

## Frequency & Predictors of Depression in Patients of Chronic Heart Failure with Reduced Ejection Fraction (HFrEF)

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### Abstract:

**Background:** Clinically significant depression is estimated to occur in a significant portion of chronic heart failure (CHF) patients and increases sharply with increase in heart failure severity. However, the frequency and predictors of depression in this group of patients are underreported. This study was designed to assess frequency & predictors of depression in patients of chronic heart failure with reduced ejection fraction (HFrEF).

**Methods:** This cross-sectional analytical study was performed in the department of Cardiology, Dhaka Medical College Hospital, Dhaka, during the period from October'2018 to Septemeber'2019. One hundred and fifty-two CHF patients with reduced ejection fraction (<40%) either admitted in the department of Cardiology or attended Cardiology OPD, Dhaka Medical College Hospital (DMCH), Dhaka who fulfilled the selection criteria were included into the study. A translated and validated Patient Health Questionnaire (PHQ-9) in Bengali was used to assess depression level in CHF patients in this study. Informed written consent was taken from each patient. Approval for the study was taken from Ethical Review Committee (ERC) of Dhaka Medical College before commencement of the study. After compiling data from

all participants, statistical analyses were performed using the Statistical Package for Social Science (SPSS), version 22.0 for windows.

**Results:** Mean age of the patients was 58.68±9.40 years, ranging from 36 to 75 years. Male predominance was noted (72% vs 28%). Overall, frequency of depression was 56%. Among the depressed patients (n=85), majority (40%) had minimal depression while 27%, 19% and 14% had mild, moderate and severe depression, respectively. Among the different risk factors, DM and sedentary lifestyle were significantly associated with depression (p<0.05). Age >65 years, sedentary lifestyle and H/O past MI were independently associated with depression among chronic HErEF patients. Widowed patients, diabetes, hospital readmission in last 2 months before study inclusion and NYHA class III/IV were also significantly associated with depression among patients with chronic HFrEF (p<0.05).

**Conclusion:** More than half of the patients with chronic HFrEF had concurrent depression of varied severity. Proper care of depression along with HF may improve the survival and quality of life of these patients.

**Keywords:** Depression, heart failure

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### Introduction:

Chronic Heart failure (CHF) is a prevalent debilitating disease of poor prognosis in which heart cannot fill with or eject the sufficient amount of blood that is required due to structural or functional cardiac disorder.<sup>1</sup> Heart failure prevails now in the form of a pandemic across the world and a serious threat to the health and financial wellbeing of the people. It is a major cause of hospitalization, morbidity, and mortality that affects >23 million people worldwide.<sup>2,3,4</sup> It affects approximately 6% of people aged between 60 and 86 years. Personal, economic and health care burden of heart failure is expected to increase more in the future as life expectancy of people increases, placing further pressure on the finite health care resource.<sup>4</sup>

Bangladesh is passing through an epidemiological transition. Following the world trend, the burden of infectious diseases are coming down while with increased life expectancy and widespread changes of lifestyles, non-communicable diseases have been on the rise in this region. But there is a paucity of data in Indo-Asians particularly in Bangladesh on characteristics of heart failure patients. Nevertheless, from a study of Bangladesh, about one-seventh of total admitted patients in a tertiary level cardiac hospital were found to be have HF.<sup>5</sup>

Depression is a common psychiatric disorder characterized by the presence of low mood or loss of interests associated with several other features that are present almost daily for at least two weeks.<sup>6</sup> It is a common comorbidity in heart failure patients. Frequency of depression in patients with chronic heart failure ranges from 13–77.5%. Depression is 4–5 times common in heart failure patients than in the general population and it might confer a higher risk of developing heart failure and negatively affect prognosis in established heart failure.<sup>1</sup> Depression increases sharply with increase in heart failure severity. Depressed heart failure patients experience a more rapid loss of physical function, poorer health-related quality of life, more frequent readmissions, and higher mortality rates than non-depressed heart failure patients.<sup>1,7</sup> For these reasons, depression is a first-order problem that should be approached within a comprehensive care program for the patients with chronic heart failure.<sup>8</sup>

The main precipitating factors associated with depression in CHF patients are age, gender, educational and economic status as well as the stage and the onset of the disease.<sup>6</sup> Previous MI, NYHA stage 3 or 4, living without a partner, absence of joint family system,

sedentary lifestyle, hospital readmission have also been associated with depression in CHF patients.<sup>9</sup> Shimizu et al. predicted that the presence of previous ischaemic heart disease, participation restriction and lack of satisfaction with social support increases the risk of developing depressive symptoms by 70%, and patients are likely to develop such symptoms at one year.<sup>7</sup>

