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Angiographic Profile of Type 2 Diabetic Patients with ST Elevation Myocardial Infarction Attending Tertiary Care Centre at Central India: A Cross-Sectional Study

Dr Pradeep Deshmukh, Dr Mohammed Arshiyan Malik

Government Medical College (GMC), Nagpur, Maharashtra, India

Abstract: ***Introduction: Diabetes is one of the most common cause of coronary artery atherosclerosis, and leads to diffuse and multivessel involvement and myocardial infarction. Aim: To evaluate the angiographic profile of diabetic patients with ST Elevation Myocardial Infarction (STEMI). Materials and Methods: The present study was a cross-sectional study which enrolled 116diabetic patients presenting with STEMI from 1st January 2022 to 30th June 2022. Coronary artery lesion of 70% or more in major coronary artery or artery having lumen diameter of >=2.5 and 50% or more in Left main coronary artery is considered significant. Results: Age of the patients was 25 yrs to 75 years, with 78 subjects being males and 38 subjects were females. Out of 116 patients 51 (43.97%) had Hypertension 56 (48.28%) had smoker in the form cigarrete and bidi and 40 (34.48%) were tobacco chewer and 72 (62.06%) were alcoholic. Atypical angina were present in 68(58.62%) of patients and 48 (41.37%) present with typival angina. Most common age group affected 56 to 65 years . AWMI seen in 63 (54.31%) of patients and IWMI in 53 (45.69%) patients, 62 (79.48%) of patients with AWMI had HbA1c more than 8.5 and 27(71.05%) of IWMI had HbA1c more than 8.5. patients with duration of Diabetes more than 5 years are affected more in percentage . (Table 4) . Among 116, 41 were thrombolysed and 75 not thrombolysed. Severe LV dysfunction were present in 20 (17.24%) patients and 22 (18.90%) had moderate LV dysfunction, mild LV dysfunction were present in 21 (18.10%) and 53 (45.6%) had normal LV function. Single vessel involvement in 34 (29.31%) DVD involvement in 39 (33.62%) and TVD in 43 (37.06%) and left main involvement in 19 (16.37%) along with SVD, DVD AND TVD Major Adverse Cardiac Events (MACE) was during hospital stay in the form of death, recurrent myocardial infarction and cardiovascular stroke, which occurred in 14 (12.06%) patients of the total 116 diabetic patients. Conclusion: In this study patients with uncontrolled diabetes with HbA1c more than 8.5 and duration of diabetes more than 5 years were affected more in number and had STEMI and diffuse and multivessel coronary artery involvement. In this study on the basis of syntax score PTCA and Coronary Artery Bypass Graft (CABG) were mode of treatment.***

Keywords: diabetes, coronary artery, myocardial infarction, angiographic profile, STEMI

