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Epidemiological Study on Pattern and Outcome of Acute Nstemi Patients in A Tertiary Care Hospital

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ABSTRACT

Background: Despite efforts to improve emergency care for patients with acute myocardial infarction (AMI), there has been a paucity of studies outlining real, countrywide patterns in the management of non-ST elevation myocardial infarction (NSTEMI) in EDs. We set out to define NSTEMI, as well as its treatment and implications.

Methods: Forty patients with non-ST-elevation myocardial infarction (NSTEMI) were enrolled in a prospective single-center experiment at Nil Ratan Sircar Medical College & Hospital, Kolkata from May 2022 to July 2023. After 30 days, participants' demographics, medical history, clinical symptoms, laboratory findings, Killip categorizations, electrocardiogram (ECG), echocardiogram (ECHO), diagnostic coronary angiography (CAG), treatment regimens, medicines, and outcomes were documented.

Results: Among the forty patients polled, sixty percent were male and seventy percent were in the age bracket of 56 to seventy (p=0.002). Heart disease (CVD) risk factors included diabetes (n=24, or 60%) and high blood pressure (40%). Of the total instances, only 29 (or 72%) had a prompt presentation (defined as occurring within 6 hours; p=0.0001). With a p-value of only 0.005, 36 patients (or 90%) were placed in Killip class I, whereas 4 patients (10%) were placed in Killip class II. Nobody had their risk scores assessed while they were in the hospital. Although 28 individuals (or 70%) displayed T-wave inversion, all patients' electrocardiograms demonstrated a sinus rhythm. Out of 36 patients who underwent echocardiography, 90% had normal results. However, in 6 patients, or

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16.7%, left ventricular systolic dysfunction was detected (p=.003). A median ejection fraction of 52% was found, with a range of 25-75%. There were 38 patients who had stents inserted (95% of the total) after diagnostic CAG, and 23 individuals who did not (58% of the total). For 23 patients (58%) in our study group, heart catheterization was the primary way of end-of-treatment. Aspirin, clopidogrel, parenteral anticoagulation, and ACE and AK inhibitors or blockers were among the numerous drugs provided to each patient. Among those individuals, diuretics were prescribed to seven (17.5%), proton pump inhibitors to twenty-eight (70%), and statins to thirty-eight (95%). In terms of the 30-day outcomes, all patients survived; ten patients, or 25%, were readmitted; and no patients died during their hospital stay or within that time frame.

Conclusion: Negative ST-elevation myocardial infarction was more common in older male patients. It took a long time for most patients to reach the emergency room. Hypertension and diabetes mellitus were major contributors to the risk. Except for one patient's electrocardiogram (ECG) revealing a T-wave inversion, all of the others showed normal sinus rhythm. The standard procedure for NSTEMI, which most patients followed, did not include risk classification. PCI was the main approach to end-of-life care. Readmission occurred in 25% of patients even though there was no mortality in the hospital or in the first 30 days.

INTRODUCTION

An abrupt imbalance between the heart's oxygen demand and supply, most often due to decreased myocardial perfusion, is the root cause of non-ST elevation myocardial infarction (NSTEMI). Contrary to popular belief, 25% of individuals who experience increased biomarkers alongside their NSTEMI also go on to develop a Q-wave MI in the weeks following their initial diagnosis. [1]

Conditions ranging from unstable angina to non-ST elevation myocardial infarction (NSTEMI) are under the umbrella of non-ST elevation acute coronary syndrome. The wide range of clinical manifestations and outcomes, however, are all thought to stem from the same process—the collapse of the atherosclerotic plaque—along with varying degrees of contemporaneous thrombosis and distal embolisation. Compared to patients with ST-segment elevation myocardial infarction (STEMI), individuals with non-ST-elevation myocardial infarction (NSTEMI) are more prone to early culprit coronary artery patency; yet, they are also more prone to suffer from repeated ischemic episodes. [2]. Patients who present with symptoms of chest pain or discomfort who are thought to be suffering from acute coronary syndrome (ACS) should be evaluated without delay. From asymptomatic individuals to those with persistent ischemia, electrical or hemodynamic instability due to large at-risk myocardium, or cardiac arrest due to malignant ventricular ischemia, the clinical spectrum of non-ST elevation myocardial infarction spans the gamut of possible outcomes. [1].