The definite mechanism which causes depression in CHF patients is not exactly known, yet the raised levels of catecholamines, cortisol and inflammatory cytokines (IL-6, IL-1 $\alpha$ , TNF- $\alpha$ ) in both the diseases might somewhat explain the pathophysiology.<sup>9,10</sup> Four different mechanisms have been proposed for the progression of CHF in depressed patients. Firstly, hypersecretion of cortisol and sympathetic hyperactivity in response to hypothalamic stimulation; secondly, reduced parasympathetic response leading to increased chances of arrhythmias; thirdly, rise in pro-inflammatory cytokines causing inflammation, and fourthly, hypercoagulability due to defective platelet activation.<sup>9,11</sup> CHF is a multi-organ disorder involving skeletal, renal, neuroendocrine and immune systems along with the heart. Cytokines like TNF- $\alpha$ , IL-1, IL-6 and macrophage chemo-attractant protein (MCP)-1 play a significant role in its development.<sup>12</sup> Similarly, depression and emotional distress have also been linked to abnormal immune responses peripherally and increased expression of pro-inflammatory cytokines which profoundly effects the brain and peripheral serotonin-mediated systems.<sup>13</sup>

Increasing or new-onset depressive symptoms have been associated with worse outcomes in CHF patients.<sup>7</sup> Depression was found to be an independent risk factor for mortality in CHF and this persists independent of NYHA class.<sup>14</sup> Clinical depression can worsen compliance with cardiac medication regimens and also causes less adherence to other recommendations, including dietary modifications, exercise, smoking cessation and attending cardiac rehabilitation programs. The meta-analysis by Rutledge, et al. found that the presence of depression in a patient with chronic heart failure predicts worse outcomes in terms of hospital readmission rates, functional status, and walk times. This analysis also found twice the rate of death in heart failure patients with depression compared to heart failure patients without depression.<sup>15</sup>

Psychological interventions and pharmacological or non-pharmacological treatment of depression may lead to a substantial decrease in morbidity and perhaps in mortality among patients with heart failure.<sup>1</sup> Considering the fact stated above, our aim of the study was to

determine the frequency & predictors of depression in patients with heart failure with reduced ejection fraction (HFrEF) as it is vital in planning the wholesome treatment in these patients.

**Methods:**

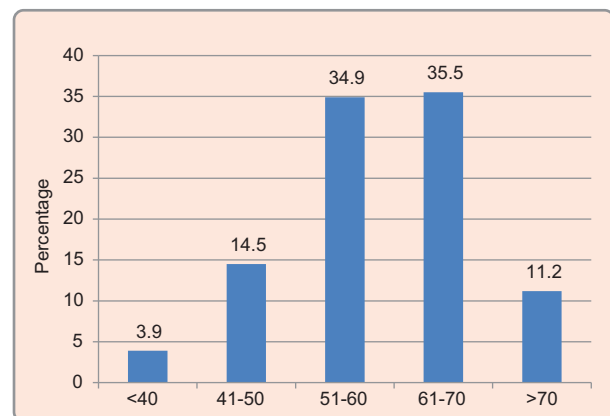
This cross-sectional analytical study was conducted at the Department of Cardiology, Dhaka Medical College Hospital (DMCH), Dhaka between October, 2018 to September, 2019. The study protocol was approved by Ethical Review Committee (ERC) of Dhaka Medical College and Hospital. Patients of chronic heart failure (more than 6 months) with reduced ejection fraction (LVEF < 40%) admitted in the department of Cardiology or attended in Cardiology OPD, DMCH, within the study period, fulfilling the inclusion and exclusion criteria were included in this study by convenient purposive sampling. Study subjects having acute coronary syndrome (ST elevation MI, Non-ST elevation MI, Unstable angina), recent major surgeries, other co-morbid conditions like moderate to severe hepatic or renal impairment, malignancy, hypothyroidism, Parkinson’s disease and other chronic illness etc., history of use of alcohol or other illicit/ recreational substances, prior use of anti-depressant medications, anti-epileptic or steroids (more than 6 weeks) during last 2 months, pregnancy and unwilling to be included in the study were excluded. The study subjects were assessed first by attending doctor and then was evaluated by the principal investigator. Detailed clinical history, physical examination, relevant investigations were done and required data were recorded in preformed data collection sheet. Each participant signed a consent form prior to data collection. Information on age, sex, marital status, income level and health status information like diabetes, hypertension, dyslipidemia, smoking history, sedentary lifestyle, previous MI and number of hospital readmissions, mean time since diagnoses was collected. Hospital readmission was specified for exacerbation of symptoms of CHF within last two months before study inclusion. The NYHA functional classification was done according to participants’ severity of limitation. It ranges from I (no limitation of physical activity) to II (Slight limitation in physical activity; comfortable at rest, but moderate physical activity results in limitation) to III (marked limitation of physical activity; symptoms are caused by less than ordinary activities) to IV (unable to carry on any physical activity without discomfort). Enrolled patients were subsequently assessed for the presence and severity of depressive

