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The Prevalence of Anxiety and Depression in Patients with Cardiovascular Diseases: Cross Sectional Study

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Abstract: ***Cardiovascular diseases (CVDs) are the leading cause of death worldwide, responsible for about one-third of all global deaths. Mental health problems like depression and anxiety are common among people with CVDs. Depression and anxiety in heart patients are linked to higher risks of death from both heart-related and other causes. Method: This cross-sectional observational study was carried out in the Cardiology Outpatient Department of Dr. R. N. Cooper Municipal General Hospital, Mumbai, over a two-month period from April 25, 2025 to June 25, 2025. Ethical approval for the study was obtained from the Institutional Ethics Committee of HBT Medical College, Mumbai. Subsequent Data analysis was done using IBM SPSS Version 23.0 and Microsoft Office Home and Student 2021. Results: The study included 368 cases of Ischemic Heart disease presenting to Cardiology and Medicine OPD/Ward/department for treatment. The mean age of the participants is 57.3 yrs (Standard deviation 11.9). The youngest participant is 20 yrs and the oldest is 85 yrs. Among the participants, 138 (37.5%) have previous history of hospitalization. In terms of severity, 17(4.6%) patients have Minimal depression, 52(14.1%) patients have mild depression, 68(18.5%) patients have moderate, 35(9.5%) have Moderately severe depression and 20(5.4%) have severe depression. For anxiety 141(38.3%) have Minimal anxiety, 101(27.4%) have mild Anxiety, 81(22%) patients have moderate, and 45(12.2%) patients have severe anxiety. With a cut-off value of GAD score ≥ 8, 164 (44.6%) are having anxiety and based on PHQ 9 score = 0, 176 (47.8%) are suffering from depression.***

Keywords: Anxiety, Depression, Cardiovascular diseases

1. Introduction

Cardiovascular diseases (CVDs) are the leading cause of death worldwide, responsible for about one-third of all global deaths [5]. In 2021, around 20.5 million people died due to CVDs, with 80% of these deaths occurring in low- and middle-income countries [5]. While developed countries have seen a decline in heart-related deaths due to better prevention and treatment methods, developing countries continue to face high death rates. This is mainly because of unhealthy lifestyles, physical inactivity, tobacco use, and limited access to healthcare [4].

Mental health problems like depression and anxiety are common among people with CVDs.

Globally, about 300 million people suffer from depression, and 272 million from anxiety [14]. Research shows that people with CVDs are almost three times more likely to have depression compared to the general population [1,2,14]. These mental health issues can worsen the patient's condition by affecting their recovery, treatment adherence, and overall quality of life [3,12]. After major heart events like a heart attack, the chances of developing depression also increase significantly [14].

Depression and anxiety in heart patients are linked to higher risks of death from both heart-related and other causes [15,16]. The American Heart Association (AHA) has recommended that depression after coronary artery disease (CAD) should be considered a serious risk factor because of its connection with worse heart outcomes [3]. The World Health Organization (WHO) has predicted that by 2030, depression and heart disease will be among the top three causes of disability worldwide [16]. These facts show the need to include mental health care in the treatment of CVDs, especially in developing countries.

2. Methodology

This cross-sectional observational study was carried out in the Cardiology Outpatient Department of Dr. R. N. Cooper Municipal General Hospital, Mumbai, over a two-month period from April 25, 2025 to June 25, 2025. Ethical approval for the study was obtained from the Institutional Ethics Committee of HBT Medical College, Mumbai.

Target Population

The target population included patients with cardiovascular diseases presenting to the Cardiology and Medicine departments of Dr. R. N. Cooper Hospital. The hospital sees approximately 4,500 cardiovascular disease (CVD) patients annually, and this entire group was considered the target population for the study.

Sample Size Calculation:

Using a standard formula for finite population sampling:

$$n = N / 1 + N(e^2)$$

Here, N is the total target population (4500), e is the margin of error (5%), and n is the required sample size, which was calculated to be 368.

Inclusion Criteria:

1) Male and female patients presenting with cardiovascular diseases to the Cardiology department and OPD.
2) Patients of all ages with cardiovascular conditions.
3) Patients with a past history of cardiovascular disease.
4) Patients admitted to the Medicine ward for CVD-related treatment.

