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Association of high BNP level with heart failure in patients presenting with STEMI.

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ABSTRACT… Objective: The objective of this study is to to determine the association of high BNP level with heart failure in patients presenting with STEMI. **Study Design:** Cohort Study. **Setting:** Department of Cardiology, Punjab Institute of Cardiology, Lahore. **Period:** 01 January 2017 to 30 June 2017. **Material & Methods:** After meeting the inclusion criteria 150 patients were enrolled. Informed consent and demographic information was taken. Then patients divided in two groups, high and normal BNP groups. Then patients were admitted in cardiology wards and were followed-up there for 5 days. Patients evaluated for symptoms of heart failure and underwent echocardiography for confirmation of presence or absence of heart failure. All the collected data was entered and analyzed on SPSS version 21. **Results:** In this study the mean age high BNP group was 48.87± 10.18 years while the mean age in normal BNP group was 48.99±12.15 years. Male to female ratio of the patients was 2:1. The heart failure occurred in 19(12.67%) patients. There is 1.58 times higher risk of heart failure in high BNP than normal BNP i.e. RR=1.58[1.14-2.19]. **Conclusion:** This present study concluded that high BNP level is strongly associated with heart failure in patients presenting with STEMI.

Key words: Cardiovascular Diseases, High BNP, Heart Failure, STEMI.

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INTRODUCTION

In developing countries one the major health burden is cardiovascular diseases. In Pakistan, there is rising trend of risk factors for coronary artery disease.[1] Rural areas of Pakistan bear the greatest burden of heart disease because 67.5% people live in these areas.[2] About 46% of patients admitted with CAD were having STEMI, of them 80% receive streptokinase while only 5.4% were subjected to primary or rescue PCI. In-hospital mortality is about 9%. Anterior wall MI was the most frequent Acute MI.[3]

The physiological response of pressure and volume overload of the ventricles is the release of Natriuretic peptides. Among the markers of left ventricular systolic dysfunction, B-type natriuretic peptide (BNP) has been proposed as a useful marker for the determination of diagnosis, severity and prognosis.[4] BNP also predicts the prognosis in patients with STEMI who underwent successful reperfusion and had preserved systolic function.[5,6]

It has been reported that percentage of heart failure was 3.8% in normal BNP group while 16.2% in high BNP group in STEMI patients ($p<0.05$).[7] But another study reported that percentage of heart failure was 4.7% with normal BNP level while 10.5% in high BNP group in STEMI patients ($p>0.05$).[8]

Rationale of this study is to find out the association of high BNP level with heart failure in patients presenting with STEMI. Literature showed that there is significant association of high BNP with heart failure during hospital stay. But varied results have been obtained from literature. But not much work has been done in this regard as well as there is no local study available in literature which could help us in determining the extent of problem in local population. Therefore, we want to conduct this study to get local data. So that in future we

can apply results of this study in local setting and can recommend the screening of STEMI patients for BNP level at emergency department and can predict the outcome. This will help us to plan strategy to alter some treatment protocol to prevent heart failure in STEMI patients with high BNP level and prevent heart failure and other complications.

MATERIAL & METHODS

This was Cohort study conducted in Department of Cardiology, Punjab Institute of Cardiology, Lahore from 01 January 2017 to 30 June 2017. Sample size of 150 patients; 75 patients in each group is calculated with 80% power of study, 5% level of significance and taking expected percentage of heart failure i.e. 3.8% in normal BNP group while 16.2% in high BNP group in STEMI patients. Sampling technique was Non-Probability, Consecutive Sampling.

Inclusion Criteria

- Patients of age 20-70years of either gender presenting with STEMI
- Exposed: high BNP
- Unexposed: normal BNP (0.5-30 pg/mL)

Exclusion Criteria

- Patients with valvular heart disease or neurological problem (on medical record)
- Patients with comorbid conditions including renal failure (creatinine>1.2mg/dl), abnormal liver profile (AST>40IU, ALT>40IU, bilirubin >5mIU)

Operational Definition

STEMI

It is defined as presence of chest pain >2hour, ST elevation >1mm on ECG with troponin >100IU and CKMB>25IU/L

High BNP

It is defined as BNP>80pg/ml

Heart Failure

It was labeled if there will be shortness of breath, congestive liver, peripheral edema, pulmonary edema and EF<40% on echocardiography within 5 days of hospital stay