symptoms during the last two weeks from the study inclusion by using a 9-item depression screening tool, the Patient Health Questionnaire-9 (PHQ-9). The PHQ-9 consists of nine items in line with the DSM-IV criteria for major depression (i.e. Loss of interest, feeling down, sleeping problems, loss of energy, appetite change, feelings of failure, trouble concentrating, psychomotor change, suicidal ideations). Each item is scored on a scale from 0 (not at all) to 3 (nearly every day) with a total score ranging from 0 to 27. PHQ-9 scores (5-9) suggest mild depression, (10-14) suggest moderate depression, (15-19) suggest moderately severe depression and (20-27) suggest severe depression.<sup>16</sup> The process of assessing of depressive symptoms by this tool was evaluated and approved by the department of Psychiatry of DMCH. After compiling data from all patients, statistical analysis was done. Sociodemographic variables and other factors related to heart failure were compared in between heart failure patients with depression & without depression in order to identify the predictors of depression.

**Results:**

One hundred and fifty-two chronic heart failure patients with reduced ejection fraction either admitted in the department of Cardiology or attended Cardiology OPD, Dhaka Medical College Hospital (DMCH), Dhaka who fulfilled the selection criteria were included in the study.

Mean age of the patients was 58.68±9.40 years, ranging from 36 to 75 years. Majority (35.5%) of the patients belonged to 61–70 years age group, followed by 51–60 years age group (34.9%).



**Figure 1:** Age distribution of patients (n=152)

In our study, 72% (110) were male and 28% (42) were female. Male and female ratio was 2.6:1.

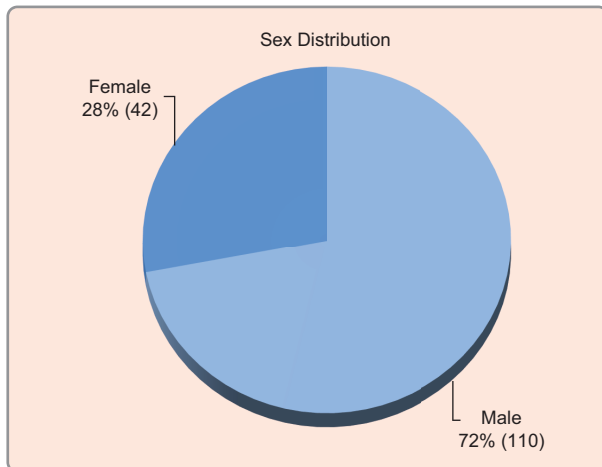


Figure 2: Pie chart of sex distribution of patients (n=152)

In this study, 77.6% (118) patients were married, 18.4% (28) were widowed, 2% (3) were divorced and 2% (3) were single.

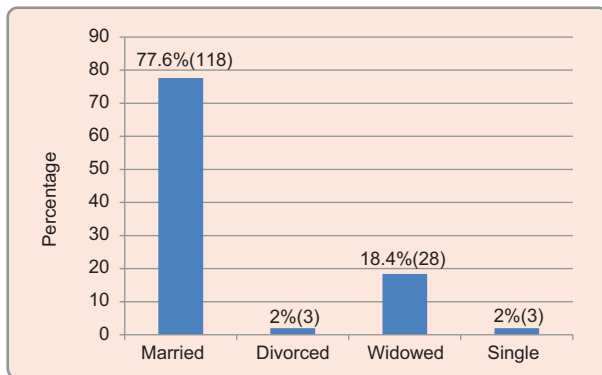


Figure 3: Marital status of patients (n=152)

Among study subjects, 58% (88) came from low-income group, followed by 28% (43) from lower-middle income group and 14% (21) from upper-middle income group. None belonged to high income group.

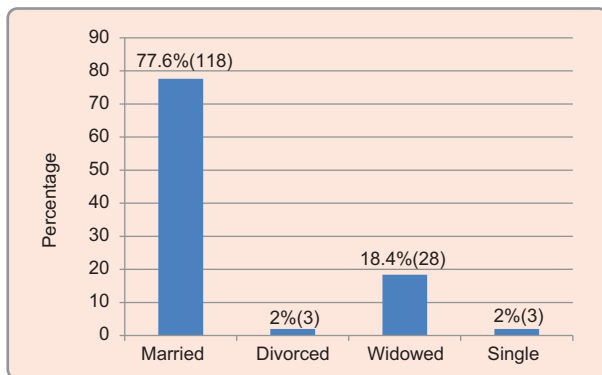


Figure 4: Socioeconomic Status of patients (n=152)

Among 152 patients, most commonly associated risk factors in heart failure patients were HTN (64.5%), sedentary lifestyle (64.5%) and diabetes (62.5%).

