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ORIGINAL ARTICLE

Clinical Features and Long-Term Outcomes in Very Young Patients with Myocardial Infarction with Non-Obstructive Coronary Arteries

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ABSTRACT

Background and Aim: The most common cause of acute coronary syndrome (ACS) is the erosion causing the development of atherosclerotic plaque. There is, however, a subset of individuals with ACS-like symptoms but no significant coronary artery obstruction characterized as myocardial infarction with non-obstructive coronary arteries (MINOCA). The purpose of the present study was to assess the clinical features and long-term outcome of young MI patients with non-obstructive coronary arteries.

Patients and Methods: This prospective observational study was carried out on 926 patients underwent coronary angiographies in the Cardiology Department of Medical Teaching Institute (MTI) Lady Reading Hospital, Peshawar from January 2019 to December 2022. All the patients (age ≤45 years) with suspected acute coronary syndrome were enrolled. Participants were categorized into three groups: Group-I [obstructive coronary artery disease (o-CAD)], Group-II (MINOCA diagnosed patients), and Group-III [control (non-coronary artery disease)]. Demographic details, clinical features, and outcomes of patients were recorded.

Results: Of the total 926 patients underwent coronary angiographies, about 122 (13.2%) patients were ≤45 years old. Out of 122 patients, the incidence of o-CAD, MINOCA, and control (non-coronary artery disease) was 60.7% (n=74), 13.1% (n=16), and 26.2% (n=32) respectively. Chest pain was the most prevalent symptom found in 95.1% (n=116) group-I, 93.8% (n=15) in group-II, and 81.3% (n=26) respectively. MINOCA patients had similar high-density lipoprotein (HDL) and low-density lipoprotein (LDL) cholesterol levels with o-CAD patients, however, the triglyceride values was significantly higher (180.8±90.6) than control (136.2±82.8).

Conclusion: The present study found that MINOCA and o-CDA group patients had similar long-term poor outcomes. Triglyceride levels, depression, BMI >30 kg/m^2, and family history of CAD are significant risk factors for MINOCA during follow-up. Secondary preventive initiatives are required in these patients to avoid recurrences and enhance outcomes.

Keywords: CAD, MINOCA, Young patients, Clinical features, Long-term outcomes

INTRODUCTION

Myocardial infarction with non-obstructive coronary arteries (MINOCA) is a disease characterized by clinical signs of a myocardial infarction with normal or near-normal coronary arteries on angiography (stenosis <50%) [1, 2]. The most prevalent cause of acute coronary syndrome (ACS) is atherosclerotic plaque formation caused by erosion. Yet, there is a minority of people who have ACS-like symptoms but no severe coronary artery blockage, which is known as myocardial infarction with non-obstructive coronary arteries (MINOCA). MINOCA has been observed to occur in 2.6%-15% of myocardial infarction patients [3-6]. Although various techniques have been suggested, the underlying pathological strategies are poorly known, including epicardial origin or microvascular. MINOCA young patients had frequently female patients with less extensive atherosclerosis and hyperlipidemia as compared to MI-CAD. The difference in prognosis between individuals with obstructive and non-obstructive MI may be due to variations in the underlying pathophysiological processes, but it might also be due to differences in risk factor profiles. This makes MINOCA diagnosis and therapy difficult in regular clinical practice [7].

The MINOCA incidence varies from 5% to 25% in patients aged above 40 years [8, 9]. Nevertheless, it is more than 18% among young patients aged 35 years [10]. Unfortunately, the peculiarities of these extremely young individuals have received little attention, and certain traditional risk factors remain unknown. There is paucity of data regarding the clinical features and long-term outcomes of MINOCA patients. Therefore, the purpose of this study is to assess the clinical features and long-term outcomes in MINOCA patients.

METHODOLOGY

This prospective observational study was carried out on 926 patients underwent coronary angiographies in the Cardiology Department of Medical Teaching Institute (MTI) Lady Reading Hospital, Peshawar from January 2019 to December 2022. All the patients (age ≤45 years) with clinical suspicion of acute coronary syndrome were enrolled. Patients were categorized into three groups: Group-I [obstructive coronary artery disease (o-CAD)], Group-II (MINOCA diagnosed patients), and Group-III [control (non-coronary artery disease)]. Demographic details, clinical features, and outcomes of patients were recorded. Individuals having a 50% blockage in the left main were classified high risk for CAD.

