

Anxiety and Depression Among Patients Who Had Cardiac Intervention in Saudi Arabia

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Abstract Introduction: This research examines the effects of depression and anxiety on patients' recovery and quality of life following cardiac intervention, highlighting the frequent occurrence of these psychological conditions after ICU stays and intensive rehab, emphasizing the need for addressing pain perception and providing patient education and counseling. **Methodology:** A descriptive cross-sectional research design was used, and the research was conducted in Saudi Arabia from April 2023 to September 2023. All participants were from Saudi Arabia and had cardiac intervention. Questionnaires collected data: The Patient Health Questionnaire (PHQ-9) and Generalized Anxiety Disorder 7 (GAD-7) questionnaire. **Results:** Among the 543 patients included who underwent cardiac intervention, 61.3% (n=333) were males, and 38.7% (n=210) were females. The most common types of intervention were percutaneous coronary intervention (30.8%, n=167) and coronary artery bypass grafting (26.7%, n=145). Notable comorbidities included arrhythmia (22.1%, n=120), diabetes (42.7%, n=232), high cholesterol (41.8%, n=227), hypertension (52.3%, n=284), a sedentary lifestyle (37.8%, n=205), and smoking (33.1%, n=180). Patients with depressive and anxiety symptoms were further categorized into different levels of severity based on their PHQ and GAD-7 scores, respectively. **Conclusion:** Our study indicated a high prevalence of depressive and anxiety symptoms in this population. Factors such as comorbidities, demographics, and intervention characteristics were associated with the presence and severity of these symptoms. The findings highlight the importance of addressing psychological well-being and implementing targeted interventions to improve the mental health outcomes of cardiac intervention patients in Saudi Arabia.

Key Words PHQ, GAD-7, Anxiety, Cardiac intervention

1. Introduction

The importance of psychosocial factors in recovery from a heart-related medical procedure has become more widely recognized. Physical qualities and medical therapy are not the only elements influencing postoperative and long-term healing results. Social and psychological factors, particularly sadness and anxiety, may also have an impact [1], [2].

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), defines depression as persistent low self-esteem, hopelessness, helplessness, and reduced interest in enjoyable activities. Secondary depression stems from physical causes, while primary depression is psycho-

logical [3], [4]. In the DSM-5, anxiety is defined as excessive apprehension or a feeling of impending doom. Anxiety disorders like post-traumatic stress disorder (PTSD) can result from life-threatening situations such as cardiac conditions.

Many people experience anxiety before the cardiac procedure, which often subsides within a few weeks post-procedure [5]. However, up to 15% of patients may develop PTSD afterward, which significantly affects their mental condition, social life, and overall well-being [2]. The intensive care unit (ICU) is crucial for post-procedure care, allowing lifesaving but invasive procedures. However, it also involves close monitoring and extended rehabilitation, including emo-

tional challenges like weaning off mechanical ventilation, removing tubes early, and promoting patient mobility, which often leads to nightmares [6].

Geriatric patients undergoing coronary artery bypass graft (CABG) present with comorbidities like hypertension, diabetes, and notable depression, which appears to be prevalent. Before CABG, 43% of patients undergoing CABG exhibit significant depressive symptoms [7]. Reports indicate that post-CABG, 31 to 60% of patients experience depressive symptoms, with 16 to 23% matching the criteria for major depressive disorder (MDD) [5]. Patients undergoing CABG may have variable postoperative outcomes that are influenced by depression. Higher scores on the Geriatric Depression Scale (GDS) are associated with reduced post-CABG functional improvement [8]. Depressed patients face a 3.5 times higher risk of immediate post-myocardial infarction death [9].

Depression is also linked to poor treatment compliance, obesity, smoking, and elevated inflammatory markers, contributing to atherosclerotic plaque development, graft failure, and increased surgical needs [10]. Patients' perception of pain is crucial, given its substantial influence on their surgical encounters and subsequent rates of chronic postoperative pain [11]. Educating patients on what to expect, guided ICU tours, counseling, and post-discharge educational interventions mitigate anxiety, enhance satisfaction, and ultimately improve patient outcomes [12], [13].