Exclusion Criteria:
1) Patients admitted to the Cardiac ICU.
2) Patients with a diagnosed history of psychiatric illness.
3) Patients who were critically ill or had intellectual impairments.
4) Patients unable to hear or respond to questions.
5) Patients with confirmed malignancy or chronic bedridden conditions.

Data Collection Tools
Depression and anxiety were assessed using standardized tools. The Patient Health Questionnaire-9 (PHQ-9) was used to evaluate depression, and the Generalized Anxiety Disorder-7 (GAD-7) scale was used to assess anxiety levels. Additionally, sociodemographic information such as age, gender, education, marital status, and socioeconomic status was collected to explore potential associations with mental health status.

Sampling Technique
Eligible patients who met the inclusion criteria were selected consecutively until the required sample size of 368 was reached.

Assessment of Depression and Anxiety
The PHQ-9 scale consists of 9 questions assessing depressive symptoms over the previous two weeks. Scores range from 0 to 27, with higher scores indicating greater severity:
- 0: No depression
- 1–4: Minimal
- 5–9: Mild
- 10–14: Moderate
- 15–19: Moderately severe
- 20–27: Severe

The PHQ-9 is widely validated and reliable, with test-retest reliability of r = 0.73 and an intraclass correlation coefficient between 0.81–0.92. It has also been found suitable for use in the Indian population.

Anxiety was measured using the GAD-7 scale, which includes 7 items assessing anxiety symptoms. The total score ranges from 0 to 21:
- 1–4: Minimal
- 5–9: Mild
- 10–14: Moderate
- 15–21: Severe

GAD-7 has demonstrated good reliability, with test-retest reliability between r = 0.69–0.87 and an intraclass correlation coefficient of 0.70–0.83, making it a consistent and valid tool for use in Indian clinical settings. According to various studies a GAD score of greater than or equal to 8 was considered significant for Anxiety.

3. Data Analysis

Subsequent Data analysis was done using IBM SPSS Version 23.0 and Microsoft Office Home and Student 2021. Continuous data has been expressed as mean (Standard deviation). The categorical data is summarised as frequencies and percentages. The unadjusted odds ratio and adjusted odds ratio with 95%Confidence intervals for depression/anxiety with the risk factors is calculated. Following which a A logistic regression analysis was conducted to predict depression among the individuals with Cardiovascular diseases. Based on the statistically significant variables found in the above bivariate tests, variables were selected.

4. Ethics

Ethical clearance was obtained before data collection from Institutional ethics committee of HBT Medical College and Dr R N Cooper Hospital. Consent forms were prepared in different languages including regional languages following which informed consent was obtained from patients. The Study was explained in detail with aims and objectives, outcomes of the study.

5. Results

According to the sample size of the study a total of 368 Cardiovascular Disease patients were interviewed. The study included 368 cases of Ischemic Heart disease presenting to Cardiology and Medicine OPD/Ward/department for treatment. The mean age of the participants is 57.3 yrs (Standard deviation 11.9). The youngest participant is 20 yrs and the oldest is 85 yrs. Among the participants, 138 (37.5%) have previous history of hospitalization.

Table 1: Descriptive profile of the participants

Characteristics	Frequency	Percentage
Age Group (in yrs)		
20 - 40	55	14.9
41 - 60	218	59.2
61 – 80	87	23.6
> 80	8	2.2
Sex		
Male	265	72
Female	103	28
Marital Status		
Married	322	87.5
Unmarried	46	12.5
Education		
Illiterate	68	18.5
Primary	135	36.7
Secondary	117	31.8
Graduate/Diploma or above	48	13
Socio-economic Status		
Lower class	32	8.7
Lower middle class	124	33.7
Upper lower class	100	27.2
Upper middle class	83	22.6
Upper class	29	7.9
Total	**368**	**100**

Sociodemographic data analysis:
Out of 368 participants, 265 (72%) participants were male and 103 (28%) participants were female. Data collection on age reported that 55 (14.9%) participants were from age group of 20-40, 218 (59.2%) participants were from the age group of 41-60, 87 (23.6%) participants were from age group 61-80, and 8(2.2%) patients were of age 81 and above. Data on Marital status was also collected wherein Married participants were 322 (87.5%) and Unmarried participants were 46 (12.5%). Socioeconomic status data concluded that 32 (8.7%)

participants belong to lower socioeconomic class, 100 (27.7%) participants belong to upper lower socioeconomic class, 124 (33.7) belong lower middle socioeconomic class, 83 (22.55%) belong to upper middle socioeconomic class and 29 (7.88%) belong to upper class.

