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PREVALENCE OF RISK FACTORS IN PATIENTS WITH HEART FAILURE WITH NORMAL EJECTION FRACTION (HFNEF)

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All the authors contributed significantly to the research that resulted in the submitted manuscript.

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ABSTRACT

Objective: To determine prevalence of risk factors in patients with heart failure with normal ejection fraction (HFNEF).

Methodology: This was a cross sectional descriptive study conducted at the Department of Cardiology, Lady Reading Hospital, Peshawar. Patients referred from Out Patient and Emergency Departments to the Echocardiography department meeting the criteria for HFNEF were included. All the patients were carefully scrutinized for common risk factors. They were subjected to detailed history and clinical examination. Their clinical record was checked, BMI calculated, ECG and Transthoracic echocardiography was performed. Data was analyzed on SPSS version 15.

Results: The total number of patients studied was 139. Males were 45.3% and females were 54.7%. Mean age ± SD was 56.64 ± 10 years. Patients were divided into three groups on the basis of age. There were 42.4% patients in age group 40-54 years, 44.6% in age group 55-69 and 12.9% in age group 70 and above. Majority (51.8%) of the patients were in NYHA class II. Hypertension (59.7%) was the most common risk factor for HFNEF, followed by Coronary artery disease in 34.5%, Diabetes mellitis (DM) 33.1% and Obesity in 15.1%. A significant number of patients 21.6% had no obvious risk factor. Sixty one (43.88%) patients had more than one risk factor contributing to diastolic dysfunction.

Conclusion: Arterial hypertension, Coronary artery disease, diabetes mellitus and obesity are the major factors in patients with diastolic dysfunction and HFNEF. A significant proportion of patients have multiple risk factors for HFNEF.

Key Words: Heart Failure With Normal Ejection Fraction (HFNEF), Risk Factors, Diastolic Dysfunction, Transthoracic Echocardiography, Tissue Doppler Imaging (TDI)

INTRODUCTION

Heart failure affects approximately 4.8 million persons in the United States, with about 500,000 new cases diagnosed each year.[1,2] Patients with an ejection fraction of 50 percent or higher were classified as having heart failure with normal ejection fraction (HFNEF), whereas those with an ejection fraction of less than 50 percent were classified as having heart failure with reduced ejection fraction (HFREF).[3] Early studies suggested that as many as one third of patients presenting with overt heart failure have isolated diastolic heart failure[4,5] but recent studies have shown a prevalence of diastolic heart failure of 50% in patients greater than 70 years of age.[6,7]

The symptoms of heart failure may be identical whether failure is secondary to systolic or diastolic dysfunction, however, there are differences in the prognosis, characteristics of the patients, pathophysiology and treatment between the two conditions.[8] Compared to patients with a low ejection fraction, those with preserved ejection fraction are older, more often women and are more likely to have a hypertensive aetiology.[9] Hypertension is the most common cause of diastolic dysfunction and diastolic heart failure that is about 60%.[10] Recent data suggested that coronary artery disease is a cause of diastolic dysfunction in approximately 1/3rd of patients.[10] Obesity alone is the cause of 11% cases of cardiac failure in men and 14% of cases in women in United States.[10] Many reports have shown a prevalence of about 30-60% of diastolic dysfunction even in well controlled diabetics.[10] Studies have shown that with increasing glucose level the prevalence of dd increases in diabetics.[11] A history of coronary artery disease was associated with the greatest risk of heart failure (29.1% vs. 11.86%, OR 3.05, 95% CI) followed by diabetes (18.5% vs. 7.89%, OR 2.65, 95% CI), obesity (24.5% vs. 9.28%, OR 2.00, 95% CI) and hypertension (61.2% vs. 57.62%, OR 1.44, 95% CI) with the p-value of less than 0.001 for each.[12]

The most useful clinical tools for the assessment of left ventricular diastolic function is Conventional Doppler Echocardiography, not only utilized for diagnostic purposes but also for establishing prognosis and evaluating the effect of treatment.[13] Tissue Doppler imaging (TDI), including the transmitral flow velocity to annular velocity ratio (E/E' index), which measures myocardial velocities during the cardiac cycle, is considered more reliable for diagnosing diastolic dysfunction.[14]

Heart failure with preserved ejection fraction becomes the most common form of heart failure, representing slightly more than half of all cases of heart failure.[15] Its frequency increases dramatically with age underscoring the importance of this growing public health problem.[15] One study indicates that the prognosis of patients with HFNEF is poor, and just as severe as in patients with reduced ejection fraction.[15] Thus, both conditions have a severe prognosis with 5 years mortality rates of almost 60%.[15]

The best strategy for avoidance of morbidity and mortality from HFNEF is prevention and control of risk factors. As the prevalence of HFNEF is high so the associated mortality is high and comparable to systolic heart failure. The rationale of my study is to determine the association between HFNEF and risk factors in our local population. This study has important public health implication, and will help the physicians in suggesting that targeting specific and most commonly found risk factor on the basis of odds ratio and control of those risk factors may have the greatest impact on reducing the number of heart failure with normal ejection fraction cases in our population.

