IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 24, Issue 8 Ser. 6 (August. 2025), PP 39-43
www.iosrjournals.org

Evaluate the impact of admission depression on the short-term outcome of patients with ACS

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Abstract
Background: *Coronary heart disease is the leading cause of mortality and morbidity throughout the world. Acute coronary syndrome refers to any group of symptoms attributed to obstruction of coronary arteries. Depression is a leading cause of worldwide disability and suffering.*
Aim of the study: *The goal of this study was to assess the impact of on admission depression on short-term prognosis of patients presenting with ACS.*
Methods: *This observational cohort study was carried out in Department of Cardiology, Dhaka Medical College Hospital, Dhaka, Bangladesh from November 2017 to October 2018. Total 192 patients were comprised in the study. The study population were divided into two groups according to their depression level as found out by PHQ-9 score: Group A consisted of patients with any depression having PHQ-9 score ≥ 5 and group B consisted of patients with no depression having PHQ-9 score < 5. After collecting the data, it was edited, coded and entered into the computer. Statistical analysis of the study was done by computer software device as the Statistical Package for Social Science (SPSS) version 17.0.*
Results: *out of 192 patients, 61 (31.8%) patients were in the age group 41-50 years and 23 (12%) patients were in the low age group ≤40 years. Most of the patients (82.9%) in group A were in lower middle class with significant difference between the two group (p=0.04). diabetic patients were more in group A than group B with significant difference between the two groups (50% vs. 33.6% respectively, p value= 0.02). Dyslipidemia patients also had higher depressive symptoms than non-depressive patients (60% vs. 36.1%, p=0.001) with significant association.*
Conclusion: *This study found that prior existence of higher depression symptoms is connected with a poor short-term prognosis in ACS patients. Depression contributes to the pathogenesis and prognosis of CHD.*
Keywords: *Depression, coronary heart disease, ACS.*

I. INTRODUCTION

Coronary heart disease is the leading cause of mortality and morbidity worldwide [1] , and acute coronary syndrome is a group of symptoms caused by an obstruction of the coronary arteries [2]. In Southeast Asian countries, the prevalence of acute coronary syndrome is rapidly increasing due to the rising prevalence of risk factors for atherosclerosis, which is the primary cause of acute coronary syndrome [3]. Depression is the main cause of disability and suffering around the world [1]. After controlling for socioeconomic characteristics and health conditions, depression had the greatest impact on worsening mean health scores compared to the other chronic conditions. Depressive disorders were the fourth major cause of disability in 2005, the third leading cause in 2015, and the single largest contributor to non-fatal health loss worldwide [4]. It is a prevalent co-morbidity among coronary artery disease patients [4]. Depression is nearly three times as common among acute myocardial infarction (MI) patients as in the general population [5]. Depression has been associated to a number of cardiovascular risk factors, including diabetes, smoking, hypertension, and physical inactivity [6]. Depression has consistently surfaced as a prevalent co-morbidity in CHD patients [7]. Mental stress-induced myocardial

ischemia at baseline in CHD patients was related with considerably increased risks of eventual fatal and nonfatal cardiac events, regardless of age, baseline left ventricular ejection fraction (LVEF), or prior MI [8]. Multiple prospective investigations have established that endothelial dysfunction is an independent predictor of cardiovascular events in individuals with CVD [9]. Furthermore, patients with diminished HRV had a considerably increased risk of sudden mortality following an acute MI [10]. Depression's negative impact on cardiovascular disease is thought to be mediated via platelet pathways [11]. The combination of susceptible myocardium following MI, acute ischemia, and unpleasant emotional arousal has long been known to cause lethal ventricular arrhythmias [12]. Depressed patients with more than 10 PVCs per hour had a greater risk of sudden cardiac mortality than their no depressed counterparts [13]. Numerous prospective studies, comprehensive reviews, and meta-analyses have found a strong link between depression and increased morbidity and mortality following an ACS. However, depression has yet to be officially recognized as a risk factor for a poor outcome following ACS by national health organizations. So, in this investigation, the short-term prognostic significance of higher depressed symptoms on admission was evaluated in a general sample of patients hospitalized with ACS.

