STUDY OF BASELINE CHARACTERISTICS AND 1-YEAR FOLLOW-UP OF DIABETIC AND NON-DIABETIC PATIENTS OF STEMI

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ABSTRACT

BACKGROUND

Cardiovascular disease is currently responsible for 30% of all deaths worldwide with most of the burden now occurring in developing countries.¹ DM is a risk factor for many cardiovascular diseases like Coronary Artery Diseases (CAD), Congestive Heart Failure (CHF) and atrial fibrillation.

Objectives- To analyse demographics, risk factors and treatment of diabetic vs. non-diabetic patients of STEMI admitted to a tertiary care hospital in India and subsequent 1-year follow-up of patients prescribed B blockers.

MATERIALS AND METHODS

This is a descriptive study of 284 consecutive patients of STEMI admitted to the hospital were included in the study. The patient's characteristics were recorded and the patients were followed up for 1 year.

RESULTS

Out of 284 patients, 232 (79%) were non-diabetic and 62 (21%) were diabetic. Out of all risk factors, hypertension was present more commonly in diabetics (55% vs. 33%, $p=0.03$). The 1-year cardiovascular mortality was higher in diabetics on B blockers as compared to non-diabetics on B blockers (18.1 vs. 5.5%, $p=0.01$).

CONCLUSION

Diabetics with myocardial infarction are a high-risk patient population who are likely to have worse long-term outcome and require optimal therapy with diligent follow-up.

KEYWORDS

Diabetes, STEMI, Beta Blockers.

HOW TO CITE THIS ARTICLE: Das B, Mishra TK. Study of baseline characteristics and 1-year follow-up of diabetic and non-diabetic patients of STEMI. J. Evolution Med. Dent. Sci. 2018;7(04):515-518, DOI: 10.14260/jemds/2018/115

BACKGROUND

Cardiovascular disease is currently responsible for 30% of all deaths worldwide with most of the burden now occurring in developing countries.¹ DM is a risk factor for many cardiovascular diseases like Coronary Artery Diseases (CAD), Congestive Heart Failure (CHF) and atrial fibrillation. The unabated rise of insulin resistance, obesity and metabolic syndrome is likely to increase the diabetic population 2-fold by 2030.² Diabetes mellitus confers an increased risk of death due to cardiovascular causes to the extent that two-third of adults with diabetes die of cardiovascular causes.³ Coronary Heart Disease (CHD) is much more common in diabetics than in the general population, affecting as many as 55 percent of these patients. The relative risk of Myocardial Infarction (MI) is 50% greater in diabetic men and 150% greater in diabetic women compared to age-matched non-diabetic subjects. Among patients admitted to coronary care units for AMI, 10%-20% are diabetic, the majority of whom have type 2 diabetes.

While the designation of CAD equivalent conferred on diabetes has remained debatable, patients with diabetes aggregate other comorbidities such as obesity, hypertension and dyslipidaemia which also contribute to increase the risk for CVD.

Beta blockers are an important component of the armamentarium of drugs prescribed to patients of myocardial infarction. A BARI 2D substudy with a follow-up period of upto 6 years concluded that in diabetic post MI patients, use of beta blocker is associated with reduced mortality. An observational study from France found that diabetics were actually prescribed β -blockers less often than non-diabetics with an absolute difference of 11%.⁴ The present study was conducted to analyse the clinical characteristics of diabetic and non-diabetic patients hospitalised for STEMI and to compare the 1-year mortality of diabetic and non-diabetic patients on beta blockers.

MATERIALS AND METHODS

This is a descriptive study of 284 consecutive patients of STEMI admitted to the Cardiology Department, MKCG Medical College, Berhampur were analysed. The demographic details and risk factors of the patients were recorded. The treatment given during hospital stay and the drugs prescribed at discharge were documented. Those who were prescribed B blockers were then followed up for 1 year. Type 2 diabetes was diagnosed based on the need for treatment with insulin or oral hypoglycaemic drugs, a confirmed diagnosis of diabetes as per history or elevated fasting plasma glucose levels. Hypertension was diagnosed on the

'Financial or Other Competing Interest': None.
Submission 13-11-2017, Peer Review 07-01-2018,
Acceptance 13-01-2018, Published 22-01-2018.

