Original Article

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Prevalence of Myocardial Infarction with Non-Obstructive Coronary Arteries in Western Nepal.

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Background and Aims: It is well known that ST segment elevation myocardial infarction results from complete occlusion of a coronary artery supplying that area. However, in up to 15 % of patients with clinical diagnosis of myocardial infarction, early angiography reveal either non-obstructive or normal coronary artery. This subgroup of disease, myocardial infarction (MI) with non-obstructive coronary arteries (MINOCA), represent a diagnostic and therapeutic challenge to clinicians. We aimed to determine prevalence and clinical profile of patients with MINOCA in current study.
Methods: This is a retrospective, observational study conducted in cardiology department of Manipal Teaching Hospital, Pokhara, Nepal from 6th April 2014 to 5th April 2019. Patients with age ≥18 years and clinically diagnosed acute myocardial infarction who underwent coronary angiography without prior use of thrombolytic agents were selected. Data were analyzed using the software SPSS for windows version 18.
Results: A total of 177 patients' underwent early coronary angiography without prior use of thrombolytic agent. The prevalence of MINOCA was 13.5% (n=24) in our study population. MINOCA patients were younger ($p<0.001$) compared to non-MINOCA. Smoking, systemic hypertension, access through femoral route and depressed left ventricular ejection fraction were significantly lower in MINOCA patients ($p<0.05$, for all).
Conclusion: The prevalence of MINOCA was high (13.5%) in our study. Prospective studies are needed to conclude its high prevalence and to look for other associated factors and etiology.

Keywords: Coronary Angiography; Myocardial infarction; Myocardial infarction with non-obstructive coronary artery disease.

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Introduction

Early diagnostic coronary angiography can detect obstructive coronary artery disease (CAD) in more than 90% of patients presenting with acute myocardial infarction (MI).[1] Studies have demonstrated a close association of atherosclerosis with pathogenesis of MI.[2] However, a normal with no evidence of CAD or non-occluded coronary arteries are observed in up to 15 % of patients with clinical diagnosis of acute MI. These subgroup patients are referred to as MI with non-obstructive coronary arteries (MINOCA).[3,4] The well-established reperfusion strategies for acute MI is considered appropriate when athero-thrombotic process is documented. In these group of patients with etiology other than atherosclerosis, reperfusion strategies remain either ineffective or sometime harmful. Different etiologies have been postulated for MINOCA that includes: myocarditis, vasospasm, thromboembolism, micro-vascular dysfunction, supply/demand mismatch, Takotsubo syndrome, myocarditis, acute pulmonary embolism, coronary thrombosis, and dissection.[1,2] As the incidence of acute MI presenting to emergency department is rising even in developing countries like Nepal, it is important to know the prevalence and clinical characteristics of MINOCA patients to develop new strategies for these patients in our population. The present study aimed to determine prevalence and clinical characteristics of MINOCA patients.

Materials and Methods

A retrospective analysis of records of patients who were planned for primary angioplasty from 6th April 2014 to 5th April 2019 were done. A single centered, observational Study conducted at Manipal Teaching Hospital, a tertiary care Centre of Western Nepal with Cathlab facility. Data was collected in a pre-structured proforma and analyzed. The collected data were secured and made accessible only to investigator to maintain confidentiality.

All patients with clinical diagnosis of acute STEMI who were posted for primary angioplasty were included for study while patients who have undergone prior thrombolysis, old IHD, known Brugada syndrome, pericarditis and previous history of PCI or CABG were excluded. MINOCA was diagnosed according to the current opinion paper of the ESC working group that focused on the clinical context of MINOCA .The diagnosis of MINOCA was based on: (1) clinical documentation of a myocardial infarction (2) the exclusion of obstructive CAD and (3) no overt cause for the acute MI presentation, such as cardiac trauma. Conventionally, obstructive CAD is defined as an epicardial artery stenosis ≥50 % on angiography, thus a stenosis <50 % is required for the diagnosis of MINOCA.[5,1,2] The clinical diagnosis of an acute coronary syndrome was established according to the fourth universal definition of MI.[6,7] Seven cases who were not fulfilling the criteria were excluded and total of 177 cases were enrolled.