II. METHODOLOGY

This prospective observational study was conducted in the Department of Cardiology, Dhaka Medical College Hospital, Dhaka, from November 2017 to October 2018 to determine the effect of admission depression on the short-term (30 day) prognosis of patients presenting with an acute coronary syndrome. This study included two hundred and ten patients, both male and female, who had acute coronary syndrome. Eighteen patients had dropped out. Finally, 192 patients were included in the study. The study population was separated into two groups based on their depression level, as determined by the PHQ-9 score: Patients in Group A had a PHQ-9 score of ≥ 5, while those in Group B had a score of <5. After collecting the data, it was edited, coded and entered into the computer. Statistical analysis of the study was done by computer software device as the Statistical Package for Social Science (SPSS) version 17.0.

Inclusion criteria:

- Newly diagnosed acute coronary syndrome (STEMI, NSTEMI, UA) patients.
- Age above 18 years.
- Preserved capacity of comprehension or cognition.

Exclusion criteria:

- Patients unwilling to give consent.
- Acute coronary syndrome patients with history of use of illicit/recreational substances like heroine, amphetamine (yaba) etc.
- Previous history of CAD, PCI/CABG, primary myocardial or pericardial disease.
- Impaired capacity of cognition/comprehension.
- Diagnosis of depression or on antidepressant medications prior to the occurrence of ACS.
- Other co-morbid conditions like moderate to severe hepatic and renal impairment, malignancy, hypothyroidism etc.
- Patient was on antiepileptic drugs or steroids (more than 6 weeks) during last 2 months of index hospitalization.

III. RESULT

Table-1 shows that out of 192 patients, 61 (31.8%) patients were in the age group 41-50 years and 23 (12%) patients were in the low age group ≤ 40 years. The mean age of total population was 54.7±10.5 year. The mean age of group A and Group B patients were 54.5±10.9 and 55.4±9.1 years respectively with no significant difference (p=0.60). Out of 192 patients, 139 (72.4%) were male and 53 (27.6%) patients were female. The table indicates that female patients were more in group A with no significant difference between two groups (p=0.36). Table-2 shows most of the patients (82.9%) in group A were in lower middle class with significant difference between the two group (p=0.04). Table-3 shows business men were more in group A than group B (37.1% vs 11.5% respectively) with significant difference ($p<0.001$). Table-4 shows that diabetic patients were more in group A than group B with significant difference between the two groups (50% vs. 33.6% respectively, p value= 0.02). Dyslipidemia patients also had higher depressive symptoms than non-depressive patients (60% vs. 36.1%, p=0.001) with significant association. Smoker patients had more depressive symptoms but failed to get the level of significance (p=0.39). The remaining risk factors had no association with depressive symptoms. Table-5 shows that re-hospitalization needed in group A patients was higher than that of group B (21.4% vs. 5.7%, p=0.001) in percentage with strongly significant association. There were 5 (7.1%) patients died in group A and 2 (1.6%) patients died in group B with significant difference between two groups (p=0.04). Table-6 shows that for smoker, the reference group is non-smoker. A smoker compared to a non-smoker was 4.59 (95% CI 1.02 to 20.54) times

more likely to have adverse cardiac events. For STEMI patient, the reference group is patients with NSTEMI and UA. A STEMI patient compared to a subject with NSTEMI or UA was 4.89 (95% CI 1.59 to 15.09) times more likely to have adverse cardiac event. For LVEF<45%, the reference group is those patients with LVEF≥45%. A subject with LVEF<45% was 3.25 (95% CI 1.15 to 7.31) times higher risk of having adverse cardiac events than those with LVEF≥45%. For patients with any depression (PHQ-9≥5), the reference group is those with no depression (PHQ-9 score<5). A subject with any depression during index hospitalization was 2.99 (95% CI 1.13 to 7.92) times more likely to have adverse cardiac events than those with no on admission depression.