This research explores the impact of psychosocial factors, particularly depression and anxiety, on the recovery and quality of life of patients undergoing heart-related medical procedures. It emphasizes the prevalence of secondary depression and anxiety disorders in cardiac intervention patients, mainly after ICU stays and traumatic rehabilitation procedures. The general objective of the study was to assess anxiety and depression among cardiac intervention patients in Saudi Arabia. Specifically, we evaluated anxiety and depression levels among patients who have undergone cardiac intervention, identified the factors affecting anxiety and depression levels, and evaluated the psychological status of patients after cardiac intervention.

2. Methodology

A descriptive cross-sectional research design was used to assess the anxiety and depression of Saudi patients who had cardiac intervention from April 2023 to September 2023. The study setting was Saudi Arabia. An online questionnaire was designed using Google Forms and distributed electronically via social media.

A. Inclusion and Exclusion

Patients and caregivers were selected for inclusion in this study, and exclusion criteria were applied. The inclusion criteria were all male and female residents living in Saudi Arabia with cardiac intervention. The exclusion criteria were people who did not live in Saudi Arabia and did not undergo cardiac intervention.

B. Sample Size Calculation and Sampling Techniques

The sample size was estimated by an online sample size calculator (Raosoft, <http://www.raosoft.com/samplesize.html>) with a margin of error of 5% and a 95% confidence interval. It was assumed that the average response for most of the questions would be 50% and that Saudi Arabia's population was 34,110,821. As a result, the required sample size was 385 participants. The study population was selected using non-probability purposive sampling.

C. Data Collection and Analysis

Questionnaires collected data. The Patient Health Questionnaire (PHQ-9) is a versatile tool that can be used for various purposes, such as screening, diagnosis, monitoring and evaluating the intensity of depression. It integrates the diagnostic criteria for depression in the DSM-IV with other major depressive symptoms, creating a concise self-assessment instrument. The tool assesses how frequently the symptoms occur, which contributes to determining the severity of depression based on the score.

The Generalized Anxiety Disorder 7 (GAD-7) survey is a self-administered survey that serves as a tool for detecting and gauging the severity of generalized anxiety disorder (GAD). It consists of seven items that assess the intensity of different GAD symptoms based on selected response categories, which have specific scores. The GAD-7 items include nervousness, uncontrollable worrying, excessive worry, restlessness, difficulty relaxing, irritability, and fear of something terrible. The overall score is determined by adding the scores of all seven items and is used to evaluate the level of anxiety experienced by an individual.

The data were entered, categorized, and cleansed of missing data before being analyzed with the Statistical Package for Social Sciences (SPSS) version 24.0. To evaluate the association between two or more qualitative variables, the chi-squared test was used. Binary logistic regression was used to find the predictors of depression and anxiety. A p-value of <0.05 was considered significant.

D. Ethical Considerations

Approval was obtained from the research ethics committee of the College of Medicine at Majmaah University. Ethics Number: MUREC-Apr.3/ COUL-2023/13-4. Participation was voluntary, and participants were permitted to withdraw their consent to participate in the study. All data from the questionnaires were kept confidential, and only researchers could access participants' information.

3. Results

Table 1 presents the sociodemographic and surgical parameters of all patients who underwent cardiac intervention. Initially, 579 individuals were considered for the study. Of these, 36 were non-residents of Saudi Arabia and were excluded. This resulted in a total of 543 participants in the study, with 333 males (61.3%) and 210 females (38.7%). Regarding age distribution, most patients (38.5%, n=209) were over

