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Original Article

Frequency of Non-ST-Elevation Myocardial Infarction (NSTEMI) among Patients Presenting with Atypical Presentation

Sumair Ahmed[1*], Muhammad Ali[1], Adeel Ur Rehman[1], Zuhaib Ahmed[1], Salman Ishaque Shaikh[1] and Fiza Sumair[2]

[1]Tabba Heart Institute, Karachi, Pakistan
[2]Jinnah Postgraduate Medical Center, Karachi, Pakistan

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***Corresponding Author:**
Sumair Ahmed
Tabba Heart Institute, Karachi, Pakistan
sumairahmad17@gmail.com

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ABSTRACT

Non-ST-Elevation Myocardial Infarction (NSTEMI) occurs when there is a partial or complete blockage of blood flow to the heart muscle. Atypical symptoms may also be more commonly observed in patients with non-obstructive coronary artery disease, which is characterized by the presence of plaque but without significant stenosis. **Objective:** To find the incidence of Non-ST-Elevation Myocardial Infarction (NSTEMI) among the patients with atypical presentation. It was a cross-sectional study conducted at Tabba Heart Institute, Karachi for the duration of six months from 19th December 2019 to 18th June 2020. **Methods:** The study was carried out on 257 patients. The average age of patients was 56.33 ± 8.07 years; mean height was measured as 162.89 ± 7.75 cm, mean weight was 72.51 ± 15.26 kg and average BMI of patients was 27.2 8 ± 5.25 kg/m^2. In distribution of gender, out of 257 patients, 155 (60.3%) were male while 102 (39.7%) were female **Results:** Hypertension was noted in 155 (60.3%) patients, diabetes mellitus was documented in 109 (42.4%) patients. Positive family history of premature CAD was found to be in 31(12.1%) while 226 (87.9%) had negative family history. Non-ST elevation myocardial infraction was noted in 77 (30%) patients. **Conclusions:** As NSTEMI is linked with high chance of mortality and severe medical issues therefore, it was vital to study the underlying risk factors so that the burden of diseases can be lowered and optimization of the management strategies can be made for this already compromised cohort of patient.

INTRODUCTION

The non-ST-elevation myocardial infarction (NSTEMI) occur when the blood supply to the heart muscle is completely or partially cut off. It is often associated with typical symptoms such as chest pain, nausea and shortness of breath. However, a number of patients with NSTEMI may present with atypical symptoms, which can make diagnosis and treatment challenging. Atypical symptoms may include fatigue, dizziness, upper back pain, or discomfort in the arms, jaw, or throat [1-3]. Atypical symptoms may also be more common in patients diagnosed with non-obstructive coronary artery disease, which is characterized by the presence of plaque but without significant stenosis. Studies show a wide range in the prevalence of atypical symptoms in NSTEMI patients, with some reporting rates as high as 50%. The reasons for this variation could be found in the various study populations, diagnostic standards, and healthcare facilities. Atypical symptoms are more prevalent in patients with comorbid conditions like peripheral artery disease, renal failure or diabetes, and in older adults and women. Clinical symptoms, electrocardiogram (ECG) changes, and cardiac injury biomarkers like troponin are all used to diagnose NSTEMI. Additional diagnostic tests such as stress testing, coronary computed tomography angiography (CTA), or invasive angiography may be necessary to confirm the diagnosis [4, 5]. However, in

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patients with atypical symptoms, the interpretation of these diagnostic tests may be difficult. For example, ECG changes may be absent or nonspecific, and troponin levels may be normal or elevated for reasons other than myocardial infarction. Despite these difficulties, early and accurate NSTEMI diagnosis is essential for the best possible patient outcomes. Missing or delaying a diagnosis may lead to worse clinical outcomes, such as higher morbidity and mortality rates [6, 7]. Therefore, healthcare professionals should use a comprehensive diagnostic approach that considers clinical presentation, ECG findings, and biomarkers of cardiac injury and maintain a high index of suspicion for NSTEMI in patients with atypical symptoms [8, 9]. The choice of treatment relies on various factors, including the severity of the blockage, the extent of the myocardial damage, and the patient's clinical characteristics and preferences. Early and aggressive treatment is associated with improved outcomes in patients with NSTEMI. Several studies have shown that patients with atypical symptoms of NSTEMI are at increased risk of delayed diagnosis, longer hospital stays, and worse clinical outcomes compared to those with typical symptoms. In conclusion, atypical symptoms of NSTEMI are common and may be associated with delayed diagnosis and worse clinical outcomes. Further research is needed to better understand the prevalence, characteristics, and outcomes of atypical NSTEMI presentations and to develop more effective diagnostic and treatment strategies for these patients.