150 patients who will fulfil the selection criteria was enrolled in the study from emergency of Department of Cardiology, Punjab Institute of Cardiology, Lahore. Informed consent was obtained. Their demographic information (name, age, gender, BMI, duration of symptoms and thrombolysis) was also noted. Then patients were divided in two groups i.e. exposed with high BNP and unexposed with normal BNP. Then patients were admitted in cardiology wards and was followed-up there for 5days. During 5 days, patients were evaluated for symptoms of heart failure and underwent echocardiography for confirmation of presence or absence of heart failure. If EF<40% on echocardiography along with symptoms, then depression labelled (as per operational definition). All this information recorded on proforma (attached).

The collected data was analysed statistically by using SPSS version 21. Quantitative variables like age, duration of symptoms and BMI was presented in form of mean ± Standard Deviation. Qualitative variables like gender, thrombolysis (given or not) and heart failure was presented in form of frequency and percentage. Relative risk was calculated to measure association between high BNP and heart failure. RR>1 was taken as significant. Data was stratified for age, gender, BMI, duration of symptoms and thrombolysis. Post-stratification, adjusted RR was calculated to measure association between high BNP and heart failure for each strata. RR>1 was taken as significant.

RESULTS

Baseline characteristic mean age, gender and BMI was presented in Table-I,II,III and Figure-1.

The study results showed that out of 150 patients the heart failure occurred in 19 (12.67%) patients. Figure-2

In our study the heart failure in high BNP group occurred in 14(18.67%) patients while the heart failure in normal BNP group occurred in 5 (6.67%) patients. The heart failure significantly occurred

higher in high BNP group than to normal BNP group i.e. p-value=0.027. There is 1.58 times higher risk of heart failure in high BNP group than to normal BNP group i.e. RR=1.58[1.14-2.19]. Table-IV.

The study results showed that in patients with age >50 years there is 1.77 times higher risk of heart failure in high BNP group than to normal BNP group i.e. RR=1.77[1.06-2.95]. Similarly in male patients there is 1.93 times higher risk of heart failure in high BNP group than to normal BNP group i.e. RR=1.93[1.49-2.51]. Table-V.

		Study Group	
		High BNP	Normal BNP
Age (years)	n	75	75
	Mean	48.87	48.99
	Standard Deviation	10.18	12.151

Table-I. Descriptive statistics of age (years) with study groups.

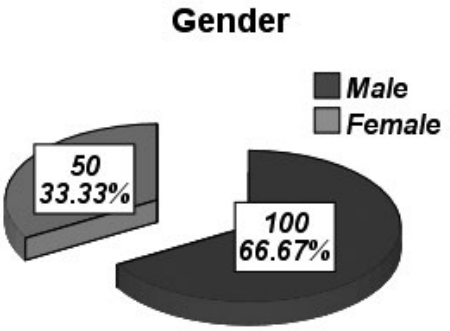

Figure-1. Frequency distribution of gender.

		Study Groups		Total
		High BNP	Normal BNP	
Gender	Male	55	45	100
		73.3%	60.0%	66.7%
	Female	20	30	50
		26.7%	40.0%	33.3%
Total		75	75	150
		100.0%	100.0%	100.0%

Table-II. Frequency distribution of gender with study groups.

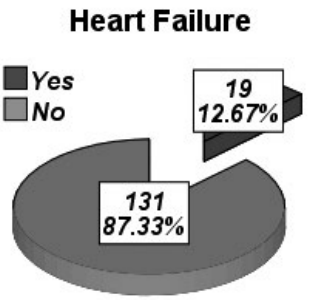

Figure-2. Frequency distribution of Heart Failure.

		Study Groups	
		High BNP	Normal BNP
BMI (kg/m^2)	n	75	75
	Mean	26.64	28.20
	Standard Deviation	4.53	4.029

Table-III. Descriptive statistics of BMI (kg/m^2) with study groups.

		Study Groups		Total	P-Value	RR
		High BNP	Normal BNP			
Heart Failure	Yes	14	5	19	0.027	1.58 [1.14-2.19]
		18.67%	6.67%	12.67%		
	No	61	70	131		
		81.33%	93.3%	87.33%		
Total		75	75	150		
		100.0%	100.0%	100.0%		

Table-IV. Comparison of heart failure with study groups.