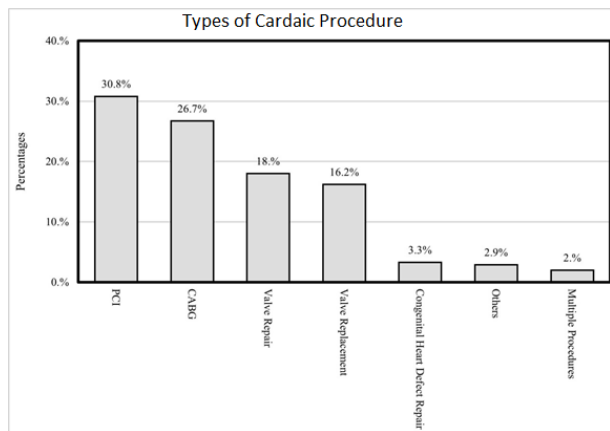


Figure 1: Distribution of the prevalence of types of cardiac intervention

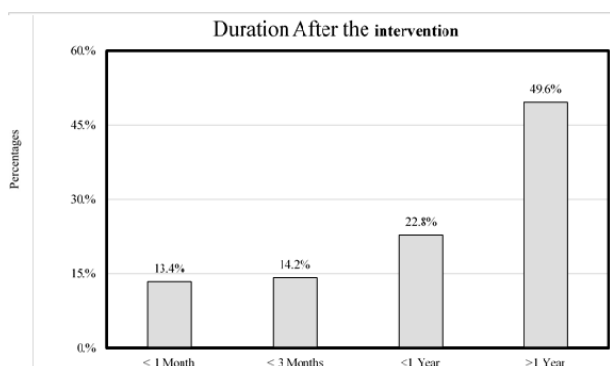


Figure 2: Distribution of patients with different durations after cardiac intervention

50 years old, followed by those aged 41-50 years (23.6%, n=128). In terms of intervention parameters, all patients had undergone cardiac intervention.

The types of cardiac intervention performed were categorized as follows: PCI (30.8%, n=167), CABG (26.7%, n=145), valve repair (18.0%, n=98), and valve replacement (16.2%, n=88). Other types are shown in Figure 1. The durations after the last cardiac intervention procedure were divided into four categories: less than one month (13.4%), less than three months (14.2%), less than one year (22.8%), and more than one year (49.6%) (Figure 2). As for the length of stay in the ICU, the largest group of patients stayed for one week (30.4%, n=165), followed by those who stayed for less than one week (30.0%, n=163). A smaller proportion of patients stayed for more than one week (14.0%, n=76), two weeks (16.8%, n=91), or more than two weeks (8.8%, n=48), while the rest did not require ICU care, as illustrated in Figure 3.

Figure 4 presents the proportion of different comorbidities among the 543 patients who underwent cardiac intervention. Hypertension was found in 52.3% (n=284) of the patients, while diabetes mellitus was present in 42.7% (n=232). High cholesterol was identified in 41.8% (n=227) of the patients.

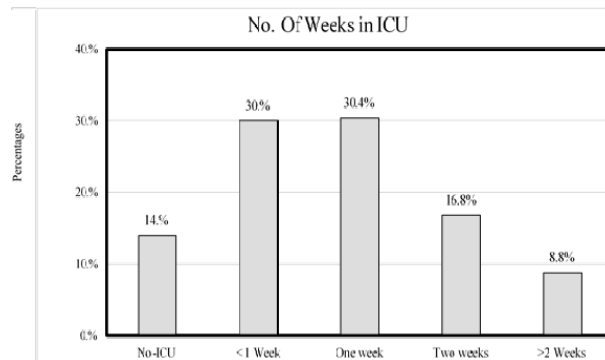


Figure 3: Distribution of patients with different ICU stays after cardiac intervention

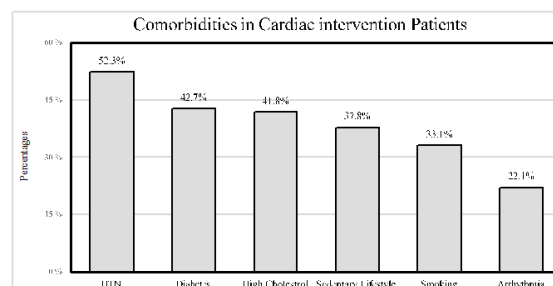


Figure 4: Proportion of different comorbidities in patients who had cardiac intervention

Additional comorbidities are detailed in Figure 4.