METHODS

The study was carried out on 257 patients who visited tertiary care unit for a duration of six months from 19th December 2019 to 18th June 2020. The average age of patients was 56.33 ± 8.07 years; mean height was measured as 162.89 ± 7.75 cm, mean weight was 72.51 ± 15.26 kg and average BMI of patients was 27.28 ± 5.25 kg/m^2. In distribution of gender, out of 257 patients, 155 (60.3%) were male while 102 (39.7%) were female. The sample size was calculated by using the World Health Organization calculator [10]. The level of confidence and margin of error was 95% and 5% respectively. Simple random sampling technique was used. Following patients were included in the study according to the inclusion criteria. The patients who have evidences of myocardial infraction on electrocardiogram, the patients who have a confirmed diagnosis of NSTEMI based on clinical criteria, the patients who present to the emergency department or hospital, the patients with the symptoms such as nausea, fatigue or dyspnea, the exclusion criteria was applied and following patients were excluded; the patients with the history of previous history of myocardial infraction, the patients who are pregnant or breastfeeding and the patients who have a clear alternative diagnosis for their symptoms. The study may include a comparison group of patients with typical symptoms of NSTEMI or a control group of patients without ACS to assess the relative frequency and outcomes of atypical presentations. The statistical analysis was performed by using SPSS V-22.0 and descriptive statistics was used to summarize the patient characteristics and outcomes, and inferential statistics to test the hypotheses and assess the associations between variables. The qualitative variables such as dyslipidemia, hypertension obesity, smoking status and family history was presented as percentage and frequencies. The duration of symptoms and age was presented as Mean SD. The mean of variables age, height, weight and BMI was calculated, SD was measured and the Shapiro Wilk test and chi-square test was applied for normality testing and calculation of p-value respectively.

RESULTS

The frequency of non-ST elevation Myocardial Infarction (NSTEMI) among patients presenting with atypical presentation was studied. The mean of variables age, height, weight and BMI was calculated, SD was measured and Shapiro Wilk test was applied for normality testing as shown in the table 1.

Table 1: Variables and their descriptive statistics for normality testing (n=257)

Variables	Mean ± SD	Shapiro-Wilk test
Age (years)	56.33 ± 8.07	0.000
Height (cm)	162.89 ± 7.75	0.011
Weight (kg)	72.51 ±15.26	0.000
BMI (kg/m2)	27.28 ± 5.25	0.000

In distribution of gender, out of 257 patients, 155 (60.3%) were male while 102 (39.7%) were female as shown in table 2. Hypertension was noted in 155 (60.3%) patients, diabetes mellitus was documented in 109 (42.4%) patients as shown in table 2. Positive family history of premature CAD was found to be in 31(12.1%) while 226 (87.9%) had negative family history. Out of 257 patients, 38 (14.8%) were smoker while 219 (85.2%) were non-smoker. Out of 257 patients, 74 (28.8%) were obese while 183 (71.2%) were non-obese. Non-ST elevation myocardial infraction was noted in 77 (30%) patients (Table 2).

Table 2: Frequency of multiple characteristics among patients

Characteristics	Frequency n (%)
Gender	
Female	102 (39.7%)
Male	155 (60.3%)
Hypertension	
Non-hypertensive	102 (39.7%)
Hypertensive	155 (60.3)

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Diabetes mellitus	
Non-Diabetic	148 (57.6%)
Diabetic	109 (42.4%)
Family history of pre-mature CAD	
Positive	31 (12.1%)
Negative	226 (87.9%)
Frequency of smoking status	
Smoker	38 (14.8%)
Non-smoker	219 (85.2%)
Frequency of obesity	
Obese	74 (28.8%)
Non-obese	183 (71.2%)
Frequency of non-ST elevation myocardial infarction	
Yes	77 (30%)
No	180 (70%)

Stratification of age group, diabetes mellitus, family history of premature CAD, hypertension, smoking status, obesity, gender, and diabetic therapy were done with respect to non-ST elevation myocardial infraction (NSTEMI) patients with atypical symptoms in order to found significant difference in table 3. P-values were calculated and results were statistically significant.

