Original Article

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Comparison of Extent and Severity of Coronary Artery Disease in Patients with and without Diabetes Mellitus Presenting with Non ST-Segment Elevation Myocardial Infarction.

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Abstract

Background and Aims: Diabetic patients are at increased risk of developing coronary artery disease. This study was conducted with the aim to compare the extent and severity of coronary artery disease in patients with and without diabetes presenting with non ST segment elevation myocardial infarction (NSTEMI).

Methods: This was a single center, hospital based, cross sectional, observational comparative study in which total 172 patients presenting with NSTEMI were divided into two groups of 86 patients each based on presence or absence of diabetes mellitus. Demographic, laboratory and angiographic data were analysed and compared between two groups.

Results: Among 86 patients enrolled in each group demographic characteristics and risk profile were not significantly different except for smoking status. Significant number of non-diabetics were current smoker (26.7% vs. 9.3%; $p < 0.01$). Hypertension was the most common risk factor in both groups. Non-diabetic patients had significantly high single vessel disease when compared to diabetics (11.6% vs 24.4%; $p=0.03$) while multivessel disease was significantly higher among diabetics (80.2% vs 59.3%; $p<0.01$). Diabetics had severe coronary artery disease with significantly high Gensini score (71.18±39.03 vs 59.84±33.68; $p=0.04$). There was no difference in terms of type of vessel affected.

Conclusions: Diabetic patients presenting with NSTEMI are likely to have more severe and extensive coronary artery disease compared to non-diabetic patients.

Keywords: Coronary Angiography; Coronary artery disease; Diabetes Mellitus; Non-ST elevation myocardial infarction.

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Introduction

The proportion of Non-ST segment elevation myocardial infarction (NSTEMI) in patients with acute coronary syndrome (ACS) has significantly increased in past decade.[1-3] Report from tertiary cardiac centre of Nepal showed that NSTEMI constituted for 37.1% of all cases admitted for ACS.[4] Coronary angiography (CAG) with the intent to perform revascularisation (either early or delayed) is a recommended procedure in NSTEMI.[5,6] But despite improvements in the medical management of patients presenting with NSTEMI, this condition remains associated with a poor prognosis, especially among persons with previously diagnosed diabetes mellitus.[7-9]

Diabetic patients are at greater risk for dying after an acute cardiac event when compared to patients without diabetes.[10-14] Data shows that patients with diabetes have more severe and

diffuse coronary artery disease (CAD) compared to patients without diabetes.[15-17] However even in absence of diabetes, the degree of CAD is found to be extensive and more severe in patients presenting with NSTEMI when compared to those presenting with ST segment elevation myocardial infarction (STEMI).[16, 18, 19]

Although patients presenting with NSTEMI are known to have more extensive CAD, if the angiographic profile of these patients based on presence or absence of diabetes mellitus is different from each other is not known. Therefore, this study was conducted with the aim to compare the extent and severity of coronary artery disease in patients presenting with NSTEMI based on diabetes status.

Methods

This was a single center, hospital based, cross sectional, observational comparative study conducted at Shahid Gangalal National Heart Center (SGNHC), Bansbari, Nepal between 1st August 2019 and 31st March 2020. The study protocol was approved by Institutional Review Board of National Academy of Medical Sciences. Using purposive sampling method, total 172 patients who were admitted with diagnosis of NSTEMI and underwent coronary angiography were enrolled in study. Patients whose angiographic data was not available for analysis and patients who did not give consent for the study were excluded. Informed written consent was acquired from each participant of the study. Patients included in study were divided into two groups; with diabetes mellitus and without diabetes mellitus with 86 patients in each group. Relevant demographic data, medical history, laboratory parameters, findings of angiography were recorded on a predesigned data collection form for each group.

Diagnosis of NSTEMI was made when patients had symptoms suggestive of myocardial ischemia in presence of positive troponin I result and in absence of persistent ST- segment elevation in ECG as per 2014 ACC/AHA guidelines for the management of patient with NSTEMI.[5]

Diabetes Mellitus was defined as patient previously diagnosed as DM or on oral hypoglycaemic drugs or Insulin during admission or newly diagnosed DM fulfilling any of the following diagnostic criteria as recommended by The American Diabetes Association:[20]

- Fasting Plasma Glucose ≥126 mg/dL
- 2-h Plasma Glucose ≥200 mg/dL during Oral Glucose Tolerance Test
- HbA1C ≥6.5%
- In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥200 mg/dL (11.1 mmol/L).