The aim of our study was to determine the common and important risk factors leading to HFNEF.

METHODOLOGY

This was a cross sectional descriptive study conducted at the Department of Cardiology, Post Graduate Medical Institute, Lady Reading Hospital Peshawar from March 2011 to Nov 2011. The study was conducted after approval from hospital ethical and research committee.

Patients referred from Out Patient and Emergency Departments to the Echocardiography department of cardiology unit meeting the inclusion criteria were included in the study. The purpose and benefits of the study was explained to patients and a written informed consent was obtained.

Our study included all patients of both gender and age 40 years and above with Heart Failure with normal ejection fraction (HFNEF). HFNEF was diagnosed on the basis of all of the following features:

1. History of shortness of breath on exertion
2. Left ventricular ejection fraction of > 50% on Transthoracic Echocardiography
3. E to A ratio of < 1 on Transthoracic Echocardiography
4. E/E'>15 on Transthoracic Echocardiography

Patients with congenital heart disease, valvular heart disease, rheumatic heart disease and technically difficult cases were excluded from the study.

All the patients were subjected to detailed history and clinical examination. Their clinical record was checked, BMI calculated and fresh ECG, Transthorecic echocardiography and lab investigation for blood sugars was done. All the patients were carefully scrutinized for the detection of common risk factors including obesity(BMI 30 or more),

hypertension (Patients taking antihypertensive medications or having blood pressure ≥ 140 mmHg systolic or ≥ 90 mmHg diastolic), diabetes (Random blood sugar >200 mg/dl or subject is on anti diabetic medications) and coronary artery disease (history of CAD or evidence of CAD on ECG/ echocardiography).

All the above mentioned information including name, age, gender and address were recorded in a pre designed Performa. Similarly care was taken during extraction of information to avoid responder bias. Confounders and other bias were controlled by strictly following exclusion criteria.

The statistical analysis performed using the statistical package for social sciences (SPSS Ver. 15.0). Numerical variables like age were presented as mean ± SD. Categorical variables like gender and common risk factors (Coronary artery disease, hypertension, Diabetes mellitus and obesity) were presented as frequencies and percentages. Also chi square test was used to compare the age and sex in both the groups to see the effect modification. Data was presented as tables and graphs where appropriate.

RESULTS

The total number of patients studied was 139. Males were 45.3% (n-63) and females were 54.7% (n-76) (Table 1). Mean age ± SD was 56.64 ± 10 years. Patients were divided into three groups on the basis of age. There were 42.4% (n=59) patients in age group 40-54 years, 44.6% (n=62) in age group 55-69 and 12.9% (n=18) in age group 70 and above. Majority of the patients were in NYHA class II at presentation (51.8%)(Table 1).

In the current study, Diabetes mellitis (DM) was noted as a risk factor of HFNEF in 33.1% (n=46) of the cases and was more common in males (39.7% vs. 27.6% p=0.15) (Table 2). Obesity was found as a risk factor of HFNEF in 15.1% (n=21) of the cases and it was equally common in males and females (14.3% vs. 15.8% p=1.0). Hypertension was noted as a risk factor of HFNEF in 59.7% (n=83) of the cases. Hypertension was more common in females vs males (63.2% vs. 55.6% p=0.389) Coronary artery disease (CAD) was noted as a risk factor of HFNEF in 34.5% (n=48) of the cases (Table 2). CAD as a risk factor was more common in males (38.1% vs. 31.6% p=0.47). A significant number of patients 21.6% (n=30) had no obvious risk factor.

Table 1: Baseline Characteristics of Study Population

Variable	Number of patients	Percentage
Male	63	45.3
Female	76	54.7
NYHA CLASS		
I	25	18.0
II	72	51.8
III	37	26.6
IV	05	03.6
AGE GROUP (YEARS)		
40-54	59	42.4
55-69	62	46.6
≥70	18	12.9
MEAN AGE ± SD(Years)	56.64 ± 10	

Table 2: Distribution of Patients According to Risk Factors (N=139)

Risk Factors	Frequency	Percentage
Hypertension	83	59.7
Ischemic Heart Disease	48	34.5
Diabsetes Mellitus	46	33.1
Obesity	21	15.1
Without obvious risk factors	30	21.6

Sixty one (43.88%) patients had more than one risk factor contributing to diastolic dysfunction.13(9.35%) had hypertension, 8(5.76%) had CAD DM, 10(7.19%) had DM and hypertension, 2(1.44%) had hypertension and obesity, 2(1.44%) had DM and obesity, 10(7.19%) had hypertension plus CAD plus DM, 8(5.76%) had HTN plus obesity plus DM, 4(2.88%) had HTN plus CAD plus obesity, 2(1.44%) had DM plus CAD plus obesity and in the last 2(1.44%) had CAD, hypertension, DM and obesity (Table 3).