Education data revealed that 68 (18.48%) participants were Illiterate, 135 (36.68%) had Primary education, 117 (31.8%) has Secondary education, 48 (13.4%) had education of Graduate/diploma.

In terms of severity, 17(4.6%) patients have Minimal depression, 52(14.1%) patients have mild depression, 68(18.5%) patients have moderate, 35(9.5%) have Moderately severe depression and 20(5.4%) have severe depression. For anxiety 141(38.3%) have Minimal anxiety, 101(27.4%) have mild Anxiety, 81(22%) patients have moderate, and 45(12.2%) patients have severe anxiety.

With a cut-off value of GAD score ≥ 8, 164 (44.6%) are having anxiety and based on PHQ 9 score = 0, 176 (47.8%) are suffering from depression.

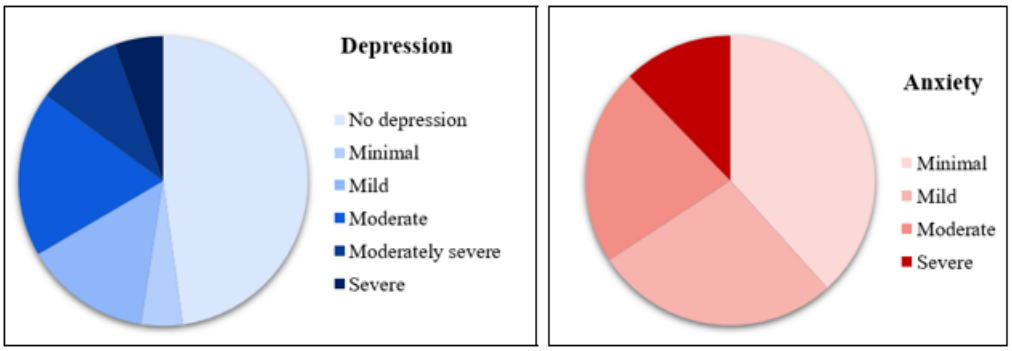

Figure 1: Prevalence of Anxiety and Depression among the participants

A Multivariable analysis for depression was done which shows high degree of association of depression with various factors like age, education, Socioeconomic status, previous history of admission.

Table 3: Risk factors of depression in the participants with Cardiovascular Diseases [Frequency (Percentage)]

Characteristics	Depression		Unadjusted odds ratio (95% CI)@	Adjusted odds ratio (95% CI)$
	Present	Absent		
Age Group (in yrs)				
> 60	85 (89.5)	10 (10.5)	13.2 (6.6 – 26.5)*	7.0 (3.2 – 15.4)*
20 - 60	107 (39.2)	166 (60.8)		
Sex				
Male	138 (52.1)	127 (47.9)	0.99 (0.6 – 1.6)	0.6 (0.4 – 1.1)
Female	54 (52.4)	49 (47.6)		
Marital Status				
Unmarried	14 (30.4)	32 (69.6)	0.4 (0.2 – 0.7)*	0.9 (0.4 – 2.0)
Married	178 (55.3)	144 (44.7)		
Education				
Secondary, Graduate/Diploma or above	45 (27.3)	120 (72.7)	0.1 (0.09 – 2.26)*	0.4 (0.2 – 0.6)*
Illiterate and Primary	147 (72.4)	56 (27.6)		
Socio-economic Status				
Upper middle or upper class	28 (25)	84 (75)	0.2 (0.1 – 0.3)*	0.5 (0.3 – 0.9)*
Lower, lower middle or upper lower class	164 (64.1)	92 (35.9)		
Previous History of admission				
Yes	114 (82.6)	24 (17.4)	9.3 (5.5 – 15.5)*	3.9 (2.1 – 7.0)*
No	78 (33.9)	152 (66.1)		
Total	**192 (52.2)**	**176 (47.8)**	-	-

*Significant at 0.05 level. $Controlling for other variables

A Binomial logistic regression analysis was conducted to predict depression among the individuals with Cardiovascular diseases. Based on the statistically significant variables found in the above bivariate tests, variables were selected. The results of the analysis are as follows:

A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between individuals who are depressed from those who do not (chi square = 155.6, p = <0.0005 with df = 4). The Hosmer and Lemeshow goodness-of-fit test statistic has a significance of 0.056 which means that it is not statistically significant and therefore our model is a good fit. Nagelkerke's R^2 of 0.46 indicates a moderate relationship between prediction and grouping. Prediction success overall was 75.8% (68.2% for depression and 84.1% for no depression).