1. Introduction

The prevalence of diabetes mellitus is increasing now days and parallels the growth of the elderly population with the rise in rates of obesity [1]. Diabetes Mellitus is the second most common disease in the world, after cardiovascular disease. It is estimated that cardiovascular (CV) disease represents two-thirds of deaths in subjects with diabetes mellitus, including approximately 40% related to coronary artery disease (CAD), 15% to congestive heart disease, and 10% to stroke [2, 3]. Type II is by far the most frequent type of diabetes. Diabetes is one of the most important CV risk factors and individuals affected by diabetes may be asymptomatic or have had unspecific symptoms for several years before the diagnosis is made, screening for this condition is mandatory both for healthy individuals and for patients with established CV disease [4].In type II Diabetes dyslipidaemia is very common finding and diabetics with high cholesterol have a 2-3 times higher risk of Coronary Artery Disease (CAD) than non-diabetics. Coronary artery disease in most common in Diabetic patients followed by cardiomyopathy and cardiac autonomic neuropathy. In hospital, autopsy, and epidemiological as well as longitudinal studies in many populations, accelerated and increased prevalence of CAD has been well documented. Cardiovascular disorders account for 70-80% of deaths in diabetics. Coronary artery disease is responsible for 40% of diabetic deaths in their fourth decade, and it accounts for 50-70% of deaths among diabetics over the age of 65 years [5]. In patients with diabetes, CAD is more prevalent, more advanced, and occurs at a younger age than in nondiabetic counterparts. Many other metabolic abnormalities—including chronic hyperglycemia, dyslipidemia, oxidative stress, and insulin resistance—have been associated with the accelerated atherogenesis observed in people with diabetes[3]. In addition to metabolic disturbances, diabetes alters the function of multiple cell lines, including endothe-lial cells, smooth muscle cells, and platelets 1) endothelial dysfunction and oxidative stress, (2) an inflammatory state, (3) a prothrombotic state, and (4) atherosclerotic plaque instability with subsequent risk of plaque rupture and occlusive thrombus formation [3]and which predisposes individuals to occlusive CAD, Myocardial Infarction (MI), and death[6].Coronary angiography is the “gold-standard” procedure for detecting and evaluating CAD. Coronary artery disease can manifests as stable angina, unstable angina, NSTEMI and STEMI to asymptomatic illness [7, 8]. It is important and necessary to understand coronary artery lesion and its affection in Diabetes to make appropriate management. [8].

The prognosis of CAD is mainly determined by the severity of the lesion, the involvement of the left main and left anterior descending arteries, and Left Ventricular (LV) function [9]. Coronary atherosclerosis is diffuse, with multivessel involvement. Much higher rate of left main coronary artery involvement is seen in Diabetic patients than nondiabetic patients [10]. Coronary artery narrowing of

more than or equal to 70% and in Left Main coronary artery 50% or more is considered as significant stenosis [11]. Diabetic patients exhibit a worse presentation of angiographic picture of ischaemic heart disease, with a higher prevalence of multivessel disease, narrow arteries, calcification, intracoronary thrombus, and less developed collaterals. In Insulin-dependent diabetics there is higher prevalence of diffuse CAD with narrow arteries, presumably because of metabolic derangement and longer progression and severity [12]. Diabetes entails an increased risk for myocardial infarction (MI). Across the spectrum of acute coronary syndrome (ACS) events, in which DM may affect more than one in three patients, those with DM have worse CVD outcomes but they also benefit more from vigorous treatment than their non diabetic counterparts. Potent antiplatelet drug treatment, such as aspirin, clopidogrel, and Glycoprotein (GP) IIb/IIIa receptor antagonists, heparin or Low Molecular Weight Heparin (LMWH) early invasive evaluation, and, if suitable, stent-based Percutaneous Coronary Intervention (PCI) are the mainstays of treatment [13]. In patients with complicated coronary architecture, Coronary Artery Bypass Graft (CABG) may be a viable option. Surgeons, on the other hand, are typically hesitant to operate in the presence of ongoingischaemia. The use of drug-eluting stents has been linked to a significant reduction in restenosis in both non diabetic and diabetic patients. This results in further improvement in the outcomes of diabetic patients with ACS [14]. Our aim of this study to assess diabetic patients, risk factors and angiographic profile, as well as the impact of this disease and clinical course of patients with ST Elevation Myocardial Infarction (STEMI).

2. Materials and Methods

This was a single-centre cross-sectional study carried out at Government Medical College and Super Speciality Hospital Nagpur Maharashtra, India, from1st January 2022 to 30th June 2022. The patients were enrolled into the study after obtaining written consents from them or their attendants. In this study we took 116 patients.

Inclusion criteria: Diabetic patients with acute MI who had ST segment elevation and T wave changes with or without reciprocal changes, and new pathological Q waves on their Electrocardiogram (ECG) and age group from 25 years to 75 years.

Exclusion criteria: Patients with acute STEMI who were non-diabetic.

Detailed history, clinical examination and the following investigations with coronary angiography were carried out, Complete Blood Count (CBC), serum urea, serumcreatinine, serum electrolytes, ECG, 2D ECHO, Glycated Haemoglobin (HbA1c), and coronary angiography.