DISCUSSION

Heart failure with normal ejection fraction (HENEF) or diastolic heart failure (DHF) is defined as failure of left ventricle to produce an adequate cardiac output at normal left ventricular filling pressure despite the presence of a normal left ventricular ejection fraction.[16] Results of early studies suggested that as many as 40% of patients with heart failure have isolated HFNEF.[17] However more recent data shows that the prevalence of diastolic dysfunction and diastolic heart failure is dependent on age, sex, study setting (e.g Hospital vs. Community), methods used to make the diagnosis (Echocardiography vs. Invasive techniques), LVEF cut off (40% vs. 50%) and the underlying disease that contribute to diastolic dysfunction.[18] One study indicates that the prognosis of patients with HFNEF is poor, and just as severe as in patients with reduced ejection fraction.

In this study we found that majority of our patients were female (52.5%) and of less than 70 years old. This study indicates that coronary disease, hypertension, diabetes and

Table 3: Patients With More Than One Risk Factor (N=139)

Risk Factors	Frequency	Percentage
HTN+DM	10	7.19
HTN+IHD	13	9.35
DM+IHD	8	5.76
HTN+OBESITY	2	1.44
DM+OBESITY	2	1.44
HTN+IHD+DM	10	7.19
HTN+OBESITY+DM	8	5.76
HTN+CAD+OBESITY	4	2.88
DM+IHD+OBESITY	2	1.44
HTN+IHD+DM+OBESITY	2	1.44

obesity are common risk factors in patients with heart failure with normal ejection fraction in both men and women. The risk of heart failure is greatest for coronary disease and diabetes, while coronary disease and hypertension are responsible for the largest proportion of new diastolic heart failure cases in the population. Sex differences in the etiology of diastolic heart failure may exist with hypertension playing the greatest role in women and coronary disease in men and similar findings were noted by Dunlay et al.[12]

Hypertension as the risk factor of HFNEF was the largest group observed in the current study i-e 59.7% and was most common in women (63.2%). Similar finding were reported by Jonathan et al, who reported that hypertension is the most common risk factor for the DHF.[19] The Framingham study showed that 75% of patients with DHF have hypertension.[20] All the previous studies showed that hypertension is the most common cause of diastolic dysfunction / DHF and DHF is the most common cause of morbidity and mortality in hypertensive patients especially African American even more than IHD (62% vs. 44%).

In this study, coronary artery disease as a risk factor for HFNEF is the second most common risk factor i-e (34.5%). Limited data is available on the prevalence of cardiac failure with preserved systolic function in patients with coronary artery disease. Some studies suggested that the prevalence of cardiac failure with preserved systolic function after myocardial infarction was as high as 45 %.[21] These studies however are mostly case series so their estimates of prevalence may be subject to selection bias. The exact prevalence of patients with cardiac failure and preserved systolic function with CAD in the community is not known. Hellermann et al, reported that 30% of patients after myocardial infarction with heart failure have preserved left ventricular systolic function which is consistent with our study results.[22] Other studies showed this prevalence rate between 27-45% for patients with heart failure and preserved systolic function (EF>50 %) and coronary artery disease as the underlying condition and these results are also consistent with the current study results.[21] Koren et al, also reported that CAD is a contributing factor of diastolic dysfunction in heart failure patients in approximately one third of patients which coincide with our results.[23]

Obesity as a risk factor for HFNEF was noted in 15.1% in the cases (men=14.3, women=15.8). In one Study it was reported that obesity alone is the cause of 11% cases of HFNEF in men and 14 % of cases in women.[24]

In the current study, 33.1% of the cases diabetes mellitus was noted as a risk factor of HFNEF. The prevalence of diabetes in men were 29.7% and in women were 27.6%. The presence of isolated diastolic dysfunction in diabetic patients in the absence of hypertension and IHD was first described by Rubler et al.[24]. Braga et al, reported that diastolic dysfunction precedes the systolic changes in the diabetic heart even in the absence of CAD.[25] Many reports have shown prevalence of diastolic dysfunction from 30 - 60 % in diabetic persons and these results coincide with the current study. O,Connor et al, found that about 30 % patients with diastolic dysfunction / DHF also were suffering from diabetes mellitus in the absence of obstructive CAD and hypertension.[26] In our study 21.6% patients had no obvious risk factor fo HFNEF. This figure is similar to the what has been reported in another study.[16]

LIMITATIONS

There were certain study limitations. This was a small single centre study and more studies are recommended to validate these findings in our population. Majority of our study population was younger while risk factors for HFNEF increases with increasing age.

CONCLUSION

Isolated diastolic dysfunction and heart failure with normal ejection fraction in our population is not an uncommon entity. Coronary artery disease, arterial hypertension, obesity and diabetes mellitus are the major risk factors in patients with diastolic dysfunction and heart failure with normal ejection fraction.