SPSS version 26 was used for data analysis. For continuous data, descriptive statistics are shown as the mean and standard deviation (SD) or median with interquartile range (IQR). Descriptive statistics are presented as numbers and percentages for all category variables. A multivariate model was developed using binary logistic regression analysis to evaluate the impact of risk combinations. For the cardiovascular risk variables studied, odds ratios (OR) and 95% confidence intervals were determined.

RESULTS

Of the total 926 patients underwent coronary angiographies, about 122 (13.2%) patients were ≤45 years old. Out of 122 patients, the incidence of o-CAD, MINOCA, and control (non-coronary artery disease) was 60.7% (n=74), 13.1% (n=16), and 26.2% (n=32) respectively. Chest pain was the most prevalent symptom found in 95.1% (n=116) group-I, 93.8% (n=15) in group-II, and 81.3% (n=26) respectively. MINOCA patients had similar high-density lipoprotein (HDL) and low-density lipoprotein (LDL) cholesterol levels with o-CAD patients, however, the triglyceride values was significantly higher (180.8±90.6) than control (136.2±82.8). Demographic and baseline details are shown in Table-I. Quantitative variables and laboratory parameters are shown in Table-II. Treatment given to the patients after discharge is shown in Table-III. Table-IV shows the different outcomes of studied population. Multivariate analysis of different risk factors for major

adverse cardiovascular events associated with MACE is shown in Table-V.

Table-I Demographic and baseline characteristics

Parameters	Group-I	P-value	Group-II	P-value	Group-III	P-value
Age (years)	36±5	0.021	34±6	0.921	33±7	0.214
Gender N (%) Female	10 (13.5)	0.492	4 (25)	0.243	5 (15.6)	0.092
BMI (>30 kg/m^2)	26 (35.1)	0.319	5 (31.3)	0.765	9 (28.1)	0.935
Hypertension N (%)	18 (24.3)	0.689	3 (18.8)	0.638	7 (21.9)	0.425
Diabetes N (%)	28 (8.8)	0.519	2 (5.6)	0.748	12 (6.8)	0.534
Smoking N (%)	64 (86.5)	<0.001	12 (75)	0.246	20 (62.5)	0.146
Depression N (%)	4 (5.3)	0.407	3 (18.8)	0.252	3 (9.4)	0.058
Family history of CAD N (%)	22 (29.7)	<0.001	5 (31.3)	0.149	7 (21.9)	0.114
Dyslipidemia N (%)	21 (28.4)	<0.001	3 (18.8)	0.152	4 (12.5)	0.409
Peripheral artery Disease N (%)	1 (1.4)	0.726	0 (0)	0.612	1 (3.1)	0.534
Congestive heart Failure N (%)	2 (2.7)	0.619	0 (0)	0.609	2 (6.3)	0.719
Atrial fibrillation N (%)	7 (9.5)	0.989	0 (0)	0.610	2 (6.3)	0.608
Previous stroke N (%)	6 (8.1)	0.994	0 (0)	0.612	2 (6.3)	0.609
Renal failure N (%)	5 (6.8)	0.031	1 (6.3)	0.412	3 (9.4)	0.803

Table-II Quantitative variables and laboratory parameters

Lab. Parameters	Group-I (N=74)	Group-II (N=16)	Group-III (N=32)	P-value
LDL (mg/dl)	131.4±50.6	119.5±31.8	111.8±31.5	0.001
HDL (mg/dl)	37.8±9.46	38.6±10.4	42.6±11.6	0.001
Triglyceride (mg/dl)	161.2±107.9	180.8±90.6	136.2±82.8	0.149
Creatinine (mg/dl)	1.04±1.0	0.91±0.3	1.56±2.5	0.03
Total Cholesterol (mg/dl)	201.0±56.2	190.2±34.6	178.9±38.6	<0.001
LVEF (%)	52.5±7.9	57.8±7.8	54.8±9.72	0.438

Table-III Treatment after discharge

Medications	Group-I (N=74)	Group-II (N=16)	Group-III (N=32)	P-value
Beta-blockers	63 (85.1)	6 (37.5)	5 (15.6)	<0.001
Anticoagulants	4 (5.4)	0 (0)	1 (3.1)	0.346
ACE inhibitors	154 (48.1)	2 (5.6)	18 (10.2)	<0.001
Statins	69 (93.2)	9 (56.3)	5 (15.6)	<0.001
Diuretics	6 (8.1)	0 (0)	2 (6.3)	0.142
Antidiabetics	2 (2.7)	1 (6.3)	0 (0)	0.326
Antiarrhythmics	2 (2.7)	0 (0)	1 (3.1)	0.369