Data were analyzed using the software SPSS for windows version 18. We used mean and standard deviation (mean±SD) or median (25th–75th percentile) values for continuous variables while categorical variables were expressed as proportions (%). Chi-square test was applied to find association for nominal data. P value less than 0.05 was considered statistically significant.

Results

Among 566 cases of STEMI who have undergone coronary angiogram during study period, 177 patients were taken without prior use of thrombolytic agent and were selected for the study. The age ranged between 21 to 90 years with mean age of 59.72±13.45 years and 114 (64.4%) patients were male. The demographic and clinical characteristics of the study population shown in Table 1. Males predominated the study with male to female ratio of 1.8 in both the group. MINOCA patients were younger (mean age 46.17±11.74 years) compared to non-MINOCA patients (mean age 61.84±12.46 years) (p<0.001 for age group of <45 years). The prevalence of MINOCA was 13.5% (n=24).The exposure to traditional risk factors like smoking (37.5% vs. 59.5%; p: 0.043), history of systemic hypertension (29.2% vs. 51.0%; p: 0.047) were significantly lower in MINOCA. Anterior wall involvement in ECG (Table 2) and access through radial route (Table 1) were higher (83.3% vs. 35.3%) in MINOCA patients. The prevalence of other risk factors like diabetes mellitus (4.2% vs. 20.0%; P: 0.31) and dyslipidemia (12.5% vs. 28.1%; P: 0.10) were also lower in MINOCA group while history of flu (P: 0.08) which can be associated with viral myocarditis and alcohol (P: 0.80) intake were higher in MINOCA, though statistically insignificant. The mean left ventricular ejection fraction measured on echocardiography was higher in MINOCA (54±10.22%) patients than in non-MINOCA (47.3±7.78%) patients which is also reflected by significantly lower systolic and diastolic BP in non-MINOCA due to depressed left ventricular function (Table 2). Among 24 cases of MINOCA (fig:1), one young male patient had ECG change during second post-op day of acute appendicitis and was diagnosed type II MI, one middle aged lady had large coronary artery to left ventricular fistula, three patients with history of flu, had either clinical or ECG and echocardiographic evidence of myocarditis and another four had slow flow in coronary angiogram reflecting micro-vascular dysfunction. In remaining more than half (n=15) of the cases of MINOCA without specific etiology for ECG changes, no further investigation performed and were discharged with diagnosis of possible auto-thrombolysis.

Table 1: Characteristics of the study population. **n=177**

Characteristics	MINOCA (n = 24)	Non-MINOCA (n = 153)	P value
Age (in years)			
< 45 (n, %)	11 (45.8)	20 (13.1)	< 0.001
>45 (n, %)	13 (54.2)	133 (91.1)	
Mean±SD	46.17±11.74	61.84±12.46	
Gender			
Female	9 (37.5%)	54 (35.3)	0.834
Male	15 (62.5)	99 (64.7)	
Smoking	9 (37.5%)	91 (59.5)	0.043
Alcohol n, (%)	11 (48.8)	66 (43.1)	0.804
History of flu n, (%)	2 (8.3)	3 (2.0)	0.080
SBP (mmHg) (mean±SD)	131.67±20.78	119.48±22.44	0.013
DBP (mmHG) (mean±SD)	85.00±17.45	82.75±13.35	0.009
Hypertension n, (%)	7 (29.2)	78 (51.0)	0.047
Diabetes n, (%)	1 (4.2)	20 (13.1)	0.316
Dyslipidemia n, (%)	3 (12.5)	43 (28.1)	0.105
Atrial fibrillation n, (%)	0 (0)	11 (7.2)	0.365
Route			
Femoral n, (%)	4 (16.7)	99 (64.7)	< 0.001
Radial n (%)	20 (83.3)	54 (35.3)	
Hemogloin (gm/dl) (mean±SD)	12.46±1.14	12.02±1.77	0.250
Random blood sugar (mg/dl) Median (25th -75th percentile)	120 (110–31.50)	132 (110–54)	0.325

Figure 1: Possible cause of ECG change in MINOCA patients.