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TO DETERMINE THREE MONTHS CLINICAL OUTCOMES AFTER ST ELEVATED MYOCARDIAL INFARCTION TREATED WITH FIBRINOLYSIS AMONG PATIENTS WITH LESS YEARS OF EDUCATION

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Contribution

YH & AA conceived the idea, MZUB & MHD planned the study and drafted the manuscript. FA & HJ helped in literature review. All authors contributed significantly in manuscript submission.

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ABSTRACT

Objective: To determine the frequency of three months mortality among patients with less than 8 years of education after acute myocardial infarction treated with fibrinolysis.

Methodology: This cross sectional study was conducted at Department of Cardiology, Lady Reading Hospital Peshawar from 16th April to 16th Oct 2013. Both male and female patients aged 18 years and above admitted with STEMI fulfilling inclusion criteria, were included in the study. Patients were divided into 2 groups on the basis of education whether less than or more than 8 years. Patients were subjected to detailed history and clinical examination. All patients were observed for mortality rate in 24 hours and in-hospital mortality (after 24 hours of hospital stay). Remaining patients were followed for 3 months mortality.

Results: A total of 482 patients who suffered acute STEMI and were treated with fibrinolysis were studied. The mean age was 60 ±13.81 years . Among these males were 298 (61.8%).The frequency of 24 hours, in hospital and 3 months mortality after STEMI treated with fibrinolysis in Group A(<8 years of education) and Group B(>8 years of education) were 7.5% vs 2.5% , 13.9% vs 4.5% and 16.4 % vs 7.0% respectively. The outcomes were statistically not significant for gender.

Conclusion: Level of education is a predictor of mortality after STEMI treated with fibrinolysis. Mortality after acute myocardial infarction is high in less educated patients.

Key Words: ST elevated Myocardial Infarction, years of education, 24hours mortality, In-hospital mortality, 3 months mortality.

INTRODUCTION

Coronary Artery disease (CAD) is an international health problem in both men and women and is the leading cause of death in the developed countries. The association between socioeconomic position and outcome of myocardial infarction (MI) is generally well documented in western countries indicating that those with lower socioeconomic status experience the most burden of the condition.[1] Given the attendant risks of mortality and morbidity, acute MI remains a principal focus of cardiovascular therapeutics. Moreover, 30-day mortality and re-hospitalization rates of acute MI are publicly reported in an effort to promote optimal acute MI care, and all aspects of MI care delivery are the focus of local, regional, and national quality initiatives.[2,3] The prevalence of CAD is equally high in south Asia including Pakistan.[4] In our local population of Peshawar, it is about 11.2% and is more prevalent in females (13.3%) than males (7.9%).[5]

Formal education is a measure of social position. There is evidence that it is a valid and reliable indicator for studies of association between health and social status in Iran.[6] Recently the Isfahan Cardiovascular Research Centre (a WHO collaborating center for research and training in cardiovascular disease control in central Iran) carried out an analysis of available data of 12514 individuals and found that socioeconomic factors as measured by education, occupation and income were associated with cardiovascular risk factors, However, Education level was the strongest associated factor.[7] Recently socio-economic status and two-years mortality rate after MI were analyzed among 664 MI patients who were hospitalized in Tehran Heart Center during one year. The results showed that education was a predictor of mortality among patients with MI. The lower educational level group (illiterate and primary) showed higher mortality risk compared to the higher level group.[8] In addition there is evidence that years of education can strongly contribute in the distribution of several risk factors for CHD such as smoking and High Blood Pressure that may well inversely have an effect on the incidence and impact of MI attack.[9]

Another Study shows that One year mortality was inversely related to years of education and was 5-fold higher in patients with less than 8 years of education (17.5%), 24 hour mortality (5.2%) in hospital mortality (11%) and 30 days mortality (13.1%).[10]

The aim of this study is to know frequency of three months mortality among patients with reference to years of education, who had suffered Acute Myocardial Infarction treated with fibrinolysis. This study will help in analyzing whether less years of education is an independent predictor of mortality or a surrogate marker of measured or unmeasured variables that are strongly related to mortality in patients with ST-Elevated Myocardial Infarction.

METHODOLOGY

This cross sectional study was conducted at Cardiology Department, Lady Reading Hospital Peshawar from 16th April to 16th Oct 2013. Non-probability consecutive sampling technique was used. Sample size was determined using 2.6 % margin of error under WHO software for sample size. Study population included all adult patients aged more than 18 years of either gender with acute ST Elevated Myocardial Infarction being treated with fibrinolysis.

Patients were divided into 2 groups on the basis of education that is less than and more than 8 years of education. Patients were subjected to detailed history and clinical examination. All patients were observed for mortality rate in 24 hours and in-hospital mortality (after 24 hours of hospital stay). Remaining patients were followed for 3 months mortality.