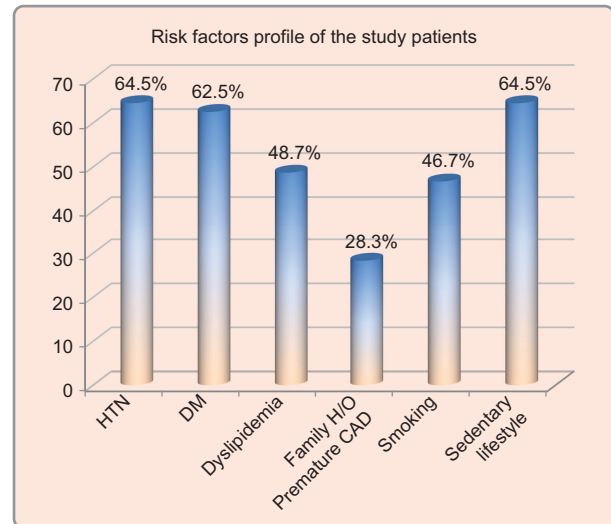


Figure 5: Risk factors profile of the study patients (n=152)

Among all patients, 51% (78) had past history of myocardial infarction (MI) and 49% (74) had no prior history of MI.

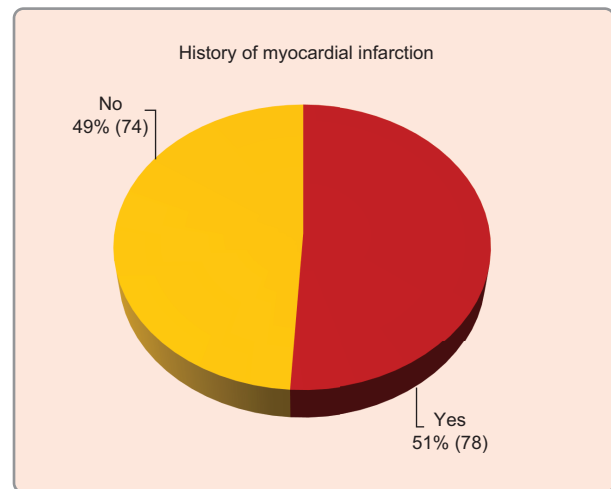
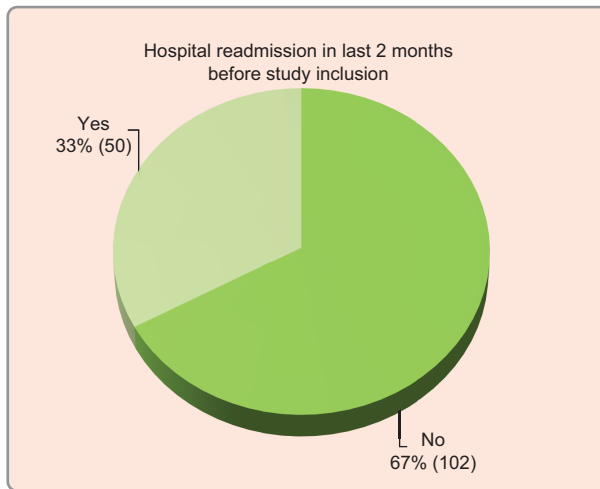
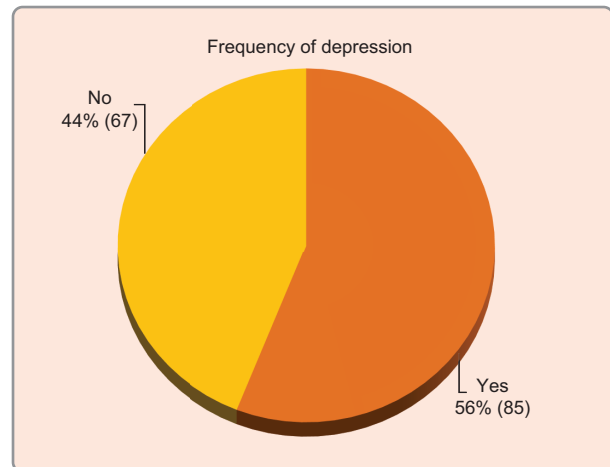


Figure 6: Distribution of patients according to past history of myocardial infarction (MI) (n=152)

Among all patients, 33% (50) had history of readmission in the hospital within last 2 months before study inclusion and 67% (102) had no such history.