Table 1: Duration of Diabetes

Diabetes duration	Female	Male	Total
Less than 5 yrs	18 (39.13 %)	28 (60.86 %)	46 (39.66 %)
More than 5 yrs	20 (28.51 %)	50 (71.42 %)	70 (60.34 %)

Table 2: Diabetes and associated risk factors and comorbidities

Comorbidities	Female	Male	Total
HTN	21 (41.17 %)	30 (58.82 %)	51 (43.97 %)
Smoker	3 (5.35 %)	53 (94.64 %)	56 (48.28 %)
Tobacco chewer	6 (15 %)	34 (85 %)	40 (34.48 %)
Alcoholic	2 (2.77 %)	70 (97.2%)	72 (62.06 %)

Table 3: Clinical presentation, sign and symptoms

Symptoms	Female	Male	Total
Atypical Angina	21(30.86%)	47(69.11%)	68(58.62%)
Typical Angina	17(35.41%)	31(64.58%)	48(41.37%)
Dyspnea	11(32.35%)	23(67.64%)	34(29.31%)
Palpitation	12(48%)	13(52%)	25(21.55%)
Sweating	06(19.03%)	25(80.64%)	31(26.72%)
Abdominal pain & vomiting	06(33.34%)	12(66.67%)	18(15.51%)
Giddiness	0	2(100%)	2(1.72%)

Table 4: Profile of patients with age of presentation and HbA1c level and duration of Diabetes

Age (years)	AWMI (ALWMI, ASWMI, Extensive AWMI)	IWMI	Total
25 - 40	3(4.07%)	5(9.43%)	8(6.89%)
41 - 55	18(28.57%)	21(39.62%)	39(33.62%)
56 - 65	25(39.68%)	18(33.90%)	43(37.06%)
>65	17(26.98%)	9(16.98%)	26(22.41%)
TOTAL	**63(54.31%)**	**53(45.69%)**	**116**
Variable HbA1C			
<8.5	16(20.51%)	11(28.94%)	27(23.27%)
>= 8.5	62(79.48%)	27(71.05%)	89(76.72%)
Total	**78**	**38(100%)**	**116**
Duration of disease			
<5 years	23(42.59%)	25(40.32%)	48(41.37%)
>5 years	31(57.40%)	37(59.67%)	68(58.62%)
Total	**54**	**62**	**116**

Table 5: Thrombolysis

Angina	Not thrombolysed	Thrombolysed	Total
Typical	39(52%)	9(21.95%)	48(41.37%)
Atypical	36(48%)	32(78.04%)	68(58.62%)
Total	75	41	116

Table 6: LV function

LV Dysfunction	Female	Male	Total
Mild	9(23.62%)	12(15.38%)	21(18.10%)
Moderate	6(15.78%)	16 (20.51%)	22(18.90%)
Severe	05(13.15%)	15(19.23%)	20(17.24%)
Normal	18(47.36%)	35(44.87%)	53(45.6%)
Total	38	78	116

Table 7: Vessel involvement in Diabetes

Angiography	Female	Male	Total
SVD	12(31.57%)	22(28.20%)	34(29.31%)
DVD	11(28.94%)	28(35.89%)	39(33.62%)
TVD	15(39.47%)	28(35.89%)	43(37.06%)
TOTAL	38	78	116

Table 8: LM involvement

Vessel	Female	Male	Total
LM+TVD	03(60%)	09(64.28%)	12
LM+DVD	02(40%)	03(15.78%)	05
LM+SVD	0	02(14.28%)	02
TOTAL	05	14	19