The diagnosis of acute myocardial infarction was based upon any two of the following features. a) History of prolonged chest pain more than 15 minutes not relieved by rest b) Cardiac enzyme elevation with raised Troponin I (>0.14mg/ml) via 3rd generation enzyme linked immunosorbent assay (ELISA) using Architect (1 2000SR) and c) ST-segment elevation of more than 1mm in at least two consecutive limb leads, 2mm or more in two consecutive chest leads.

The patients treated with primary PCI, having contraindications to thrombolysis, with all other causes of ST elevation other than STEMI like pericarditis, left ventricular hypertrophy and electrolyte imbalances were excluded. Patient who already had diabetes mellitus and hypertension, chronic liver disease, chronic renal failure and congestive cardiac failure were also excluded from the study.

Patients were thrombolysed with streptokinase in the Lady Reading Hospital Coronary care unit. All the patients were managed according to guidelines. All patients were followed within the hospital stay. Those who survived the hospital course were discharged on medications as indicated and were followed up to the end of third month to detect 3 month mortality.

All data was analyzed with SPSS version 20.0. Mean ± SD was calculated for continuous variables. Frequencies and percentages were calculated for categorical variables. Mortality was stratified between gender and years of education to see the effect modifications. P value was calculated with Chi square test. All results were arranged and presented in the form of tables and graphs.

RESULTS

A total of 482 patients were enrolled in the study. Mean age was 60 ± 13.81 (30 – 85) years. Females were 184(38.2%) and males were 298 (61.8%). Based on years of education, patients were divided into two groups, Group A included patients with less than 8 years of education and Group B included patients with more than 8 years of education. The number of patients in group A was 281 (58.3%), and in Group B 201 (41.7%) as shown in table 1.

All STEMI patients were followed during their hospital stay for 24 hours mortality in CCU and then for in hospital mortality . Twenty four hours mortality, in-hospital mortality and 3 months mortality noted in these patients was 5.4 %, 10% and 12.4% respectively (Table 2).

Subgroup analysis showed an equal 24 hours mortality in males and females (5.4% vs 5.4%). In-hospital mortality rate was higher in females vs males but statistically insignificant. (11.4% vs 9.1%). Three months mortality rate was found to be equal for both male and female patients (12.4% each) (Table 3).

Twenty four hours mortality rate in Group A was 7.5% and 2.5% in Group B. In hospital mortality rate for Group A was 13.9% vs 4.5% in Group B. The remaining patients which were discharged on standard myocardial infarction treatment and were followed for 3 months mortality and observed for mortality in Group A and B(16.4% vs 7.0%).

Table 1: Demographic variables of Study Population (n=482)

OVERALL	
MEAN AGE(years)	60.32 ± 13.81 (30-85)
MALE %(n)	61.8% (298)
FEMALE % (n)	38.2% (184)
GROUP A(<8 years of education)%(n)	58.3% (281)
GROUP B(>8 years of education)(%)(n)	41.7% (201)

Table 2: Frequency of 24 Hours, In Hospital, Three Months Mortality In Patients with STEMI Treated with in Study Population. (n=482)

24 Hours Mortality	5.4% (26)
In Hospital Mortality	10% (48)
Three Months Mortality	12.4% (60)

Table 3: Gender wise Distribution of 24 Hours, In-Hospital and 3 Month in Study Population (n=482)

Time of Mortality		Gender		Total	p-value
		Male	Female		
Within 24 hours	n	16	10	26	0.866
	%	5.4%	5.4%	5.4%	
In-hospital Mortality	n	27	21	48	
	%	9.1%	11.4%	10.0%	
In 3 months	n	37	23	60	
	%	12.4%	12.5%	12.4%	
Survived	n	218	130	348	
	%	73.2%	70.7%	72.2%	
Total	n	298	184	482	
	%	100.0%	100.0%	100.0%	

Table 4: Comparison of Mortality and Years of in Study Population (n=482)

Mortality		Education		Total	p-value
		<8 years	>8 years		
Within 24 hours	n	21	5	26	
	%	7.5%	2.5%	5.4%	
In-hospital Mortality	n	39	9	48	0.000
	%	13.9%	4.5%	10.0%	
In 3 months	n	46	14	60	
	%	16.4%	7.0%	12.4%	
Survived	n	175	173	348	
	%	62.3%	86.1%	72.2%	
Total	n	281	201	482	
	%	100.0%	100.0%	100.0%	

Results for this comparison were highly significant (Table 4).

DISCUSSION

Acute myocardial infarction (MI) is a common medical emergency and is the leading cause of death worldwide.[2] Education was a predictor of mortality among patients with MI. The lower educational level group (illiterate and primary) showed higher mortality risk compared to the higher level group.

In our study 24 hours, in hospital and 3 months mortality among 2 groups of patients (Group A= less than 8 years of education, Group B= more than 8 years of education) after STEMI and Thrombolysis were studied. Twenty four hours mortality was 7.5% in Group A and 2.5% in Group B which is in close comparison to International data. Mehta et al included 2249 patients less than 8 years of education and reported 24 hours mortality of 5.2% (117) in their study.[10]

Similarly In hospital mortality was 13.9% in Group A and 4.5% in Group B in our study, as compared to the international data, there is a difference, but there is a close similarity in being statistically significant, indicating a high mortality rate in patients with less years of education. The probable reason for the difference might be their large sample size and secondly, not all of the patients in this study presented to hospital in time for thrombolysis, due to poor knowledge of acute MI and logistic problem so the chance of mortality was more in my patients.