**Figure 7:** Frequency of patients who was re-admitted in hospital in last 2 months before study inclusion (n=152)



**Figure 8:** Distribution of patients according to frequency of depression (n=152)

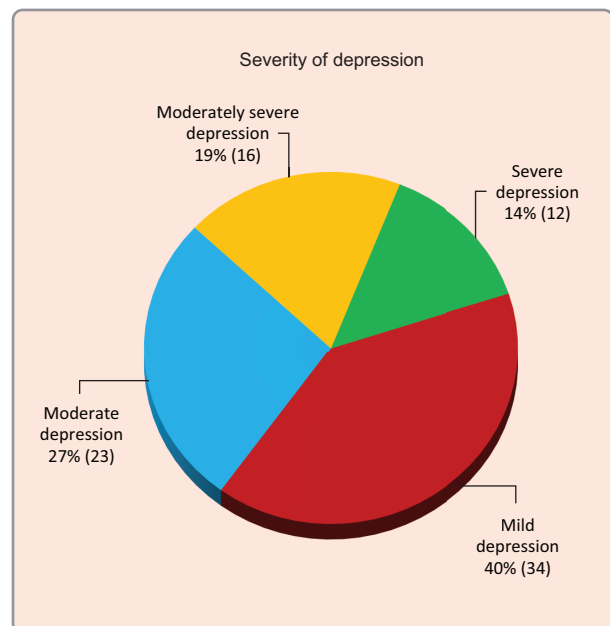
Table I shows that among all patients, according to NYHA class of heart failure, 17.8% (27), 45.4% (69), 25.0% (38) and 11.8% (18) patients had class I, II, III and IV heart failure respectively. Mean duration of heart failure was 1.25±0.98 years, ranging from 0.5-5.0 years. Mean ejection fraction was 35.67±2.37%, ranging from 26-39%.

**Table I**  
Characteristics of heart failure of patients (n=152)

	Frequency	Percentage
NYHA class of heart failure		
Class I	27	17.8%
Class II	69	45.4%
Class III	38	25.0%
Class IV	18	11.8%
	Mean±SD	Range
Duration of heart failure (years)	1.25±0.98	0.5 – 5.0
Ejection fraction (%)	35.67±2.37	26 – 39

Among all patients, 56% (85) had depression (PHQ-9 ≥5) of varied severity according to Patients Health Questionnaire-9 (PHQ-9). 44% (67) patients had no depression (PHQ-9 <5).

Among 85 depressed patients, 40% (34) had mild depression, while 27% (23), 19% (16) and 14% (12) had moderate, moderately severe and severe depression respectively.



**Figure 9:** Pie diagram showing distribution of depressed patients according to severity (n=85)

In our study, patients who were depressed were significantly older than non-depressed patients (62.25±6.80 vs 54.14±10.29 years, p<0.001). Patients with age >65 years were significantly associated with depression (p<0.001). Patients who were widowed/ divorced/ single were found more depressed significantly (p<0.001). No relationship of sex and socioeconomic status with depression was noted.

**Table-II**  
*Comparison of sociodemographic profile in HFrEF patients with and without depression (n=152)*

Variable	Depression		Total (n=152) n (%)	P value
	Present (PHQ-9 ≥5) (n= 85)n (%)	Absent (PHQ-9 <5) (n=67) n (%)		
Age in years, mean±SD	62.25±6.80	54.14±10.29	58.68±9.40	* <0.001 <sup>s</sup>
Age groups				
> 65	34 (40%)	10 (14.9%)	44 (28.9%)	**<0.001 <sup>s</sup>
≤65	51 (60%)	57 (85.1%)	108 (71.1%)	
Sex				
Male	61 (71.8%)	49 (73.1%)	110 (72%)	**0.851 <sup>ns</sup>
Female	24 (28.2%)	18 (26.9%)	42 (28%)	
Marital Status				
Married	55 (64.7%)	63 (94.0%)	118 (77.6%)	**<0.001 <sup>s</sup>
Widowed/divorced/single	30 (35.3%)	4 (6.0%)	34 (22.4%)	
Socioeconomic status				
Low-income	50 (58.8%)	38 (56.7%)	88 (58%)	**0.934 <sup>ns</sup>
Lower-Middle income	24 (28.2%)	19 (28.4%)	43 (28%)	
Upper-Middle income	11 (12.9%)	10 (14.9%)	21 (14%)	

p value determined by unpaired samples \*Student's t test and \*\*Chi-square test as appropriate.

s = Significant (p<0.05), ns = Not significant (p>0.05).