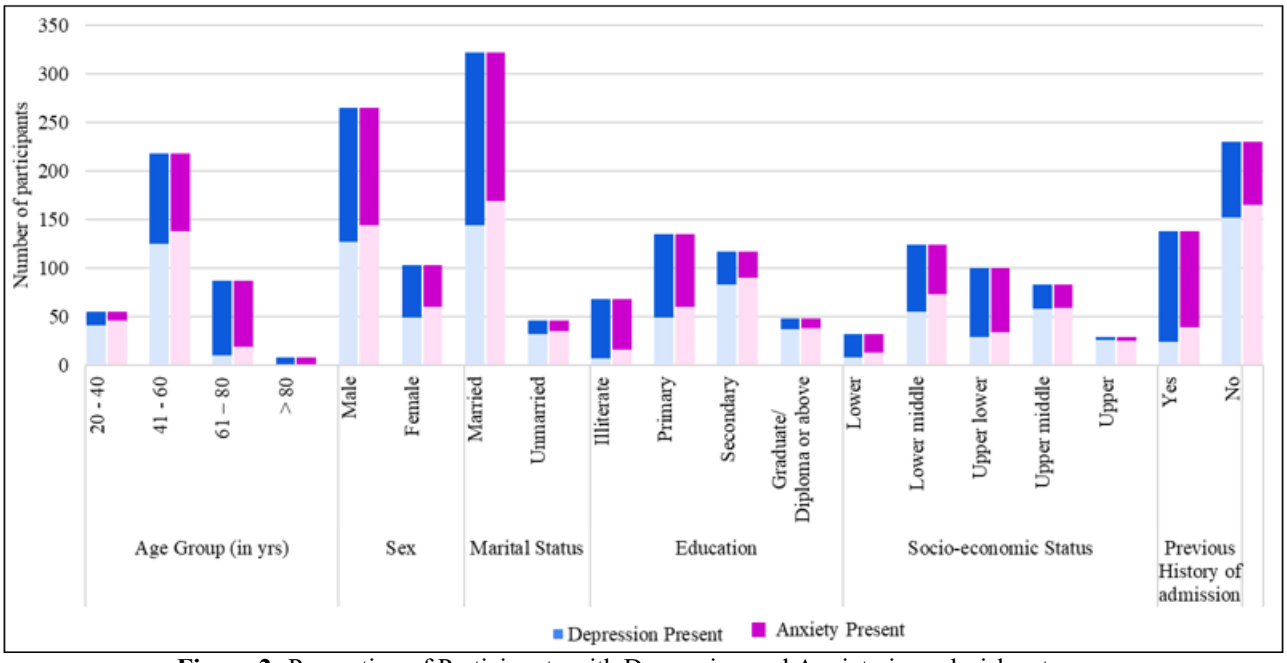

Figure 2: Proportion of Participants with Depression and Anxiety in each risk category

Similarly, A Multivariable analysis for was done which shows high degree of association of anxiety with various factors like age, education, Socioeconomic status, previous history of admission.

A Binomial logistic regression analysis was conducted to predict anxiety among the individuals with Cardiovascular diseases. Based on the statistically significant variables found in the above bivariate tests, variables were selected. The following predictor variables were included:

1) Age (Reference variable: Age below 60 yrs)
2) Education - Secondary, Graduate/Diploma or above (Reference variable: Illiterate and Primary)
3) Previous history of admission (Present) (Reference variable: Absent)

The results of the analysis are as follows: A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between individuals who have anxiety from those who do not (chi square = 115.1, p = <0.0005 with df = 3). The Hosmer and Lemeshow goodness-of-fit test statistic has a significance of 0.165 which means that it is not statistically significant and therefore our model is a good fit. Nagelkerke's R^2 of 0.36 indicates a moderate relationship between prediction and grouping. Prediction success overall was 77.4% (67.7% for anxiety and 85.3% for no anxiety).