In this study, patients were followed for 3 months, which showed a mortality of 16.4% in Group A and 7% in Group B. This also shows similarity with other studies as Mehta et also showed a greater 30 days mortality in patients with less years of education.[10]

In comparison with another study, MILIS (Multicenter Investigation of Limitation of infarct size), Tofler et al studied 453 patients who have completed high school and 363 patients who have not completed after Acute Myocardial Infarction.[11] The study showed In-hospital mortality of 5 % in high school group versus 13% in the second group. These results are almost similar to this study.

Similarly, In BHAT(Beta-blocker in Heart Attack Trial), Ruberman et al studied 1739 male patients after acute MI and found an inverse relationship between education and mortality after MI. This relationship was explained on the basis of high prevalence of social isolation and high degree of stress in less educated people.[12]

Kotke et al reported high rates of reinfarction in their study of hospitalized survivors among patients with less years of education in North Carolina.[13]

Donyavi et al showed that survival after MI varied with socio-economic status and analyzed a two-year mortality rate among 664 MI patients who hospitalized in Tehran Heart Center during a one complete calendar year. After adjustment for demographic, clinical and socio-economic variables, education was a predictor of mortality among patients with MI. The lower educational level group (illiterate and primary) showed higher mortality risk compared to the higher level group.[8]

Studies showed that patients with lower educational levels experience lower survival rates after an acute MI attack.[14] In addition there is evidence that years of education can strongly contribute in the distribution of several risk factors for CHD such as smoking and HBP that may well inversely have an effect on the incidence and impact of MI attack.[9]

Higher SES patients experienced significantly greater post-AMI functional recovery than did their socioeconomically disadvantaged counterparts. Functional recovery was the strongest modifiable predictor of long-term mortality irrespective of SES, and explained nearly 30% of the association between SES and long-term mortality after AMI.[15]

In this study higher mortality in less educated patients may have been contributed by late presentations, longer time to treatment, non-compliance with medications and no proper

follow-up visits.This study showed that education is a predictor of short term mortality. Improving education has potential to improve health outcomes of patients.

LIMITATIONS

This study involves only small number of patients which might have affected the outcomes of the patients. Larger studies are required to prove this inverse relationship between education and mortality after STEMI. Other domains of socioeconomic status like poverty, job etc were not assessed in predicting mortality among these patients. Since this was a short term study, longer follow up is required to see effect of education on mortality. Morbidity is increased in less educated patients as evidenced by previous study which is not checked in this study.

CONCLUSION

Years of education has an impact on the mortality of patients after STEMI treated with fibrinolysis. Less years of education is inversely related with higher short term mortality. However, further study is required to prove this relationship and mechanism underlying this association between socioeconomic status and cardiovascular outcomes.

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ORIGINAL ARTICLE

EFFICACY OF STREPTOKINASE IN DIABETIC PATIENTS WITH ACUTE ST ELEVATION MYOCARDIAL INFARCTION

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Background: The efficacy of streptokinase in Myocardial Infarction is usually evaluated either by coronary angiographic measurement of thrombolysis in myocardial infarction or by the measurement of ST segment resolution at 90 minutes after streptokinase infusion, in 12-lead electrocardiogram (ECG). This study was carried out to determine the efficacy of streptokinase in diabetic patients with acute ST Elevation Myocardial Infarction (STEMI). **Methods:** This was a descriptive cross-sectional study carried out at the Cardiology Department of Ayub Teaching Hospital from June 2015 to July 2016. A total of 169 patients with STEMI were included in the study using non-probability consecutive sampling. Patients were administered injection Streptokinase in a dose of 1.5 million units, diluted in 100 ml of normal saline, in 1 hour and repeat ECG was done at 90 mins to assess ST segment resolution. A repeat ECG was performed within 90 minutes of start of therapy to check the efficacy of fibrinolytic therapy. Fifty percent or >50% reduction in height of ST segment elevation (ST resolution) towards baseline within 90 minutes after start of streptokinase infusion was considered effective. **Results:** Mean age of the patients was 53.76±4.76 years. Most of the patients were >55 years of age. Out of 169 patients, 69.23% (n=117) were male while 30.77% (n=52) were female. Streptokinase administration in acute STEMI in diabetics revealed ST segment resolution at 90 mins in 15.38% (n=26), while 84.62% (n=143) showed no ST segment resolution. **Conclusion:** Thrombolytic therapy is not effective in diabetic subjects with STEMI. In diabetics to improve outcome, newer strategies such as peri-infarction metabolic control and primary angioplasty should be investigated.