Table 2 provides information on the level and assessment of depressive symptoms among the 543 patients who underwent cardiac intervention. For the symptom "Little Interest in Activities," 33.9% (n=184) of patients reported not experiencing this symptom at all, 41.3% (n=224) experienced it for several days, 13.1% (n=71) for more than half of all days, and 7.7% (n=42) nearly every day. Regarding "Feeling Sad and hopeless," 32.6% (n=177) did not experience this symptom at all, 42.7% (n=232) experienced it for several days, 14.7% (n=80) for more than half of all days, and 9.9% (n=54) nearly every day. The prevalence of other depressive symptoms is detailed in Table 2.

Table 3 presents the predictors or factors associated with depression among patients who underwent cardiac intervention. Diabetes was strongly associated with depression, indicating that patients with diabetes were more likely to experience depression after the intervention (p < 0.001). Similarly, hypertension was identified as a significant predictor, suggesting that patients with high blood pressure had an increased risk of developing depression (p < 0.020). Sex was also found to play a role, with male patients being less likely to experience depression compared to females (p < 0.011).

Age was a significant factor as well, with younger patients (under 50 years) showing a higher risk of depression compared to older individuals (p = 0.001). Furthermore, the duration after the intervention and the length of stay in the

		Frequency (n=543 included in the study)	Percent %
Sex	Females	210	38.7
	Males	333	61.3
Age	<18 Years	53	9.8
	18-30 Years	63	11.6
	31-40 Years	90	16.6
	41-50 Years	128	23.6
	>50 Years	209	38.5
Cardiac intervention	Yes	543	100.0
	No	0	0.0
Type of cardiac intervention	PCI	167	30.8
	CABG	145	26.7
	Valve Repair	98	18.0
	Valve Replacement	88	16.2
	Congenital Heart Defect Repair	18	3.3
	Others	16	2.9
	Multiple Procedures	11	2.0
Duration after intervention	<1 month	73	13.4
	<3 months	77	14.2
	<1 year	124	22.8
	>1 year	269	49.6
No. of weeks in ICU	<1 week	163	30.0
	One week	165	30.4
	>1 week	76	14.0
	Two weeks	91	16.8
	>2 weeks	48	8.8

Table 1: Sociodemographic and surgical parameters of all patients who underwent cardiac intervention

PHQ-9 questionnaire	No		Yes	
	No (Not at All) n (%)	Yes (Several Days) n (%)	More than half the Days n (%)	Nearly Every Day n (%)
Little Interest in Activities	206 (37.9%)	224 (41.3%)	71 (13.1%)	42 (7.7%)
Feeling Sad & Hopeless	177 (32.6%)	232 (42.7%)	80 (14.7%)	54 (9.9%)
Trouble falling asleep or too much sleep	153 (28.2%)	231 (42.5%)	99 (18.2%)	60 (11.0%)
Always feeling tired	148 (27.3%)	242 (44.6%)	90 (16.6%)	63 (11.6%)
Poor appetite or overeating	189 (34.8%)	211 (38.9%)	86 (15.8%)	57 (10.5%)
Feeling bad about yourself	258 (47.5%)	173 (31.9%)	71 (13.1%)	41 (7.6%)
Trouble in concentration	222 (40.9%)	214 (39.4%)	72 (13.3%)	35 (6.4%)
Slow speech & movement	243 (44.8%)	196 (36.1%)	60 (11.0%)	44 (8.1%)
Thoughts of death & suicide	339 (62.4%)	145 (26.7%)	38 (7.0%)	21 (3.9%)

Table 2: Assessment of depressive symptoms among patients who had cardiac intervention

ICU were significantly associated with depression, implying that a more extended recovery period or ICU stay may contribute to higher rates of depression. Regarding the type of cardiac intervention, patients who underwent multiple procedures were less likely to experience depression, suggesting that the severity or complexity of the intervention may have influenced depression outcomes.

Table 4 provides information on the level and assessment of generalized anxiety symptoms among the 543 patients who underwent cardiac intervention. For the parameter "Feeling Nervous or Angry," 32.6% (n=177) of patients reported not experiencing this symptom at all, 45.1% (n=245) experienced it for several days, 14.5% (n=79) for more than half of all days, and 7.7% (n=42) nearly every day. For "Not able to Stop Anxiety and Worrying" 35.7% (n=194) did not experience this symptom at all, 42.2% (n=229) experienced it for several days, 14.9% (n=81) for more than half of all days, and 7.2% (n=39) nearly every day. Details on other anxiety-related symptoms are provided in Table 4.