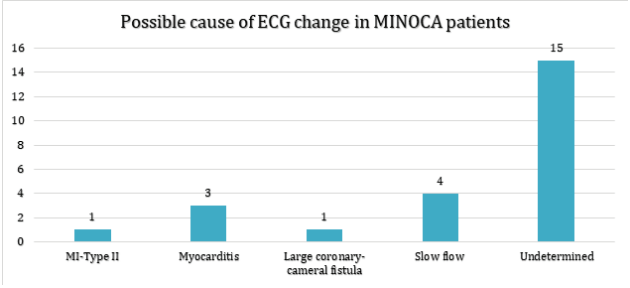

Table 2: Echocardiographic and electrocardiographic findings

		n=177	
Characteristics	**MINOCA (n = 24)**	**Non- MINOCA (n = 153)**	**P value**
LV ejection fraction (%)			
≥ 55	14 (58.3)	28 (18.3)	<0.001
41–54	9 (37.5)	95 (62.1)	
30–40	0 (0)	27 (17.6)	
< 30	1 (4.2)	3 (2.0)	
Mean±SD	54 ± 10.22	47.3±7.78	
Anterior wall involvement n, (%)	18 (75)	87 (56.8)	0.047

Discussion

Acute myocardial infarction with no evidence of relevant stenosis of the coronary artery is known as myocardial infarction with non-obstructive coronary arteries (MINOCA).[8] Non-obstructive coronary artery disease on coronary angiography after myocardial infarction is associated with a lower risk of adverse outcomes, but the prognosis may not be benign.[9] Nowadays with the common use of coronary angiography in MI, clinicians are regularly confronted with MINOCA which represents a puzzling diagnosis, including heterogeneous patients with many potential etiologies that need to be investigated.[10] The prevalence of MINOCA in our study was 13.5% which is in line with study by Pasquale Paolisso et al (12%),[10] Roberta Rossini et al (13 %)[11] and Peter R Barr et al (15%)[9] but higher compared to studies by Daniel Ballesteros-Ortega et al (6%),[8] Rachel P Dreyer et al (5.9%)[12] and Salih kilic et al (6.7%).[1] Non-availability of CT coronary angiography during study period for low risk young patients with atypical chest pain and subtle ST elevation in anterior leads, as J-point elevation is common in this age group that required diagnostic coronary angiogram, could be the reason for high prevalence of MINOCA in our study. Similar to many previous studies, MINOCA patients were younger (Mean age 46.17±11.74 years).[8,9,10] Patients with MINOCA were more likely to be female and such association was statistically significant in many studies.[8,11] However we found no gender differences between two groups with male predominance in both. Males are more privileged to have access to health care facility and further expensive investigatory test and treatment in our society, so females may have under-represented in our study. MINOCA patients being younger with better radial pulse and hemodynamic stability may have been accessed through radial route in our study. The prevalence of exposure to traditional risk factors for MI, like in previous studies were significantly lower in MINOCA as compared to Non-MINOCA patients. This suggest possibility of different pathogenesis other than atherosclerosis for coronary occlusion in MINOCA, as traditional risk factors are associated with atherosclerosis. Regarding etiology of MINOCA, in majority (62.5%; n=15) of cases remain undetermined, four had slow flow, three had myocarditis, one each had type II MI and large coronary artery to left ventricular fistula. Previous studies have implicated spasm,[13] microvascular dysfunction[14] and thrombophilic states (Factor V Leiden,[15-17] protein C deficiency)[18] and malignancy-associated thrombophilia.[19] Da Costa et al. reported that a third of patients with MINOCA had evidence of coronary spasm or thrombotic disorders.[17] In a large prospective nationwide survey of 2361 consecutive ST-elevation–acute coronary syndrome patients, 405 (17%) patients were found to have spontaneous reperfusion.[20]

This study has few limitations. First, a single center study with limited number of sample size. Second, being retrospective study, further diagnostic work up to look for cause of ST elevation in ECG could not be done in MINOCA group.

Conclusion

The prevalence of MINOCA was high (13.5%) in our study. MINOCA patients were younger, had less traditional risk factors as compared to non-MINOCA patients. Prospective studies are needed to conclude its high prevalence and to evaluate other associated factors. Future prospective trials can enlighten the undetermined etiology and possible management.

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Conflict of Interest: None

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