Table 3: Stratification of multiple variables with non-ST-elevation myocardial infarction (STEMI) n=257

Variables	Non-STEMI		Risk	95% CI	p-value
	Yes	No			
Hypertensive	49 (19.1%)	106 (41.2%)	1.222	0.704-2.120	0.476
Non-hypertensive	28 (10.9%)	74 (28.8%)			
Diabetic	37 (14.4%)	72 (28.0%)	1.388	0.811-2.375	0.232
Non-diabetic	40 (15.6%)	108 (42.0%)			
Family history of premature CAD (positive)	16 (6.2%)	15 (5.8%)	2.885	0.1345-6.189	0.005
Negative	61 (23.7%)	165 (64.2%)			
Smoking status (smoker)	14 (5.4%)	24 (9.3%)	1.444	0.702-2.971	0.316
Non-smoker	63 (24.5%)	156 (60.7%)			
Obese	55 (21.4%)	128 (49.8%)	0.985	0.546-1.777	0.959
Non-obese	22 (8.6%)	52 (20.2%)			

DISCUSSION

Cardiovascular disease (CVD) is one of the primary causes of death all over the world, causing 17.5 million deaths every year [11]. Epidemiological data from the previous literature have revealed that there are less patients of acute coronary syndrome patients with STEM and that NSTEMI is more frequently present among patients than STEMI [12]. In the United States, the study estimates that approximately>780,000 people are reported with an ACS each year, and more than 70% of these report about NSTEMI. NSTEMI is a consequence of a severe imbalance between demand and supply of myocardial oxygen, mostly due to a lowering of myocardial perfusion [13]. Type 1 MI is known to be caused by a non-occlusive thrombus that is developed in an abnormal atherosclerotic plaque, leading to non-occlusive or in some cases near-complete thrombosis of a vessel that supply the myocardium. In our present analysis, 18% of patients with AMI had report of atypical presentation (i.e., without any signs of typical chest pain). Atypical presentations were linked with female sex, higher age, and more serious factors (including medical conditions like DM, chronic kidney disease, hypertension, and history of cardiovascular disease) except in some patients with symptoms of cardiac arrest. These results were similar with the study conducted by the group of scientists in Sweden [14]. The gender differences in ACS patients are related to altered incidences of neuropathies. The incidence of neuropathies escalates with advancing body mass index, age, and a previous history of diabetes mellitus. In case of diabetes mellitus, autonomic neuropathy is common issue, and may affect the vagal nerves prior to affecting the sympathetic nerves. The findings of our study are comparable with the study conducted at Chinese biomedicine department. In our study, the mean age was 56.33 ± 8.07 years. As per that study the reported age was 55 ± 12 years [15]. Our study is also comparable to another study that noted 50.55 ± 6.72 as mean age. In this study, the mean weight was 72.51 ± 15.26 kg and mean height was 162.89 ± 7.75. However previous study reported weight as 85.2 ± 18.7 and 85.5 ± 18.4 kg in his two groups study. In current study, the mean body mass index was 27.28 ± 5.25 kg/m2 as against previous study that noted BMI as 22.5 kg/m2 [16]. Another study reported BMI as 26.1 ± 3.2 and 25.8 ± 3.2 kg/m2 in his both study groups. In present study, out of 257 patients, 155 (60.3%) were male while 102 (39.7%) were female. A study has noted to have 78% males and 22% females. In recent study, hypertension was noted in 155 (60.3%) patients however, Kitahara *et al.*, has noted to have hypertensive patients as 47% [17]. In our study, diabetes mellitus was reported in 109 (42.4%) patients. There were 38% diabetic patients found in the study conducted by Ram *et al.*, [18]. Another study showed that 61 (34.1%) were diabetic. In this study, positive family history of premature CAD was found for 31 (12.1%) while negative for 226 (87.9%) patients. However, the past studies have noted the prevalence of family history in 13% cases [19]. In current study, 38 (14.8%) were smoker while 219 (85.2%) were non-smoker. 41% smokers were found in previous studies [20]. In recent study, 74 (28.8%) were obese while 183 (71.2%) were non-obese. The prevalence of obese patients was 25% in the past analysis. In present study, diabetes therapy showed that 8 (7.3%) patients were treated with diet plan, 50 (45.9%) were taking oral, 45 (41.3%) were given insulin while 6 (5.5%) patients were not under any therapy. In our study, non-ST elevation