Table 4: Risk factors of anxiety in the participants with Cardiovascular Diseases

Characteristics	Anxiety		Unadjusted odds ratio@	Adjusted odds ratio$
	Present	Absent		
Age Group (in yrs)				
> 60	75 (78.9)	20 (21.1)	7.8 (4.5 – 13.5)*	3.9 (2.1 – 7.2)*
20 - 60	89 (32.6)	184 (67.4)		
Sex				
Male	121 (45.7)	144 (54.3)	1.2 (0.7 – 1.9)	0.9 (0.5 – 1.5)
Female	43 (41.7)	60 (58.3)		
Marital Status				
Unmarried	11 (23.9)	35 (76.1)	0.4 (0.2 – 0.7)*	0.7 (0.3 – 1.6)
Married	153 (47.5)	169 (52.5)		
Education				
Secondary, Graduate/Diploma or above	37 (22.4)	128 (77.6)	0.2 (0.1 – 0.3)*	0.3 (0.2 – 0.6)*
Illiterate and Primary	127 (62.6)	76 (37.4)		
Socio-economic Status				
Upper middle or upper class	28 (25)	84 (75)	0.3 (0.2 – 0.5)*	0.9 (0.5 – 1.6)*
Lower, lower middle or upper lower class	136 (53.1)	120 (46.9)		
Previous History of admission				
Yes	99 (71.7)	39 (28.3)	6.4 (4.0 – 10.3)*	3.0 (1.7 – 5.1)*
No	65 (28.3)	165 (71.7)		
Total	164 (44.6)	204 (55.4)		

*Significant at 0.05 level. $Controlling for other variables

6. Discussion

This study aimed to assess the prevalence of depression and anxiety among cardiovascular disease (CVD) patients

attending a tertiary care hospital in Mumbai. Mental health issues are often overlooked in patients with physical illnesses like CVD, but growing research shows a strong connection between mental and cardiac health [1, 2].

In our study, 47.8 % of patients were found to have some level of depression, and 44.6% showed signs of anxiety. These findings are consistent with previous studies from India and globally. A meta-analysis by Mensah et al. found similar rates of psychological distress in CVD patients, showing that around 31.3% of cardiac patients have depression and 32.9% have anxiety [4]. Our rates are slightly higher, which may reflect cultural, socioeconomic, and healthcare access differences in the Indian population.

In terms of severity, 14.13% had mild depression, 18.48% had moderate, and 5.43% had severe depression. For anxiety, 27.45% had mild, 22.01% moderate, and 12.23% severe anxiety.

These figures suggest that many patients experience moderate-to-severe psychological symptoms, which can negatively impact their recovery, adherence to treatment, and overall quality of life [2, 10, 12].

When looking at the demographics, the majority of patients were male (72%), aged between 50–64 years (44.83%), and married (87.5%). Most had a primary or secondary education, and belonged to lower-middle (33.7%) or upper-lower (27.17%) socioeconomic classes. Other studies also show that lower education and income levels are linked with higher rates of depression and anxiety [11, 13]. Gender-based findings in previous studies suggest that women may experience more psychological distress after heart disease, but in our study, the higher male representation might have influenced this [17].

It is well known that depression and anxiety can worsen cardiac outcomes by affecting lifestyle choices—patients may not take medications regularly, follow diet restrictions, or attend follow-ups [7, 11]. The American Heart Association (AHA) even recommends routine screening for depression in patients with coronary artery disease due to its effect on long-term outcomes [3].

The World Health Organization predicts that depression and ischemic heart disease will be among the top three causes of global disease burden by 2030 [16]. This makes early diagnosis and management of mental health issues in CVD patients even more critical.

Our findings highlight the need for routine mental health screening in cardiology OPDs and wards, especially in resource-limited settings. Tools like PHQ-9 and GAD-7 are quick, easy, and reliable to implement in clinical settings [6]. Providing mental health support alongside physical treatment can potentially improve recovery rates, reduce readmissions, and enhance patients' quality of life [12, 14].

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