Coronary artery disease detected in coronary angiogram with >50% stenosis in any of major epicardial coronary arteries with vessels size >2mm in diameter [(1) Left Anterior Descending (LAD) and its branches diagonal, septal or ramus intermedius (2) Left Circumflex (LCX) and its branches obtuse marginal (OM) (3) Right coronary (RCA) and its branches right ventricular, posterior descending artery (PDA), posterolateral artery (PLV) (4) Left main coronary artery] was considered obstructive coronary artery disease. Based on disease involvement, obstructive CAD was classified as (1) Single vessel disease (SVD) - one coronary artery involved, (2) Double vessel disease (DVD) - two coronary artery involved and (3) Triple vessel disease (TVD) - three coronary artery involved. Coronary artery lesions <50 % narrowing was taken as non-significant stenosis.[21] Gensini score was calculated to measure the severity of disease.[22] Smoking status was categorised in either of the following: current smoker defined as smoking cigarettes within 1 month of time of evaluation; recent smoker defined as stopped smoking cigarettes between 1 month and 1 year before evaluation; former smoker defined as stopped smoking cigarettes greater than 1 year before evaluation and never smoker defined as person who never smoked cigarettes.[23] Other clinical history and risk factor was also defined according to American College of Cardiology Key Data Elements and Definitions for Measuring the Clinical Management and Outcomes of Patients with Acute Coronary Syndrome.[23]

Statistical Analysis

Qualitative variables were summarized as absolute frequencies and percentages. The quantitative data was expressed as means ± standard deviation. Groups were compared using chi-squared test/ Fisher's exact test for qualitative variables, and Student's t-test/the Mann-Whitney test for quantitative variables. 'P' value of less than 0.05 was considered statistically significant. All the statistical analyses were carried out via Statistical Package for Social Sciences version 20 (SPSS, IL, Chicago Inc., USA)

Results

Among 86 patients enrolled in each group (diabetic and non-diabetic) demographic characteristics and risk profile were not significantly different except for smoking status. Hypertension was the most common risk factor in both groups. Smoking was more prevalent among patients without diabetes (Table 1).

Table 1: Demographic characteristics and risk profile

Variables	Diabetic (n=86)	Non-Diabetic (n=86)	P Value
Age (years)	61.65±12.7	59.41±9.1	0.18
Sex			
Male	45 (52.3%)	48 (55.8%)	0.64
Female	41 (47.7%)	38 (44.2%)	0.08
BMI	25.3±3.8	24.2±4.5	0.14
Hypertension	63 (73.3%)	54 (62.8%)	0.24
Family history of MI	5 (5.8%)	2 (2.3%)	0.08
Dyslipidaemia	42 (48.8%)	31 (36.0%)	
Smoking Status			
Current Smoker	8 (9.3%)	23 (26.7%)	
Recent Smoker	1 (1.2%)	4 (4.7%)	0.01
Former Smoker	21 (24.4%)	15 (17.4%)	
Never Smoker	56 (65.1%)	44 (51.1%)	
Creatinine (mg/dl)	0.96±0.42	0.91±0.28	0.36
HbA1C (%)	7.58±1.49	5.6±0.41	<0.01

Data are mean±(SD) for continuous and n (%) categorical variables

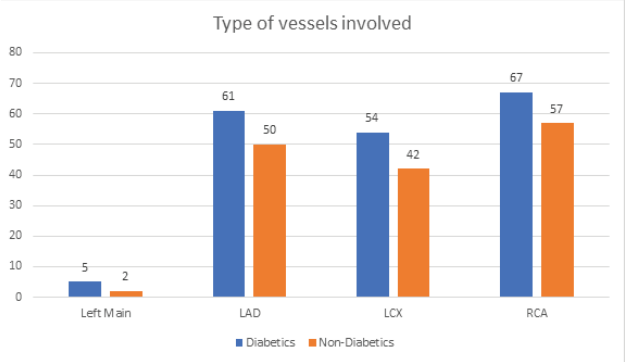
Angiographic characteristics of both groups is shown in Table 2. The prevalence of normal coronaries, non-significant stenosis and double vessel disease was not significantly different between two group. Non-diabetic patients had significantly high single vessel disease when compared to diabetics (p=0.03) while triple vessel disease was higher among diabetics (p=0.04). Overall multivessel involvement was significantly higher among diabetics when compared to non-diabetics (80.2% vs 59.3%, p<0.01). Diabetics had more severe CAD as shown by significantly high Gensini score when compared to non-diabetics (p=0.04). There was no significant difference between group in terms of type of vessel affected including left main coronary artery (Figure 1).