Table 5 presents the predictors or factors associated with anxiety among patients who underwent cardiac intervention. Patients with diabetes were found to have a significant association with anxiety, with a regression coefficient of 0.700 (p

= 0.004) and an odds ratio of 2.015. Smoking also showed a significant association with anxiety, with a regression coefficient of 0.604 (p = 0.015) and an odds ratio of 1.829. This indicates that smokers had a higher likelihood of experiencing anxiety compared to non-smokers. The age groups of 18-30 years were significantly associated with anxiety. The duration after intervention was also associated significantly with anxiety, and the number of weeks spent in the ICU also showed significant associations with anxiety. Regarding the type of intervention, valve replacement showed a significant association with anxiety with a regression coefficient of 1.136 (p = 0.039) and an odds ratio of 3.115. Other factors are shown in Table 5.

Figure 5 displays the proportion of the 543 patients with depressive symptoms based on their PHQ scores. The largest proportion (35%, n=190) had mild depressive symptoms. Figure 6 presents the proportions for anxiety symptoms among these patients based on their GAD-7 scores. The majority had mild anxiety symptoms (41.3%, n=224), with the remaining patients distributed among minimal, moderate, and severe symptom categories.

	B	Sig.	Exp (B)	95% CI
Arrhythmia	0.210	0.396	1.233	0.698, 1.768
Diabetes	0.984	0.000*	2.674	2.139, 3.209
High cholesterol	-0.176	0.423	0.838	0.303, 1.373
HTN	0.511	0.029*	1.666	1.131, 2.201
Sedentary life style	0.172	0.425	1.187	0.652, 1.722
Smoking	0.448	0.069	1.565	1.030, 2.100
Sex (Male)	-0.575	0.011*	0.563	0.028, 1.098
Age (<18 Years)		0.000*	Ref	
Age (18-30 Years)	1.388	0.001*	4.009	3.474, 4.544
Age (31-40 Years)	1.749	0.000*	5.747	5.212, 6.282
Age (41-50 Years)	0.950	0.024*	2.585	2.050, 3.120
Age (>50 Years)	0.577	0.158	1.780	1.245, 2.315
Duration after the intervention (<1 Month)		0.004*		
Duration after the intervention (<3 Months)	0.042	0.911	1.043	0.508, 1.578
Duration after the intervention (<1 Year)	0.597	0.091	1.817	1.282, 2.352
Duration after the intervention (>1 Year)	-0.387	0.193	0.679	0.144, 1.214
No ICU		0.000*		
Weeks in ICU (<1 Week)	0.254	0.400	1.289	0.754, 1.824
Weeks in ICU (1 Week)	0.741	0.016*	2.099	1.564, 2.634
Weeks in ICU (2 Week)	1.322	0.000*	3.751	3.216, 4.286
Weeks in ICU (>2 Weeks)	2.473	0.000*	11.858	11.323,12.393
Surgery type (CABG)		0.000*		
Valve repair	0.310	0.546	1.363	0.828, 1.898
Valve replacement	1.043	0.051	2.838	2.303, 3.373
PCI	0.674	0.208	1.962	1.427, 2.497
Congenital heart defect repair	0.246	0.629	1.279	0.744, 1.814
Multiple procedures	-1.792	0.024*	0.167	-0.368, 0.702
Others	-0.300	0.699	0.741	0.206, 1.276

*B Regression Coefficient **Sig.Significance Level (p-value) ***Exp (B) Exponential B, logistic regression ****95% CI 95% Confidence Interval

Table 3: Predictors or factors of depression among patients who had cardiac intervention