Table-1: Age and gender distribution of study population and association with on admission depressive symptoms (N=192)

Characteristics	Group A (n=70)		Group B (n=122)		Total (N=192)		P value
	No.	%	No.	%	No.	%	
Age (years)							
≤40	5	7.1	18	14.8	23	12.0	
41-50	29	41.4	32	26.2	61	31.8	
51-60	19	27.1	36	29.5	55	28.6	0.60^{ns}
>60	17	24.3	36	29.5	53	27.6	
Mean ± SD	**54.5±10.9**		**55.4±9.1**		**54.7±10.5**		
Gender	48	68.6	91	74.6	139	72.4	0.36^{ns}
Male	22	31.4	31	25.4	53	27.6	
Female							

Table -2: Income status of the study population and association with on admission depressive symptoms (N=192)

Characteristics Family income(taka/month)	Group A (n=70)		Group B (n=122)		Total (N=192)		P value
	No.	%	No.	%	No.	%	
Low class ≤7000	0	0.0	31	25.4	31	16.1	
Lower middle 7001-27000	58	82.9	85	69.7	143	74.5	**0.04^{s}**
Upper middle >27000	12	17.1	6	4.9	18	9.4	

Table-3: Occupation status of the study population and association with on admission depressive symptoms (N=192)

Occupation	Group A (n=70)		Group B (n=122)		Total (N=192)		P value
	No.	%	No.	%	No.	%	
Business	26	37.1	14	11.5	40	20.8	**<0.001^{s}**
Service	9	12.9	19	15.6	28	14.6	0.60^{ns}
Retired	11	15.7	28	23.0	39	20.3	0.23^{ns}
House wife	14	20.0	30	24.6	44	22.9	0.46^{ns}
Physical labour	6	8.6	22	18.0	28	14.6	0.07^{ns}
Unemployed	4	5.7	9	7.4	13	6.8	0.88^{ns}

Table-4: Association of on admission depression status and atherosclerotic risk factors of study subjects (N=192)

Risk Factors	Group A (n=70)		Group B (n=122)		Total (N=192)		P value
	No.	%	No.	%	No.	%	
Hypertension	33	47.1	62	50.8	95	49.5	0.62^{ns}
Diabetes mellitus	35	50.0	41	33.6	76	39.6	**0.02^{s}**
Smoking	36	51.4	55	45.1	91	47.4	0.39^{ns}
Obesity	5	7.1	8	6.6	13	6.8	0.87^{ns}
Dyslipidemia	42	60.0	44	36.1	86	44.8	**0.001^{s}**

Table-5: Association of on admission depression status of study subjects with adverse cardiac event (N=192)

Adverse cardiac event	Group A (n=70)		Group B (n=122)		P value
	No.	%	No.	%	
Re-hospitalization	15	21.4	7	5.7	**0.001[s]**
Death	5	7.1	2	1.6	**0.04[s]**

Table-6: Multiple logistic regression analysis for adverse cardiac events with confounding factors

Variables of interest	Regression coefficient (β)	Odds Ratio (OR)	95% CI of OR	P value
Age (>50 years)	0.866	2.38	0.780 – 7.248	0.13[ns]
Male gender	-2.513	0.08	0.017-0.388	0.002
Smoking	**1.525**	**4.59**	**1.028 – 20.548**	**0.04[s]**
Hypertension	-0.129	0.78	0.349 - 2.215	0.87[ns]
Diabetes mellitus	-0.395	0.67	0.213 – 2.126	0.50[ns]
Dyslipidemia	0.261	1.29	0.495 – 3.405	0.59[ns]
Obesity	0.121	1.26	0.049 – 5.918	0.31[ns]
STEMI	**1.589**	**4.89**	**1.591 – 15.090**	**0.006[s]**
LVEF<45%	**1.175**	**3.25**	**1.155-7.314**	**0.01[s]**
Any depression (PHQ-9≥5)	**1.097**	**2.99**	**1.133 – 7.915**	**0.02[s]**