Among risk factors of IHD, diabetes mellitus (DM) and sedentary lifestyle were significantly associated with depression (P<0.001).

**Table-III**  
*Comparison of risk factors of IHD in HFrEF patients with and without depression (n=152)*

Risk factors	Depression		Total (n=152) n (%)	P value
	Present (PHQ-9 ≥5) (n= 85)n (%)	Absent (PHQ-9 <5) (n=67) n (%)		
Hypertension	58 (68.2%)	40 (59.7%)	98 (64.5%)	0.275 <sup>ns</sup>
DM	64 (75.3%)	31 (46.3%)	95 (62.5%)	<0.001 <sup>s</sup>
Dyslipidaemia	41 (48.2%)	33 (49.3%)	74 (48.7%)	0.901 <sup>ns</sup>
Smoking	41 (48.2%)	30 (42.3%)	71 (46.7%)	0.671 <sup>ns</sup>
Family H/O premature CAD	26 (30.6%)	17 (25.4%)	43 (28.2%)	0.478 <sup>ns</sup>
Sedentary lifestyle	68 (80%)	30 (44.8%)	98 (64.5%)	<0.001 <sup>s</sup>

p value determined by Chi-square test

s = Significant (p<0.05), ns = Not significant (p>0.05).

Majority patients had IHD as cause of heart failure accounting for 77% of the heart failure. None of the causes were significantly associated with depression (P>0.05).

**Table-IV**  
*Comparison of etiology in chronic HF<sub>rEF</sub> patients with and without depression (n=152)*

Etiology	Depression		Total (n=152) n (%)	P value
	Present (PHQ-9 ≥5) (n= 85)n (%)	Absent (PHQ-9 <5) (n=67) n (%)		
IHD	64 (75.3%)	53 (79.1%)	117 (77%)	0.580 <sup>ns</sup>
DCM	18 (21.1%)	11 (16.4%)	29 (19%)	0.459 <sup>ns</sup>
VHD	3 (3.6%)	3 (4.5%)	6 (4%)	0.766 <sup>ns</sup>

p value determined by Chi-square test  
s = Significant (p<0.05), ns = Not significant (p>0.05).

Past history of MI and hospital readmission within last 2 months before study inclusion were significantly associated with depression (p <0.05).

**Table-V**  
*Comparison of history of MI and hospital readmission in HF<sub>rEF</sub> patients with and without depression (n=152)*

Variable	Depression		Total (n=152) n (%)	P value
	Present (PHQ-9 ≥5) (n= 85)n (%)	Absent (PHQ-9 <5) (n=67) n (%)		
Past H/O MI	55 (64.7%)	23 (34.3%)	<0.001 <sup>s</sup>	
Hospital readmission within last 2 monthsbefore study inclusion	36 (42.4%)	14 (20.9%)	0.005 <sup>s</sup>	

p value determined by Chi-square test  
s = Significant (p<0.05), ns = Not significant (p>0.05).

Among class I, II, III and IV NYHA heart failure patients, 33.3%, 50.7%, 71.1% and 77.8% had depression respectively. This indicates that an increasing class of heart failure was significantly associated with increasing frequency of depression (p<0.05).

**Table-VI**  
*Comparison of NYHA class of heart failure in HF<sub>rEF</sub> patients with and without depression (n=152)*

NYHA classification	Depression		Total (n=152) n (%)	P value
	Present (PHQ-9 ≥5) (n= 85)n (%)	Absent (PHQ-9 <5) (n=67) n (%)		
Class I		9 (33.3%)	18 (66.7%)	0.004 <sup>s</sup>
Class II		35 (50.7%)	34 (49.3%)	
Class III		27 (71.1%)	11 (28.9%)	
Class IV		14 (77.8%)	4 (22.2%)	

p value determined by Chi-square test  
s = Significant (p<0.05), ns = Not significant (p>0.05).

The multivariate analysis showed that age >65 years, sedentary lifestyle and past history of MI were independently associated with depression among HF<sub>rEF</sub> patients with Odds Ratio (OR) 5.549, 4.692, 8.451 respectively.