Qad-7 questionnaire	No		Yes	
	No (not at all) n (%)	Yes (several days) n (%)	More than half the days n (%)	Nearly every day n (%)
Feeling nervous or angry	177(32.6%)	245(45.1%)	79(14.5%)	42(7.7%)
Not able to stop anxiety & worrying	194(35.7%)	229(42.2%)	81(14.9%)	39(7.2%)
Worrying too much about things	192(35.4%)	215(39.6%)	87(16.0%)	49(9.0%)
Hard to sit due to restlessness	217(40.0%)	227(41.8%)	63(11.6%)	36(6.6%)
Become upset & annoyed easily	168(30.9%)	238(43.8%)	74(13.6%)	63(11.6%)
Feeling afraid as if something awful might happen	187(34.4%)	222(40.9%)	79(14.5%)	55(10.1%)
Trouble relaxing	173(31.9%)	257(47.3%)	63(11.6%)	50(9.2%)

Table 4: Level and assessment of generalized anxiety symptoms among patients who had cardiac intervention

Qad-7 questionnaire	No		Yes	
	No (not at all) n (%)	Yes (several days) n (%)	More than half the days n (%)	Nearly every day n (%)
Feeling nervous or angry	177(32.6%)	245(45.1%)	79(14.5%)	42(7.7%)
Not able to stop anxiety & worrying	194(35.7%)	229(42.2%)	81(14.9%)	39(7.2%)
Worrying too much about things	192(35.4%)	215(39.6%)	87(16.0%)	49(9.0%)
Hard to sit due to restlessness	217(40.0%)	227(41.8%)	63(11.6%)	36(6.6%)
Become upset & annoyed easily	168(30.9%)	238(43.8%)	74(13.6%)	63(11.6%)
Feeling afraid as if something awful might happen	187(34.4%)	222(40.9%)	79(14.5%)	55(10.1%)
Trouble relaxing	173(31.9%)	257(47.3%)	63(11.6%)	50(9.2%)

Table 5: Predictors or factors of anxiety among patients who had cardiac intervention

4. Discussion

This study aimed to examine anxiety and depression among cardiac intervention patients in Saudi Arabia. We investigated the sociodemographic and intervention parameters of the patients. Regarding sex distribution, most patients were males (61.3%, n=333). Regarding age distribution, the majority were above 50 years old (38.5%, n=209), followed by those aged 41-50 (23.6%, n=128). All participants were Saudi nationals. Regarding intervention parameters, the most common cardiac interventions performed were CABG, valve repair, and valve replacement, with a significant prevalence

of PCI (30.8%, n=167) noted in our study. The prevalence of different types of cardiac procedures is consistent with findings reported by Choinière et al. [14].

Regarding the duration after the intervention, a considerable proportion of patients had surpassed one-year post-operation (49.6%, n=269). Diabetes was prevalent among 42.7% (n=232) of patients, while high cholesterol was present in 41.8% (n=227) of cases. Hypertension affected a significant portion of the cohort (52.3%, n=284). These findings align with previous studies that have identified these comorbidities as common among patients undergoing cardiac

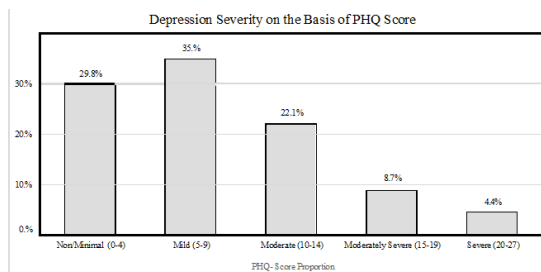


Figure 5: Proportion of patients with depressive symptoms based on PHQ Score

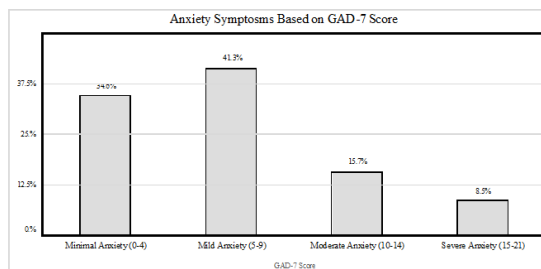


Figure 6: Proportion of patients with anxiety symptoms based on GAD-7 score

procedures [15]. The assessment of depressive symptoms among these patients revealed that a considerable number experienced symptoms indicative of depression across various domains. These findings are consistent with previous research demonstrating the high prevalence of depressive symptoms in these patients [16].