IV. DISCUSSION

The study found that the average age was 54.7±10.5 years, with a range of 27 to 75 years. Most patients were between the ages of 41 and 50. Hasan et al. (2013) showed a similar pattern of age distribution, with the population's mean age being 55.5±9.5 years [13]. This conclusion, early onset ACS in relation to age, is consistent with prior studies, which revealed that Asian people were more prone to develop their first myocardial infarction (MI) 5-10 years earlier than other communities [14]. In our investigation, males made up 72.4% of the 192 ACS patients, which was consistent with most prior studies [13]. Our study indicated that work and poor family income were substantially related with depression symptoms. Businessmen were more likely to be in group A compared to group B (37.1% vs 11.5%, p<0.001). This suggests that patients who are businessmen have much higher depression symptoms. Godin et al. (2005) found a clear graded association between cumulative occupational stress and all five mental health indicators in both men and women. In this study, depression was linked to low family income [15]. The lower middle class had more depressive patients than the upper middle class (82.9% vs. 17.1%, p=0.04). A review of important research conducted in African and Asian nations found that low socioeconomic status (SES) and poverty are risk factors for serious depression [2]. In this study, dyslipidemia was substantially related with increased depression symptoms. The number of dyslipidemia patients was substantially larger in group A than in group B (60% vs. 36.1%, p=0.001). This is consistent with the findings of a recent study of 2126 patients with depression and anxiety in the Netherlands, in which van Reedt Dortland et al. (2013) and his colleagues discovered that people with initial severe symptoms of depression or anxiety had a subsequent decrease in HDL cholesterol levels and an increase in abdominal obesity over a two-year follow-up period [16]. As a result, they found that such patients have an increased risk of dyslipidemia and obesity, which predisposes them to cardiovascular disease. In this study, we discovered that STEMI was an independent predictor of mortality and re-hospitalization (OR 4.89, 95% CI 1.59 -15.09, P <0.006) after 30 days follow-up. This is consistent with a six-month cross-sectional observational study conducted in the Department of Cardiology, BIRDEM General Hospital, Dhaka by Rahman et al. (2012) and her colleagues, who concluded that short-term complications were relatively higher in ST elevated MI [17]. Patients with LVEF <45% had a greater risk of adverse cardiac events compared to those with LVEF ≥45%. Patients with LVEF <45% were nearly three times more likely to experience unfavorable cardiac events, according to multivariate analysis (CI 1.16-7.51, p=0.02). Chew et al. (2018) found that patients with no LVEF recovery after MI are at a high risk of abrupt cardiac arrest and mortality [18]. This study found that current smokers had a significantly increased risk of adverse cardiac events at a one-month

follow-up (OR 4.59, CI 1.028 - 20.548, P<0.04). A very recent study entitled "current smoking and prognosis after acute ST-segment elevation myocardial infarction: new pathophysiological insights" done by Haig et al. (2018) revealed that at two days post MI smoking independently predicted myocardial infarct zone hemorrhage (OR:2.76; 95% CI: 1.42 to 5.37; p=0.003) [19]. Finally, Haig et al. (2018) concluded that smoking is associated with increased inflammation, acute infarct-zone bleeding, and long-term poor cardiac outcomes [19]. Current smoking is linked to an increased risk of poor cardiac outcomes in HFpEF, including hospitalization for heart failure [2]. In a subsequence cross-sectional study, the authors discovered that improvements in depression during the first month after ACS led to greater medication adherence over the next two months, clearly suggesting depression as a causal element in this connection [7]. Heart disease and depression frequently share symptoms such as weariness, poor energy, and difficulty sleeping and keeping up with daily routines. So it's not surprising that the patient, his or her family, and the cardiologist may mistake depression symptoms for heart problems. Physicians must grasp the necessity of treating depression, as it is treated differently from cardiac illness.

Limitation of the study:
This is a single-center study that used purposeful sampling rather than random sampling.

V. CONCLUSION & RECOMMENDATION

This study found that prior existence of higher depression symptoms is connected with a poor short-term prognosis in ACS patients. Depression contributes to the pathogenesis and prognosis of CHD. If future studies show that treating patients who screen positive for depressive symptoms during an acute hospitalization for ACS improves short-term outcomes, policymakers should increase support for mental health screening as an integral component of ACS patient management, particularly in the post-discharge rehabilitation schedule.

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