Table 2: Angiographic characteristics

	Diabetic (n =86)	Non-Diabetic (n=86)	P value
Normal Coronaries	1 (1.2%)	3 (3.5%)	0.31
Non-significant stenosis	6 (6.9%)	11 (12.8%)	0.20
Single Vessel Disease	10 (11.6%)	21 (24.4%)	0.03
Double Vessel Disease	30 (34.9%)	25 (29.1%)	0.41
Triple Vessel Disease	39 (45.4%)	26 (30.2%)	0.04
Gensini Score (Mean±SD)	71.18±39.03	59.84±33.68	0.04

Data are mean ± (SD) for continuous and n (%) categorical variables

Figure 1. Type of vessels involved as per group



Discussion

Our results indicate that coronary artery disease was more severe in diabetic patients compared to non-diabetic patients presenting with NSTEMI. This was true not only with regards to number of vessels involved but also to the severity of the involvement of vessels which is demonstrated by higher Gensini score among diabetic patients.

Study conducted by Sousa et al[24] showed that diabetic patients with non ST elevation acute coronary syndrome had severe atherosclerotic changes in coronaries in terms of luminal obstruction as well as extent to which vessels was affected. Another study done in one of tertiary cardiac centre of Nepal showed that among patients attending the hospital with ACS, patients with diabetes were more likely to have triple vessel disease compared to non-diabetics.[25] Similarly, study from India showed that diabetic patients presenting with NSTEMI were likely to have multivessel disease.[26] Findings of our study are consistent with these studies, showing that diabetic patients with NSTEMI have significantly more multivessel disease than non-diabetic patients. Diabetes is known to accelerate the process of atherosclerosis.[27] Apart from this mechanism, severe involvement of coronary artery in diabetics may also be in part due to the fact that myocardial ischemia in diabetic patients is often known to be without symptoms. So, when they present with acute coronary syndrome, they tend to have advanced disease with higher incidence of multivessel coronary atherosclerosis at the time of diagnosis.

Past studies have shown that diabetes mellitus is linked to poor prognosis among patients presenting with NSTEMI.[7-9] This might be related to the extensive and more severe CAD among diabetic patients presenting with NSTEMI as shown in our study. This might also be related to the frequent occurrence of plaques which has higher vulnerability for rupture among diabetics.[28,29] However, nature of plaques was not studied in our study.

With regards to risk factors, our study showed there was no significant difference in terms of age, sex, BMI or family history of CAD between two groups. Although patients with diabetes tend to have a greater number of patients with hypertension and dyslipidaemia, but this difference was not statistically significant between two groups. However, smoking was significantly prevalent among non-diabetics who developed NSTEMI. Consistent with our findings Sousa et al showed higher prevalence of active smoker among non-diabetics who presented with non ST elevation ACS in their study.[24] Swamy BC et al in their study showed higher prevalence of dyslipidaemia in diabetics and smoking in non-diabetics and no difference for hypertension and family history between them.[30] Despite smoking being more prevalent among non-diabetics, severe coronary artery involvement was significantly high among patients with diabetics which highlights the impact of diabetes on CAD.

This study had several limitations. Nature of plaque and anatomical location in terms of bifurcation or trifurcation lesion which is known to affect the outcome of intervention as well as overall prognosis was not studied. Difference in coronary artery involvement among diabetics based on duration of diabetes was not analysed. Other changes in coronary artery besides atherosclerosis like spontaneous coronary artery dissections or coronary artery spasm which may have accounted for non-significant stenosis in this study were not evaluated. In future, a multicentre study with larger sample size which addresses the limitation of our study is required to confirm findings from this study.

Conclusions

Diabetic patients presenting with NSTEMI are likely to have more severe and extensive coronary artery involvement compared to non-diabetic patients. Hence, routine check-up, aggressive risk factor modification by lifestyle changes and medications might aid in decreasing cardiovascular mortality and morbidity before as well as after acute coronary syndrome among patients with diabetes.

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