers, including WBC and RDW (9). Akaishi (2024) also revealed that low levels of hemoglobin and increased inflammatory blood ratio were associated with depression in the general population (11). Previous research has shown that an increased WBC count is associated with an increased risk of atherosclerosis (12). The results obtained by Shafiei et al. (2017) showed that depression had a significant negative relationship with red blood cells (RBC) and average hemoglobin (10), which was consistent with the findings of the present study. However, in the Amouzeshi study (2015), no significant relationship was observed between depression and variables, such as hemoglobin, hematocrit, and CRP levels (8). In a study by Ivankovic et al. (2022), there was no relationship between depression before surgery and CRP level after surgery (13). Meanwhile, the measurement of CRP level may identify patients who are at risk of developing depression after heart surgery (14). The results of the study by Poole et al. (2014) showed that preoperative depressive symptoms were associated with longer postoperative hospitalization in patients undergoing CABG surgery, and this relationship was mediated by CRP changes from preoperative to postoperative levels (15).

One of the limitations of the present study was that the length of stay in the cardiac intensive care unit, smoking, comorbidities, as well as social and economic status were not investigated in this study. Moreover, since the study population was small, it is recommended that the variables mentioned in future studies be paid attention to and that the study be conducted in several centers with a larger sample size.

Conclusions

There was a statistically significant difference between the mean score of depression before and after the operation, and the mean score of depression after the operation was higher than the time before the operation. However, through the preoperative clinical interview, it is possible to identify patients with postoperative depression. This enables the medical team to implement preventive strategies and monitor the progress of depression. The results contribute to advancing our understanding of the psychological impact of CABG surgery and inform evidence-based strategies to enhance patient well-being and recovery outcomes.

Acknowledgments

The authors thank the participated patients and nursing staff in the cardiac surgery ward for their contribution to this study.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest

There is no conflict of interest to be declared.

[DOI: 10.61186/jsurgtrauma.12.2.73]

References

1. Bikmoradi A, Omidvar S, Roshanaei G, Khatiban M, Harorani MJJoVN. The impact of telenursing on level of depression, stress and anxiety in discharged patients after coronary artery bypass graft surgery: A randomized clinical trial. J Vasc Nurs. 2023;41(3):89-94.
2. Jannati M, Aslani AJJoM, Sciences M. Management of anxiety and depression in post coronary artery bypass graft surgery. J of Mind and Med Sci. 2023;10(1):34-41.
3. Correa-Rodríguez M, Abu Ejheisheh M, Suleiman-Martos N, Membrive-Jiménez MJ, Velando-Soriano A, Schmidt-RioValle J ,et al. Prevalence of depression in coronary artery bypass surgery: A systematic review and meta-analysis. J Clin Med. 2020;9(4):909.
4. Stenman M, Jeppsson A, Pivodic A, Sartipy U, Nielsen SJ. Risk of depression after coronary artery bypass grafting: a SWEDEHEART population-based cohort study. Eur Heart J Open. 2022;2(2):oeac015.
5. Açıkel MET. Evaluation of depression and anxiety in coronary artery bypass surgery patients: a prospective clinical study. Braz J Cardiovasc Surg. 2019;34(4):389-395.
6. Zarean E, Samani ZB, Kheiri S, Torkian S. Comparing depression, anxiety, and quality of life in individuals with cardiac and non-cardiac chest pain. Front Psychiatry. 2024;14:1302715.
7. Hamidi R, Fekrizadeh Z, Azadbakht M, Garmaroudi G, Taheri Tanjani P, Fathizadeh S, et al. Validity and reliability Beck Depression Inventory-II among the Iranian elderly population. Journal of Sabzevar University of Medical Sciences. 2015;22(1):189-198.
8. Amouzeshi A, Hosseini SM, Javadi A, Norozian F, Zamanian N, Mohammadi Y, et al. Depression and associated factors in patients undergoing coronary artery bypass grafting in Imam Reza Hospital of Mashhad in 2013. Journal of Surgery and Trauma. 2015;3(3):51-56.
9. Sawalha O, Ariza-Vega P, Alhalaiqa F, Pérez-Rodríguez S, Romero-Ayuso D. Psychological Discomfort in Patients Undergoing Coronary Artery Bypass Graft (CABG) in West Bank: A Cohort Study. J Clin Med. 2024;13(7):2027.
10. Shafiee M, Tayefi M, Hassanian SM, Ghaneifar Z, Parizadeh MR, Avan A, et al. Depression and anxiety symptoms are associated with white blood cell count and red cell distribution width: a sex-stratified analysis in a population-based study. Psychoneuroendocrinology. 2017;84:101-108.
11. Akaishi T, Nakaya K, Nakaya N, Kogure M, Hatanaka R, Chiba I, et al. Low Hemoglobin Level and Elevated Inflammatory Hematological Ratios Associated With Depression and Sleep Disturbance. Cureus. 2024;16(3) :e56621.
12. Duivis HE, Kupper N, Penninx BW, Na B, de Jonge P, Whooley MA. Depressive symptoms and white blood cell count in coronary heart disease patients: prospective findings from the Heart and Soul Study. Psychoneuroendocrinology. 2013;38(4):479-487.
13. Ivankovic S, Coric V, Paic F, Mihaljevic Peles A, Svagusa T, Kalamar V, et al. The Association of Preoperative Depression, and C-reactive protein levels with a postoperative length of stay in patients undergoing coronary artery bypass grafting. Appl Sci. 2022; 12(20):10201.
14. Vu T, Smith JA. The pathophysiology and management of depression in cardiac surgery patients. Front Psychiatry. 2023;14:1195028.
15. Poole L, Kidd T, Leigh E, Ronaldson A, Jahangiri M, Steptoe A. Depression, C-reactive protein and length of post-operative hospital stay in coronary artery bypass graft surgery patients. Brain Behav Immun. 2014;37:115-121.

[DOI: 10.61186/jsurgtrauma.12.2.73]