		HF	Study Groups		Total	RR
			High BNP	Normal BNP		
Age (years)	≤ 50	Yes	8(17.0%)	3(7.0%)	11(12.2%)	1.47 [0.96-2.25]
		No	39(83.0%)	40(93.0%)	79(87.8%)	
	>50	Yes	6(21.4%)	2(6.3%)	8(13.3%)	1.77 [1.06-2.95]
		No	22(78.6%)	30(93.8%)	52(86.7%)	
Gender	Male	Yes	14(25.5%)	1(2.2%)	15(15.0%)	1.93 [1.49-2.51]
		No	41(74.5%)	44(97.8%)	85(85.0%)	
	Female	Yes	0(0.0%)	4(13.3%)	4(8.0%)	--
		No	20(100.0%)	26(86.7%)	46(92.0%)	

Table-V. Comparison of heart failure with study groups stratified y age & gender.

DISCUSSION

The neurohormones, BNP and NT-proBNP which is the N-terminal fragment of the prohormone BNP are synthesized and released from ventricular myocardium in response to pressure or volume overload. The natriuretic peptides predicts prognosis in acute coronary syndrome. High BNP or NT-proBNP are associated with high incidences of heart failure and mortality.[7]

In our study among the 150 patients, the heart failure occurred in 19 (12.67%) patients. The heart failure in high BNP group occurred in 14 (18.67%) patients while the heart failure in normal BNP group occurred in 5 (6.67%) patients. According to this study there is 1.58 times higher risk of heart failure in high BNP group than to normal BNP group. i. e RR=1.58[1.14-2.19].

It has been reported that of 2,273,853 patients with STEMI, 2.2% had CHB. In patients with CHB, in-hospital mortality occurred in 20.4% and in 8.7% without CHB (OR: 2.68; 95% CI: 2.62 to 2.74; p < 0.001).[16] It has been reported that percentage of heart failure was 3.8% in normal BNP group while 16.2% in high BNP group in STEMI patients ($p<0.05$).[7] But another study reported that percentage of heart failure was 4.7% in normal BNP group while 10.5% in high BNP group in STEMI patients ($p>0.05$).[8]

Hanan Radwan et al[7] concluded the significant negative correlation between NT-proBNP and ejection fraction. Patients with elevated BNP level (NT-proBNP equal or more than 474 pg/ml) had longer length of hospital stay and more incidence of heart failure as compare to patients without elevated natriuretic peptides. Moreover, there was a trend to an increased incidence of cardiogenic shock and mortality were are high among patients with high NT-proBNP level.

Higher BNP had associated with high mortality as well as more new incidences of acute heart failure or decompensation of CHF. Similarly elevated BNP at the time of hospital admission among STEMI patients was associated with impaired reperfusion after fibrinolysis and higher short-term risk of mortality.[9] This study results are consistent with many studies of patients with STEMI.[10-14] Sadanandan et al.[15] reported that patients with BNP more than 80 pg/ml was associated with severity of coronary artery disease and multi-vessel disease as compare to patients with lower plasma BNP level.[16]

L. Lorgis et al[16] reported the strong relationship between incomplete STR with elevated level of NT-proBNP at admission, suggesting the importance of NT-proBNP as a marker for early risk stratification in failed reperfusion therapy after STEMI. Similarly Benjamin M. Scirica et al[17] demonstrated that NPs are measured in almost 50% of patients in the US admitted with STEMI and independently associated with in-hospital mortality and heart failure.

According to this study in patients with age >50 years there is 1.77 times higher risk of heart failure in high BNP group than to normal BNP group. i. e RR=1.77[1.06-2.95]. Similarly in male patients there is 1.93 times higher risk of heart failure in

high BNP group than to normal BNP group. i. e RR=1.93[1.49-2.51].

This present study concluded that high BNP level is strongly associated with heart failure in patients presenting with STEMI.

CONCLUSION

This present study concluded that high BNP level is strongly associated with heart failure in patients presenting with STEMI.

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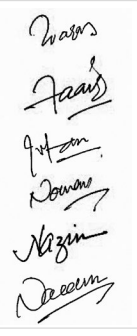
1	Muhammad Waqas	1st Author	
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