The results indicated that diabetes and hypertension were significant predictors of depression. Patients with diabetes were more likely to experience depression after cardiac procedure, which is consistent with previous studies [17], [18]. Similarly, hypertension was identified as a significant predictor of depression, which also aligns with previous research in various populations [19], [20].

The sex of patients also showed a significant association with depression, with males being less likely to experience depression. This finding is consistent with previous studies, which have consistently reported higher rates of depression among female patients undergoing cardiac procedures [21]. The age of patients emerged as another significant predictor, with younger age groups, particularly those between 18 and 30 years old, being more susceptible to depression following cardiac procedures. This finding corroborates previous research highlighting the vulnerability of younger patients to depression in the context of cardiac procedures [22].

The duration after the procedure and the length of stay in the ICU were additional significant factors associated with depression among cardiac interventional patients. Patients who had a longer duration after the procedure and spent more weeks in the ICU showed significant associations with depression. This aligns with previous studies that have iden-

tified the impact of procedure recovery and ICU experiences on mental health outcomes in cardiac interventional patients [23].

The assessment revealed a significant prevalence of generalized anxiety symptoms in various domains. These findings are consistent with previous studies [24]. The predictors or factors associated with anxiety among cardiac intervention patients highlighted several significant associations. Diabetes and smoking were identified as significant predictors of anxiety. These findings are also in line with the literature demonstrating the association between diabetes, smoking, and anxiety in various populations [25]. Similar to the findings for depression, younger age groups, notably those aged 18-30 years, showed a significant association with anxiety. This finding aligns with previous research indicating higher rates of anxiety in younger cardiac interventional patients [26]. The duration after the intervention and the length of ICU stay were also found to be significant factors associated with anxiety.

Our study revealed the proportion of patients with depressive symptoms and anxiety symptoms based on their PHQ and GAD-7 scores, respectively. According to the PHQ score, many patients had mild depressive symptoms (35%, n=190). Additionally, 29.8% (n=162) of patients experienced no depressive symptoms or minimal symptoms. Based on the GAD-7 score, 34.6% (n=188) of individuals had minimal anxiety symptoms, while 41.3% (n=224) exhibited mild anxiety symptoms.

This research has several limitations that should be considered when interpreting the results. Firstly, the sample selection process may limit the generalizability of the findings as the study focused on a specific population of cardiac intervention patients in a specific location (Saudi Arabia). Excluding participants not living in the region may have introduced bias and affected the sample's representativeness. Additionally, while the study included 543 participants, a larger sample size would have enhanced the statistical power and reliability of the results.

The non-randomized design of the study is another limitation, as it may introduce selection bias and hinder the establishment of causal relationships between variables. The reliance on self-report measures for depressive and anxiety symptoms introduces the possibility of response biases or inaccuracies, and a more objective assessment method could provide additional insights. Furthermore, the study captured only a snapshot of symptoms at a specific time, and longitudinal data would have been valuable in understanding the long-term effects of cardiac intervention. The study was conducted at a single center, which limits the diversity of patient characteristics and healthcare practices, and multi-center studies would provide a broader perspective. The use of subjective scoring systems to categorize symptoms may be influenced by cultural or population variations, highlighting the need for careful interpretation. Our study may have selection bias because it relied on online questionnaires distributed via social media. This approach may exclude individuals not active on

social media or lacking internet access, potentially skewing the sample towards a more digitally connected population. Thus, the population may only represent some cardiac intervention patients in Saudi Arabia. These limitations should be considered when evaluating the findings and suggest areas for further research and improvement.

5. Conclusion

Our study indicated a high prevalence of depressive and anxiety symptoms in this population. Factors such as comorbidities, demographics, and intervention characteristics were found to be associated with the presence and severity of these symptoms. The findings highlight the importance of addressing psychological well-being and implementing targeted interventions to improve the mental health outcomes of cardiac intervention patients in Saudi Arabia.

Conflict of interest

The authors declare no conflict of interests. All authors read and approved final version of the paper.

Authors Contribution

All authors contributed equally in this paper.

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