Keywords: ST segment elevation myocardial infarction, STEMI, Streptokinase, diabetes mellitus

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INTRODUCTION

After sudden cardiac death, ST-segment elevation myocardial infarction (STEMI) is the most severe form of acute coronary syndrome (ACS). Acute ST segment elevation myocardial infarction usually occurs when thrombus forms on a ruptured atheromatous plaque and occludes an epicardial coronary artery.

According to the Fourth National Registry of Myocardial Infarction (NRMI-4), 29% of infarction patients experience STEMI. The risk of acute myocardial infarction (AMI) is 2–4 times higher in diabetics.[1] The coronary artery disease is much more serious in diabetics with 4 times higher morbidity/ mortality in men, while 8 times in women.[2,3] Patients with diabetes mellitus who presented with acute STEMI often have a higher risk of adverse outcomes than non-diabetic counterparts, probably due to extensive coronary disease or poor left ventricular function.[4]

There has been a profound fall in the fatality of patients treated in hospital in contrast to community mortality and that is mostly due to administration of thrombolytics. Thrombolytics such as streptokinase represents one of the major advances in the management of STEMI. Approximately 400,000–500,000 patients world over receive this thrombolytic therapy yearly.[5] The success of fibrinolytic therapy is largely dependent on timely administration. Use of streptokinase in patients with acute STEMI is considered up to 12 hours after the onset of chest pain.

The outcome of AMI treated with fibrinolytic therapy, i.e., the efficacy of streptokinase can be evaluated either by coronary angiographic measurement of thrombolysis in myocardial infarction blood flow or by the measurement of ST segment resolution at 90 minutes after start of streptokinase infusion, in 12-lead electrocardiogram (ECG) which is a simple measure of assessing reperfusion in patients receiving fibrinolytics.[6,7] The ST segment changes reflect myocardial rather than epicardial blood flow and yield prognostic information beyond that provided by coronary angiogram alone.

This study was carried out to determine the efficacy of streptokinase in diabetic patients with acute ST segment elevation myocardial infarction.

METHODOLOGY

This was a descriptive cross-sectional study carried out at the Cardiology Department of Ayub Teaching Hospital from June 2015 to July 2016. A total of 169 patients with STEMI were included in the study using non-probability consecutive sampling. The sample size was calculated keeping efficacy of streptokinase among

STEMI with diabetes at 19.7%, with 95% confidence interval, and 6% margin of error.

Patients were administered Streptokinase in a dose of 1.5 million units, diluted in 100 ml of normal saline, in 1 hour. A repeat ECG was performed within 90 minutes of start of therapy as evaluation of ECG segment resolution is a simple and readily available technique to check the efficacy of fibrinolytic therapy. Fifty percent or more than 50% reduction in height of ST segment elevation (ST resolution) towards baseline within 90 minutes after start of streptokinase infusion was considered effective as resolution of more than 50% of ST-segment elevation at 60–90 minutes after the initiation of therapy is a good indicator of improved myocardial perfusion.[8,9] The information along with social and demographical information of the patients was recorded on a pre-designed performa. The ECGs were reported by single expert Physician to avoid inter observer bias. Data were analysed using SPSS-16.

RESULTS

A total of 169 patients were enrolled. Mean age of the patients was 53.76±4.76 years. Most of the patients, i.e., 46.74% (n=79), were >55 years of age; 37.28% (n=63) were aged 51–55 years, and only 15.98% (n=27) were in 45–50 years of age group. Males were 69.23% and females were 30.77% (Table-1).

Efficacy of streptokinase administration in STEMI in diabetics revealed ST segment resolution within 90 mins in 15.38% (n=26) while 84.62% (n=143) showed no ST segment resolution even after 90 mins. Out of 26 cases effectively treated, 30.77% (n=8) were between 45 and 50 years, 42.31% (n=11) between 51 and 55 years, and only 26.92% (n=7) had >55 years of age. Out of effectively treated patients, 38.46% (n=10) were male and 61.54% (n=16) female (Table-2).

Table-1: Age groups and gender ratio (n=169)

		Number (%)
Gender	Male	117 (69.23)
	Female	52 (30.77)
Mean age	53.76±4.76	
Age Groups	45–50 years	27 (15.98)
	51–55 years	63 (37.28)
	>55 years	79 (46.74)

Table-2: Efficacy of streptokinase in diabetic patients

		Number (%)
Gender	Male	10 (38.46)
	Female	16 (61.54)
Effectively Treated	45–50 years	8 (30.77)
	51–55 years	11 (42.31)
	>55 years	7 (26.92)
Not treated	143 (84.62)	

DISCUSSION

Patients having diabetes mellitus presenting with acute STEMI are commonly at greater risk of adverse outcomes as compared to non-diabetics possibly extreme coronary disease or having poorer left ventricular function.[2]

We recorded 15.38% efficacy of streptokinase on ST Segment elevation MI in diabetic subjects. Zairis *et al*[10] recorded that diabetic subjects had significantly lower incidence of sustained ST recovery than non-diabetic subjects (p=0.03). These findings are in accordance to the findings of our study. In another study, Chowdhury AR *et al*[7] compared the thrombolytic effect of streptokinase between diabetic and non-diabetic myocardial infarction patients and determined that successful reperfusion was significantly higher in non-diabetic than diabetic ($p<0.001$), while failed reperfusion was significantly higher in diabetic patients ($p<0.001$), and concluded that diabetes mellitus might affect the thrombolytic outcome of acute myocardial infarction patients with diabetes mellitus. These findings strongly support the findings of our study.