Table-IV Outcome of studied population

Outcomes	Group-I (N=74)	Group-II (N=16)	Group-III (N=32)	P-value
New coronary revascularizations	10 (13.5)	4 (12.5)	3 (9.4)	<0.001
Mortality	3 (4.1)	1 (6.3)	1 (3.1)	1.000
Stroke	2 (2.7)	0 (0)	1 (3.1)	1.000
AMI	8 (10.8)	1 (6.3)	1 (3.1)	0.326
MACE	51 (68.9)	10 (62.5)	26 (81.3)	<0.001

Table-V Multivariate analysis of different risk factors for major adverse cardiovascular events associated with MACE

MACE	OD 95% CI	P-value
Hypertension	8.32 (0.92 – 30.89)	0.049
Diabetes	1.72 (0.03 – 30.78)	0.782
BMI>30 kg/m^2	0.17 (0.25 – 1.45)	0.110
Smoking	4.86 (0.58 – 20.35)	0.129
Dyslipidemia	0.46 (0.61 – 3.65)	0.486
Family history of CAD	6.18 (1.35 – 26.42)	0.015
Depression	5.21 (1.12 – 24.27)	0.041

DISCUSSION

The present study mainly focused on the clinical features and long-term outcomes of MINOCA patients and found that Patients in the MINOCA and o-CDA groups exhibited comparable long-term bad results. During follow-up, triglyceride levels, depression, BMI >30 kg/m2, and a family history of CAD are all significant risk factors for MINOCA. Secondary preventative measures are essential in these patients in order to avoid recurrences and improve outcomes. The cardiovascular events associated risk factors are comparable in MINOCA and o-CAD patients as compared to control group. Depression and family history of CAD are different risk factors for MINOCA and 0-CAD in MACE patients. Chest pain was the most prevalent complaint found in 95.1% in group-I, 93.8% in group-II, and 81.3% in control group.

A previous study investigated the various etiology associated with clinical presentation of MINOCA [11]. The precise occurrence rate of MINOCA varies between researches, although it has been shown to be present in 3-15% in the MI patients [12, 13]. The prevalence of MINOCA in our sample was 6.8%, which is lower than reported incidence in a previous studies [14, 15]. Additionally, similar to previous finding, MI-CAD patients had three times higher incidence of STEMI in MI-CAD than MINOCA [16]. Additionally, earlier intravascular imaging investigations have revealed atherosclerotic breakdown in 40% of MINOCA patients [17, 18].

Since MINOCA patients do not have obstructive atherosclerosis, their prognosis seems to be better than that of MI-CAD patients. Additionally, few investigations reported that MI-CAD patients had poor prognosis than MINOCA patients [19, 20]. Just a few trials, however, have shown comparable results for MINOCA individuals [21, 22].

The MINOCA patient's risk is remarkably comparable to o-CAD patients. Also, the MINOCA group had higher prevalence of depression, drug used, and female gender. The MINOCA patients with elevated triglyceride levels had statistically significant which were similar to other studies findings [23, 24]. In addition, prior investigations have found that the MINOCA group had lower LDL levels than healthy controls [25] and obstructive CAD individuals [26].

A recent randomized, placebo-controlled research found that calcium channel blockers did not improve symptoms, dysfunction of coronary vasomotor, or life quality, while diltiazem medication did lower the epicardial spasm incidence [27]. An earlier study revealed that MINOCA patients over the age of 40 have demonstrated improved outcomes [28]. These medications are infrequently recommended in under 40 year's old MINOCA population, despite the fact that they, together with statins and beta-blockers, can enhance long term outcomes [29].

Several studies [30, 31] found a family history of CAD may have a role in MINOCA development in CAD patients. Numerous investigations related the CAD early vulnerability to CAD family history and elevated subclinical atherosclerosis levels [32, 33].

CONCLUSION

The present study found that MINOCA and o-CDA group patients had similar long-term poor outcomes. Triglyceride levels, depression, BMI >30 kg/m^2, and family history of CAD are significant risk factors for MINOCA during follow-up. Secondary preventive initiatives are required in these patients to avoid recurrences and enhance outcomes.

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