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myocardial infraction was found in 77 (30%) patients. 23% patients were found to have NSTEMI in the previous research [21]. In our study, there is a link between confounders stratification and modifiers with relation to NSTEMI, insignificant results were noted in age group (p=0.037), gender (p=0.204), hypertension (p=0.476), diabetes mellitus (p=0.232), family history of premature CAD (p=0.005), smoking status (p=0.316), obesity (p=0.959) and diabetic therapy (p=0.060). Our study has used consecutive sampling method that was best and appropriate method for such study. the inclusion and exclusion criteria were followed strictly. There was no bias in the present study as objective definitions were used for both predictors and outcome variables. In our study the study plan can be considered as weak as the strength of evidences were limited and there was no sample size calculation in the study plan. There are few limitations of the study as it is hospital-based study conducted in the single center therefore, its generalization is confine.

CONCLUSIOS

It is concluded that Non-ST Elevation Myocardial Infarction (NSTEMI) was documented in considerable number of patients who report with atypical symptoms. As NSTEMI is linked with high chance of mortality and severe medical issues therefore, it is vital to study the underlying risk factors so that the burden of diseases can be lowered and optimization of the management strategies can be made for this already compromised cohort of patient.

Authors Contribution

Conceptualization: SA
Methodology: MA
Formal analysis: AUR, SIS
Writing-review and editing: SA, AUR, ZA, SIS, FS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

[1] Negrea MO, Zdrenghea D, Teodoru M, Neamțu B, Cipăian CR, Pop D. Gender Particularities and Prevalence of Atypical Clinical Presentation in Non-ST Elevation Acute Coronary Syndrome. Journal of Cardiovascular Development and Disease. 2022 Mar; 9(3): 84. doi: 10.3390/jcdd9030084.

[2] Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, *et al*. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). European Heart Journal. 2018 Jan; 39(2): 119-77.

[3] Tziakas D, Chalikias G, Al-Lamee R, Kaski JC. Total coronary occlusion in non ST elevation myocardial infarction: Time to change our practice? International Journal of Cardiology. 2021 Apr; 329: 1-8. doi: 10.1016/j.ijcard.2020.12.082.

[4] Lawesson SS, Isaksson RM, Thylén I, Ericsson M, Ängerud K, Swahn E, *et al*. Gender differences in symptom presentation of ST-elevation myocardial infarction–an observational multicenter survey study. International Journal of Cardiology. 2018 Aug; 264: 7-11. doi: 10.1016/j.ijcard.2018.03.084.

[5] Cha JJ, Bae S, Park DW, Park JH, Hong SJ, Park SM, *et al*. Clinical outcomes in patients with delayed hospitalization for non-ST-segment elevation myocardial infarction. Journal of the American College of Cardiology. 2022 Feb; 79(4): 311-23. doi: 10.1016/j.jacc.2021.11.019.

[6] Baumann AA, Mishra A, Worthley MI, Nelson AJ, Psaltis PJ. Management of multivessel coronary artery disease in patients with non-ST-elevation myocardial infarction: a complex path to precision medicine. Therapeutic Advances in Chronic Disease. 2020 Jun; 11: 2040622320938527. doi: 10.1177/20 40622320938527.

[7] Tisminetzky M, Gurwitz JH, Miozzo R, Nunes A, Gore JM, Lessard D, *et al*. Age Differences in the Chief Complaint Associated With a First Acute Myocardial Infarction and Patient's Care-Seeking Behavior. The American Journal of Medicine. 2020 Sep; 133(9): e501-7. doi: 10.1016/j.amjmed.2020.02.018.

[8] Cohen M and Visveswaran G. Defining and managing patients with non-ST-elevation myocardial infarction: Sorting through type 1 vs other types. Clinical Cardiology. 2020 Mar; 43(3): 242-50. doi: 10.1002/clc.23308.

[9] Kim I, Kim MC, Park KH, Sim DS, Hong YJ, Kim JH, *et al*. Prognostic significance of non-chest pain symptoms in patients with non-ST-segment elevation myocardial infarction. The Korean Journal of Internal Medicine. 2018 Nov; 33(6): 1111. doi: 10.3904/kjim. 2017.071.