Type 2 diabetes is a strong predictor of acute intravenous thrombolysis failure during STEMI. This association may contribute significantly to the worse prognosis of type 2 diabetic subjects compared with non-diabetic ones. If it is validated with larger prospective studies, more appropriate therapeutic approaches that accelerate and increase the achievement of satisfactory reperfusion in the cellular level may further improve prognosis in type 2 diabetic subjects suffering from STEMI. However, these finding reinforces the need for increased efforts to discover newer pharmacological agents to reduce failed reperfusion after streptokinase therapy in diabetic patients with myocardial infarction.

The limitation of this study was that we did not compare the results of streptokinase in non-diabetics but the studies mentioned above compared diabetics and non-diabetics which further clarifies that streptokinase therapy is not highly successful in patients of STEMI with diabetes.

CONCLUSION

Thrombolytic therapy is not highly effective in diabetic subjects with STEMI, however, special attention should be given to the diabetic individuals before administration of thrombolytic therapy. Newer strategies such as peri-infarction metabolic control and primary angioplasty should be investigated to further improve outcome after myocardial infarction and thrombolysis among patients with diabetes.

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Association of Diastolic Dysfunction with Contrast-induced Nephropathy on the Basis of Measured Left Ventricular End Diastolic Pressure during Coronary Angioplasty

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BACKGROUND

CIN (Contrast-induced Nephropathy) is one of the complications after percutaneous transluminal coronary angioplasty (PTCA) which is associated with short-term and long-term mortality. Diastolic dysfunctions assessed by Echocardiography parameters (E/E' ratio) has correlated with incidence of the CIN and E/E' ratio greater than 15 had a high incidence of CIN [1]. Echo parameter are indirect measurement of LVEDP, which is not reliable to determine the diastolic dysfunction [2].

OBJECTIVES

The purpose of this study was to determine the relationship of diastolic dysfunction with CIN on the basis of measured left ventricular end diastolic pressure (LVEDP) during the PTCA

METHODS

We Conducted a retrospective study included 984 patients who underwent PTCA at Virginia Commonwealth University Hospital from March 2015 to December 2016. Among these 984 patients, 161 patients had hemodialysis and were excluded. Of 823 patients, 647 subjects had their LVEDP measured. NCDR defined the CIN on the basis of AKIN criteria (10), which is an increase in serum creatinine by 50% or 0.3 mg/dl after PCI compared with the baseline. T-Test, chi-square and one way ANOVA tests were used for data analysis. Multivariate binary logistic regression analyses were conducted in the stepwise selection with entry and exit criteria of p <0.1 to identify risk factors predicting the development of CIN. All those patients whose EF less than 45 were excluded during the Multivariate regression analy

RESULTS

Of the 924 patients, 109 patients had CIN after the procedure.The mean age was 64.8 ± 12.3 years and 23.5% were female. The mean values of creatinine and GFR before the procedure were 1.147±0.54 and 74.47 ± 26.54mL/min/1.73m2 respectively. Patient with CI-AKI has higher prevalence, DM, emergency/ urgent procedure, cardiogenic shock, history of heart failure, IV diuretics, and IABP use during the PTCA than non-CIN group. Patients with CIN demonstrated eGFR and hemoglobin were significantly lower, while creatinine levels were significantly higher compared to the non-CIN group. LVEDP in the CIN group (18.48± 9.237) was high as compare to the non-CIN group (16.606±9.105),p= 0.050. When patients were classified into three groups based on the LVEDP of 10 and 20, CIN occurred in 38 (34.9%) patients in the highest tertile and 44 (40.4%) in the middle compared with 27 (24.8%) in the lowest tertile ($p < 0.03$). In addition, patients whose LVEDP >20 mmHg experienced more acute heart failures events and had cardiogenic shock more frequently during the procedure than patients in the middle and lowest tertiles. In multivariate regression analysis, the LVEDP >20 (odd ratio 3.75, 95% confidence interval 2.08-7.23, p=0.002) was identified as an independent risk factor for the development of CIN after the adjustment for age, diabetes, dose of contrast media, IABP use, eGFR, hs-CRP and left ventricular ejection fraction less than 45.

CONCLUSIONS

This study demonstrated that LVEDP greater than 20 is an independent risk factor of the CIN, which suggest that diastolic dysfunction has correlation with CIN.

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