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DOI: 10.14260/jemds/2018/115

basis of history of hypertension, on treatment for hypertension or at least 2 measurements demonstrating elevated BP. Patients who had a smoking habit at present or consumed oral tobacco were considered smokers.

Statistical Analysis

SPSS software was used to perform all statistical analyses. The discrete and continuous variables were compared using Chi-square test and student 't' test. P value < 0.05 was considered significant.

RESULTS

The characteristics of the patients are displayed in Table 1. Out of 294 patients, 232 (79%) were non-diabetic and 62 (21%) were diabetic. The mean age of the diabetic subgroup was 64.3 years, while that of the non-diabetic group was 66 years. 68% of diabetics were male as compared to 72% of non-diabetics. The incidence of smoking (12.4% vs. 16%), hypercholesterolaemia (42.7 vs. 51.7%) and sedentary lifestyle (22.6% vs. 26.4%) was not significantly different between the 2 groups. Hypertension was significantly more common in diabetics than non-diabetics (55% vs. 33%, $p=0.03$). Past history of CAD was equally common in both groups (9.6% vs. 12.6%). The frequency of thrombolysis was similar in both groups (28.6% vs. 24.3%). An analysis of the drugs prescribed to the patients at discharge showed that anti-platelets, ACE inhibitors/ ARB and statins were prescribed to both groups at a similar high rate. Beta blockers were prescribed more frequently to non-diabetics as compared to diabetics, but the difference did not assume statistical significance.

44 diabetics and 198 non-diabetics were prescribed B blockers. At the end of 1-year of follow-up, out of these patients, cardiovascular mortality was 18.1% (8 patients) in the diabetic group and 5.5% (10 patients) in the non-diabetic group ($p=0.01$).

Parameter	Diabetics (62- 21%)	Non- Diabetics (232-79%)	P value
Age	64.3	66	NS
Male Gender	44 (68%)	166 (72%)	NS
Hypertension	34 (55%)	76 (33%)	0.03
Smoking	8 (12.4%)	38 (16%)	NS (0.78)
Known Case of CAD	6 (9.6%)	28 (12.6%)	NS (1)
Hypercholesterolaemia	26 (42.7)	120 (51.7%)	NS (0.41)
Sedentary Lifestyle	14 (22.6)	60 (26.4%)	NS (0.81)
Thrombolysis	18 (28.6)	56 (24.3%)	NS (0.64)
Drugs at Discharge			
Antiplatelet	62 (100)	226 (97.9)	NS (1)
ACEI/ ARB	46 (73.3)	188 (80.7%)	NS (0.45)
Statin	60 (96)	214 (92%)	NS (0.69)

Table 1. Baseline Characteristics and Treatment Characteristics in Diabetic and Non-Diabetic Patients of STEMI

DISCUSSION

Today, diabetes has become a worldwide epidemic. Myocardial infarction is a leading cause of mortality in diabetes. A major contributor to the deleterious effects of myocardial infarction is reactive oxygen species (ROS).⁵ Hyperglycaemia by inducing mitochondrial dysfunction and endoplasmic reticulum stress increases ROS synthesis. ROS

directly damages proteins, lipids and DNA and impedes intracellular signaling pathways. Hyperglycaemia also promotes endothelial dysfunction, pro-inflammatory and procoagulant factor expression. No release is defective, and apoptosis is augmented. Through such myriad and many other such unexplained pathways, diabetes influences the pathogenesis and outcome of CHD.

In our study, out of total 294 patients 79% were non-diabetics and 21% were diabetics. The incidence of DM in AMI varies from 10% - 25%. Our result is in agreement with previous Indian studies that have also demonstrated that diabetes is seen in 5% - 20% of CAD patients. A recent study of 925 patients of ACS found 27% of patients to be diabetic,⁶ whereas in the study by Sharma et al diabetics comprised 28% of ACS patients.⁷ The Kerala ACS registry found a higher incidence of 37.6% of diabetes. The International data reveals an estimate of 35% in the NCDR and 30% in the OASIS trial.⁸ Hence, the importance of diabetes as a risk factor for CAD has been repeatedly underlined.