[10] Chen H, Li M, Liu L, Dang X, Zhu D, Tian G. Monocyte/lymphocyte ratio is related to the severity of coronary artery disease and clinical outcome in patients with non-ST-elevation myocardial

DOI: https://doi.org/10.54393/pjhs.v4i05.776

infarction. Medicine. 2019 Jun; 98(26): e16267. doi: 10.1097/MD.0000000000016267.

[11] Michaels J, Parfrey S, Mozid AM, Veerasamy M, Bulluck H, Tayebjee MH. Incidence and Clinical Predictors of Non-Obstructive Coronary Arteries in Patients with Suspected Non-ST Elevation Myocardial Infarction Undergoing Invasive Coronary Angiography. Heart, Lung and Circulation. 2022 Aug; 31(8): e115-6. doi: 10.1016/j.hlc.2022.03.009.

[12] Ahmed S, Khan A, Ali SI, Saad M, Jawaid H, Islam M, *et al*. Differences in symptoms and presentation delay times in myocardial infarction patients with and without diabetes: A cross-sectional study in Pakistan. Indian Heart Journal. 2018 Mar; 70(2): 241-5. doi: 10.1016/j.ihj.2017.07.013.

[13] Steiro OT, Aakre KM, Tjora HL, Bjoerneklett RO, Skadberg OS, Bonarjee VV, *et al*. Chest pain characteristics and their ability to predict NSTEMI according to gender and age in patients presenting with suspected ACS. European Heart Journal. 2021 Oct; 42(Supplement_1): 724-1477. doi: 10.1093/eurheartj/ehab724.1477.

[14] Ängerud KH, Sederholm Lawesson S, Isaksson RM, Thylén I, Swahn E. Differences in symptoms, first medical contact and pre-hospital delay times between patients with ST-and non-ST-elevation myocardial infarction. European Heart Journal: Acute Cardiovascular Care. 2019 Apr; 8(3): 201-7. doi: 10.1177/2048872617741734.

[15] Oz TK, Özbilgin N, Sungur A, Bas EG, Zengin A, Gürol T, *et al*. Prevalence of metabolic syndrome in young patients with ST-elevation myocardial infarction. International Journal of the Cardiovascular Academy. 2018 Jul; 4(3): 53. doi: 10.4103/IJCA.IJCA_10_18.

[16] Wu CC, Hsu WD, Islam MM, Poly TN, Yang HC, Nguyen PA, *et al*. An artificial intelligence approach to early predict non-ST-elevation myocardial infarction patients with chest pain. Computer Methods and Programs in Biomedicine. 2019 May; 173: 109-17. doi: 10.1016/j.cmpb.2019.01.013.

[17] Kitahara S, Fujino M, Honda S, Asaumi Y, Kataoka Y, Otsuka F, Nakanishi M, Tahara Y, Ogata S, Onozuka D, Nishimura K. COVID-19 pandemic is associated with mechanical complications in patients with ST-elevation myocardial infarction. Open Heart. 2021 Feb; 8(1): e001497. doi: 10.1136/openhrt-2020-001497.

[18] Ram E, Sternik L, Klempfner R, Iakobishvili Z, Peled Y, Shlomo N, *et al*. Outcomes of different revascularization strategies among patients presenting with acute coronary syndromes without ST elevation. The Journal of Thoracic and Cardiovascular Surgery. 2020 Oct; 160(4): 926-35. doi: 10.1016/j.jtcvs.2019.08.130.

[19] Chien DK, Lee SY, Hung CL, Sun FJ, Lin MR, Chang WH. Do patients with non-ST-elevation myocardial infarction without chest pain suffer a poor prognosis? Taiwanese Journal of Obstetrics and Gynecology. 2019 Nov; 58(6): 788-92. doi: 10.1016/j.tjog.2019.09.010.

[20] Fu R, Li SD, Song CX, Yang JA, Xu HY, Gao XJ, *et al*. Clinical significance of diabetes on symptom and patient delay among patients with acute myocardial infarction—an analysis from China Acute Myocardial Infarction (CAMI) registry. Journal of Geriatric Cardiology: JGC. 2019 May; 16(5): 395.

[21] Harrington DH, Stueben F, Lenahan CM. ST-elevation myocardial infarction and non-ST-elevation myocardial infarction: medical and surgical interventions. Critical Care Nursing Clinics. 2019 Mar; 31(1): 49-64. doi: 10.1016/j.cnc.2018.10.002.