**Table-VII***Multivariate logistic regression of different risk factors for development of depression in HFrEF patients (n=152)*

Risk factors	OR	95%CI		p value
		Lower bound	Upper bound	
Age >65 years	5.549	1.115	27.607	0.036 <sup>s</sup>
Unmarried/ widowed/ single	2.031	0.324	12.746	0.449 <sup>ns</sup>
DM	0.335	0.094	1.202	0.094 <sup>ns</sup>
Sedentary lifestyle	4.692	1.457	15.105	0.01 <sup>s</sup>
H/O Past MI	8.451	4.889	13.933	0.002 <sup>s</sup>
H/O of hospital readmission	3.975	0.483	32.72	0.199 <sup>ns</sup>
NYHA Class III/IV HF	0.053	0.002	1.144	0.061 <sup>ns</sup>

H/O: History of; NYHA: New York Heart Association; HF: Heart failure;  
s = Significant (p<0.05), ns = Not significant (p>0.05).

### Discussions:

This study included 152 patients of chronic heart failure with reduced ejection fraction (HFrEF) who had their ejection fraction <40%, to find out the frequency and predictors of depression among them.

Mean age of the participants was 58.68±9.40 years, ranging from 36 to 75 years. Majority patients belonged to age group 61–70 years (35.5%). Nearly 70% of the patients were between 51 to 70 years. This is comparable with the findings of a study conducted in BSMMU in 2016, where a mean age of 55±14 years was recorded among patients of congestive heart failure.<sup>17</sup> In their study majority patients were aged between 51–60 years (42.2%) with 61.8% patients falling within the age range 51–70 years. Another study conducted on heart failure patients to see the effect of albumin infusion found that 60% patients were aged between 51–70 years.<sup>18</sup> Rahman, et al. (2019) conducted demographic study on heart failure patients with preserved ejection fraction (HFpEF) and found a mean age of 65±10.1 years with majority falling into age group 60 to 79 years. This might be due to probability of living longer of HFpEF patients than HFrEF patients.<sup>19</sup>

Most of the patients were male in this study constituting 72% of the study population giving a male-female ratio of 2.6:1. Abedin, et al. (2016) found a similar proportion of male and female in their study (respectively 66.7 and 33.3%).<sup>17</sup> Rahman, et al. (2019) found 60% male in their study.<sup>19</sup> A study similar to present study conducted by Zahid, et al. (2018) found 73.5% male patients among the sample population.<sup>9</sup>

In this study 77.6% were married, 18.4% widowed, 2% divorced and 2% single. Although married patients were less, if widowed & divorced patients were considered

married, it would give a figure of 98% which is similar to that (98%) found by Abedin and coresearchers.<sup>17</sup>

In this study, 58%, 28% and 14% patients belonged to low income, lower-middle income and upper-middle income group respectively. Highest proportion of patients came from low-income group which is consistent with the findings of Zahid, et al. (2018) where they found 61.2% patients were from low socio-economic group.<sup>9</sup> Low socioeconomic status is associated with increased incidence of heart failure worldwide.<sup>20</sup> Hence, socioeconomic deprivation is a powerful independent predictor of heart failure.

In this study, risk factors most commonly associated with HFrEF were hypertension and sedentary lifestyle (64.5% each), DM (62.5%), dyslipidaemia (48.7%) & smoking (46.7%). Talukder, et al. (2019) in their study found risk factors in following order: HTN (48%), smoking (40%), DM (28%), dyslipidaemia (24%).<sup>18</sup> Zahid et al. (2018) found that HTN (60.5%), DM (57.6%), sedentary lifestyle (53.5%) and smoking (42.9%) were common associated risk factors.<sup>9</sup> All these studies showed that hypertension was the most common comorbidity among heart failure patients.

The present study found 51% patients with past history of myocardial infarction and 33% patients with history of readmission in hospital within last 2 months of study inclusion. This is nearly similar to the findings of Zahid et al. (2018). They found previous history of myocardial infarction in 46.4% patients and at least 1 hospital readmission in last 2 months in 25.9% patients.<sup>9</sup>

In this study, majority of patients had NYHA class II heart failure (45.4%), followed in decreasing order by 25% class III, 17.8% class I and 11.8% class IV patients. This pattern is similar to that of Haworth, et al. (2005) who



found 65% class II, 26% class III, 8% class I and 1% class IV patients in an outpatient study.<sup>21</sup> In another study, Sherwood, et al. (2011) found 59 & 37% class II & III patients respectively.<sup>22</sup>

The frequency of depression has been shown to be extremely high in the present study, with 56% of the participants labeled as depressed. Zahid et al. (2018) found a nearly similar 60% cases of depression among patients with chronic heart failure in their study.<sup>9</sup> Previous small studies have recorded varying prevalence ranging from 9% to 60%.<sup>23</sup>

Presence of depression makes treatment in heart failure patients more difficult and causes increase in NYHA class, hospitalization, and mortality rate.<sup>10,24</sup> A previous study demonstrated how depressive symptoms developed in 22% of CHF patients within one year post-discharge (Shimizu, et al., 2014) which partly explains that depression is more common in CHF patients.<sup>7</sup>