3. Results

In this study total 116 diabetic patients with acute STEMI admitted in ICCU. Subjects of age group from 25 years to 75 were included out of this78 subjects were males and 38 subjects were females. The age group of 56 to 65 years (37.06 %) contains major subject group. [Table 1,2 & 4] shows duration of diabetes, other co-morbidities and risk factors among patients. Majority of patients were diabetic for more than 5 years (60.34%), patients with co-morbidities like hypertension and risk factors like alcoholism, smoking, and tobacco chewing were included . There were 68 (58.62%) patients who had atypical chest pain and 48 (41.37%) people who had typical chest pain. Along with chest pain they also presented with other symptoms like dyspnoea, sweating, vomiting, and abdominal pain and giddiness [Table3]. Among 116 patients, 63 patients had AWMI, 53 patients had IWMI.HbA1C > 8.5 were seen in 89 patients that mean most of them had deranged blood sugar level. Out of 116, 41 patients were thrombolysed among them 9 had typical chest pain and 32 had atypical chest pain and 75 patients were not thrombolysed among them 39 had typical chest pain and 36 had atypical chest pain (Table 5).Normal LV function was seen in 53(45.6%) patients among them 21 (18.1%) had mild lv dysfunction 22 (18.9%) had moderate lv dysfunction and 20(17.24%) had severe LV dysfunction(table 6). The angiographic result of these patients had shown higher percentage of multivessel involvement. Among them 34(29.31%) had SVD ,39(33.62%] had DVD and 43(37.06%) had TVD.PTCA done in 63 patients, CABG in 31 patients and medical management given to 22 patients (Table 7). There were total 19 patients having left main involvement out of which LM +TVD seen in 12 patients which include 9 male and 3 female patients, LM+DVD seen in 5patients 3 male and 2 female and LM+SVD in 2 patients both of them male (Table 8)

Outcome: The MACE was observed during the hospital stay in the form of death, recurrent MI, and cardiovascular stroke occurred in 14 (12.06%) of patients of total 116 diabetic patients.

4. Discussion

A total of 116 diabetic patients with acute STEMI were included in the study. Risk factors, diabetes duration, HbA1c levels, echocardiography and angiographic profile were studied. During study we found duration of diabetes more than 5 years were seen in 70 (60.34%) of patients and 50 (28.51%) were male and 20 (28.51%) were female and rest having less than 5 years duration STEMI were more common in patients who had poor glycaemic control (HbA1c>8.5%) made up 76.72% of the participants in this study out of them 62 had AWMI and 27 had IWMI. These results shows that inadequate glucose control causes great impact on coronary artery involvement and stenosis and leads to increase severity of disease. The observation was consistent with Malthesh MK et al., [17]. In this study, the peak incidence of MI in diabetics was observed in the 56 to 65 years age group followed by 40 to 55 years age group findings consistant with Chowdhary I and Sambyal V [5]. Incidence of MI were more in patient who had duration of diabetes more than 5 years which was matching with another study by Lüscher TF et al., which suggest the risk of coronary heart disease increased 1.38 times for every 10 years of diabetes duration [6]. Multi vessel and diffuse coronary artery involvement seen in coronary angiography. These findings were consistent with other studies that also found that diabetics have a greater incidence of multivessel disease [7,8]. Many different studies conducted on Diabetes had similar results .Coronary artery involvement in diabetic patients with ACS had diffuse and multivessel involvement [9, 10]. Further, there is literature that showed the angiographic extent and severity of CAD to be high among diabetic patients with ACS [11-16].For patients with diabetes and multivessel CAD, CABG surgery provided slightly better intermediate-term health status and quality of life than PCI using drug-eluting stents. The magnitude of benefit was small, without consistent differences beyond 2 years, in part due to the higher rate of repeat revascularization with PCI. Limitations of this study was a single-centred study [18]. There was no follow-up data, that could have provided more information about MACE.

5. Conclusion

The severity and extent of CAD and triple/multivessel disease was significantly high among diabetics. With a diabetic duration of more than 5 years, the risk of triple vessel or multivessel illness was found to be significantly higher. Diabetics with poor glycemic control, high HbA1c levels, and a greater number of coronary vascular involvement required CABG as a therapy option. Involvement of LMCA was significantly high and severity of stenosis and total occlusion of vessels were more commonly seen in diabetic patients. The LAD artery was the most commonly involved vessel.

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