There was no gender difference between the two populations with both showing a male predominance. The incidence of hypertension was significantly more in the diabetic group ($p=0.03$). Vaur et al found hypertension in 70% of diabetics with MI as compared to non-diabetics.⁴ A German registry-based study also found an extremely significant increase in incidence of hypertension among diabetics. Also, among Indian studies, Sharma et al also found a significantly higher incidence of hypertension among diabetic patients of ACS as compared to non-diabetics (78.6% vs. 44.4%, $p=0.002$).⁷ The combination of diabetes and hypertension significantly amplifies the risk of microvascular and macrovascular complications. Also, the relatively worse outcomes for patients of ACS from India as reported in the CREATE registry could be due to coexistence of multiple known risk factors. In contrast, Pandit et al found that hypertension was more prevalent in the non-diabetic category.⁹ Smoking was equally prevalent in both groups, which is in agreement with other Indian studies.⁷ A Korean study had similarly found no difference in incidence of smoking between the groups.¹⁰

The use of medicines for secondary prophylaxis was much more impressive compared to the large Indian registry data such as CREATE and Kerala ACS. An audit of physicians' prescriptions by Sharma et al in 2012 found that aspirin was used equally in both groups.¹¹ However, ACE inhibitors/ARBs and statins were used more often in diabetics and B blocker use was significantly less. Our study found that all drugs were administered equally in both groups. B blocker use was lower in diabetics, but it did not reach statistical significance. This probably reflects the increasing adherence to guideline-directed medical therapy. A contemporary Indian study has also found equal use of all drugs in both categories except dual antiplatelets and B blockers used less frequently in diabetics.⁷ Voller et al analysed registry data to show that statin therapy was administered equally in diabetics and non-diabetics (93%) and similar was the case with aspirin (80%).¹²

There is ample evidence to display that patients with DM have worse outcome than non-diabetics including both morbidity and mortality. The reasons include more extensive coronary artery disease, greater incidence of comorbidities and additional risk factors for CHD. Diabetics are also less

frequently exposed to evidence-based therapy than non-diabetics.¹³ The mortality of diabetic patients on B blockers is significantly more than non-diabetics on B blockers. According to the landmark Framingham Heart Study, cardiovascular mortality is raised twice in diabetic men and 4 times in diabetic women as compared to non-diabetics.¹⁴ Diabetes not only plays an important role in causation of CAD, but also adversely impacts outcome following cardiac events. A subgroup analysis of diabetics with STEMI in the GUSTO 1 trial found higher 30-day mortality in diabetics (10.5% vs. 6.2%).¹⁵ A TIMI study group sub-study found that diabetes in ACS as compared to non-diabetics was associated with higher 1 year mortality in STEMI (13.2 vs. 8.1%, $p < 0.001$) as well as NSTEMI (7.2% vs. 3.1%, $p < 0.001$).¹⁶ Hur et al in a prospective Korean study of diabetic patients with MI found long-term mortality (after 1 month of stabilization) to be 3.9% in diabetics vs. 1.7% in non-diabetics ($p < 0.05$).¹⁷ A 2017 meta-analysis concluded that the risk of death overtime was significantly higher among diabetics compared with non-diabetics.¹⁸ This risk has been revealed in studies over the past 30 years and persists in spite of modern treatment strategies including reperfusion. Thus, in spite of all recent advances, the difference in mortality between diabetics and non-diabetics remains considerable.

In the present study, the use of B blockers was more common in non-diabetics, although not statistically significant. However, the 1-year cardiovascular mortality was higher in diabetics on B blockers. B blockers are known to have beneficial effects in post MI patients. In diabetics, an additional benefit of B blockers is the reduction of adverse events following severe hypoglycaemia. On the other hand, B blockers aggravate the potential risk of occurrence of severe hypoglycaemia and weight gain. A recent sub-study from the ACCORD trial found that in diabetics use of B blocker was associated with an increase in cardiovascular events, both in the larger category of all diabetics and in the smaller subgroup of patients with CHD or heart failure.¹⁹

Our study had a small sample size and was conducted at a single hospital. Hence, a larger study to confirm the findings and throw more light on the diabetic MI population would be in order.

CONCLUSION

Diabetics with AMI are considered high-risk patients. With the increasing prevalence of diabetes, this population of patients can only be expected to increase. A comprehensive understanding of the patient's profile and the grave prognosis of the disease will spur more intensive secondary prevention strategies to improve the long-term outcome.

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