In this study, the risk factors associated significantly ( $p < 0.05$ ) with depression in HFrEF patients were age  $> 65$  years, previous MI, DM, sedentary lifestyle, increasing NYHA class, living without a partner, and hospital readmission within 2 months of study inclusion. The results were in line with a similar study which found a significant relation of age, previous MI, NYHA class III or IV, living without a partner, absence of a joint family system, sedentary lifestyle, hospitalization within the past 2 months, and hospital readmission with depression.<sup>9</sup> Another study predicted that the presence of previous ischaemic heart disease, participation restriction, and lack of satisfaction with social support alone increases the risk of developing depressive symptoms by 70%, and patients are likely to develop such symptoms in one year.<sup>7</sup> But multivariate logistic regression showed that age  $> 65$  years, sedentary lifestyle and past history of MI were the most significant predictors of depression among patients.

Living without a partner and social isolation have previously been found to be associated with depression in elderly people.<sup>25</sup> The present study found that being single is a significant risk factor for depression in patients with HFrEF. Nonetheless, a study by Shimizu, et al. (2014) did not find the same relation to be significant.<sup>7</sup> Although some individuals might be depressed due to lack of support because of being single or not living with family, other individuals find it positive to live alone, which explains how depression is a subjective phase which develops when level of relationship does not meet one's desire to bond.<sup>26</sup>

NYHA class is another factor that was significantly associated with depression in the study participants which is comparable with the findings of a meta-analysis performed in 2006 where higher prevalence rates were associated with higher NYHA functional class.<sup>15</sup> Moreover, it has been demonstrated that patients with NYHA class 3 and 4 are more likely to be depressed.<sup>27</sup> This study is analogous as it shows this group as having moderate to severe depression rather than mild to moderate depression, and the difference is significant.

Smoking<sup>28,29</sup> and hypertension<sup>27</sup> have previously been shown to be strongly associated with depression implying reduced desire for self-care and drug compliance, but it was not a significant predictor of depression in the chronic heart failure patients in this study. Rather, DM and sedentary lifestyle were found to be significantly associated with depression in present study. This finding is similar to the study done by Zahid, et al. (2018) which showed sedentary lifestyle was demonstrated as a risk factor of depression.<sup>9</sup> Physically active people are more likely to have a mentally healthy life. This could positively lead them away from depression.

This study revealed that diabetes was more prevalent among depressed patients than non-depressed patients with statistical significance (75.3% vs 46.3%,  $p$  value  $< 0.001$ ). Previously it was shown that depression among diabetic patients culminated into heart failure within a median follow-up of 1.5 years.<sup>30</sup> Majority patients had IHD as cause of heart failure accounting for 77% of the heart failure. None of the causes were significantly associated with depression ( $P > 0.05$ ).

The consequences of depression cannot be overlooked. It has been found to lower the quality of life and the survival rate.<sup>25</sup> Adelberg, et al. (2016) have shown that all-cause mortality increases in heart failure patients with ejection fraction  $< 35\%$ ,<sup>3</sup> and depressed patients were at risk for significant worsening of their HF symptoms, physical and social function, decline in health status and quality of life.<sup>31</sup> Accordingly, studies have suggested that treatment of depression can decrease morbidity and mortality in patients of HF.<sup>27</sup>

Therefore, comprehensive treatment strategies should be taken to deal with depression in patients of chronic heart failure with low ejection fraction to decrease morbidity and improve quality of life among them.

#### **Conclusion:**

Depression is common among patients with chronic heart failure. In this study, about 56% patients of chronic heart failure (CHF) with reduced ejection fraction ( $< 40\%$ )

suffered from different degrees of depression. Age >65 years, sedentary lifestyle and H/O past MI were independently associated with depression among chronic HErEF patients. Widowed, Diabetes, hospital readmission & NYHA class III/IV were also linked with higher prevalence of depression among patients with chronic HFrEF. So, Depression screening programme should be recommended as an integral part of management of chronic HFrEF patients.

#### Limitations of the study:

Although the result of this study supports the hypothesis, there are some facts to be considered which might have affected the result of the current study. It was a single center study. Study population was small. Purposive sampling was done instead of random sampling. Therefore, the results of the study may not reflect the exact picture of the country. Follow up of the patients for longer duration was beyond scope. Full psychiatric evaluation of the patients could not be done who were screen-positive.

#### Recommendations:

Chronic heart failure patients should be screened for depression. Early detection of depression in these patients is crucial to improve a patient's quality of life. Proper counseling and management of depression should be started promptly for the better outcome of the heart failure patients.

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