Acute myocardial infarction (AMI) is a common reason why people visit the emergency department (ED). Both STEMI and NSTEMI fall under this category. The majority of patients with AMI eventually visit the emergency room. [3]. The emergency department transfers a large number of patients to other hospitals, even though 60% of patients are admitted to the same institution. [4]. Better clinical outcomes following NSTEMI may be possible with adherence to treatment guidelines, which include the use of pharmacological medications supported by evidence and invasive coronary procedures. [5,6]. Patients who are more likely to follow evidence-based treatment had a lower chance of dying after non-ST-elevation myocardial infarction (NSTEMI), according to various cohort studies. We still don't know how to reduce the incidence and prevalence of cardiovascular disease (CVD), even though NSTEMI delivery and outcomes vary between and even within European nations. [7,8]. Examining current standards of care can help reduce disparities in the use of therapies recommended by recommendations for NSTEMI, which in turn improves cardiovascular outcomes.[9]

Two important projects for the treatment and enhancement of quality of life for patients with non-ST-elevation myocardial infarction (NSTEMI) have had their results published by the European Society of Cardiology (ESC). In the first article, titled "2016 ESC guideline for the management of acute coronary

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syndromes in patients without persistent ST-segment elevation," the best way to treat people who have myocardial infarction but don't have ST-segment elevation is recommended. The Acute Cardiovascular Care Association's second publication, "Quality indicators for acute myocardial infarction: A position paper," specifies specific quality evaluation indicators spanning seven categories and twenty indicators. Both evidence-based process measurements that conform to the 2017 NSTEMI requirements and non-evidence-based components that contribute to quality improvement are included in these indicators. [10] Higher ESC criterion accomplishment during NSTEMI treatment is associated with improved clinical outcomes, according to UK and French external validation studies. The majority of Quality Indicators (Qis) were shown to be negatively associated with 30-day and 1-year mortality in these studies. [11,12]

Although the survival rate for STEMI is higher, the fatality rate for NSTEMI is significantly higher. With an already high prevalence of non-ST-elevation myocardial infarction (NSTEMI), the ageing and co-morbidity rates in Europe are making the situation even worse. [3, 4, 15, 16]. In addition, there are still discrepancies in NSTEMI care and outcomes and a high frequency of the disease, even though treatment has come a long way. [17,18,19,20].

Non-ST elevation myocardial infarction

Acute myocardial ischemia, the hallmark of non-ST-elevation myocardial infarction (NSTEMI), is the result of an ischemic event that leads to heart muscle cell death. 21. Acute coronary syndrome (ACS) is most often characterised by chest pain, but a non-ST elevation myocardial infarction (NSTEMI) requires other criteria, such as a normal spike and subsequent drop in cardiac biomarkers (e.g., troponin or CKMB). 21 (i) signs of constriction of blood vessels; (ii) changes in electrocardiogram (ECG); (iii) imaging evidence of new or suspected new loss of viable myocardium or abnormalities in regional wall motion; (iv) autopsy or angiography finding of intracoronary thrombus.

Research justifications

The bulk of global mortality is attributable to cardiovascular illnesses. Lives can be saved when the right treatment is started right away when signs are found. Among cardiac emergencies, NSTEMI (non-ST elevation myocardial infarction) is the leading cause of death and severe illness. Competent management and adherence to norms and regulations may substantially alleviate this pressure. To practise medicine based on evidence, one must be well-versed on demographic and illness trends.

MATERIALS AND METHODS

Researchers at a single tertiary cardiology facility collected data for an observational study from May 2022 to December 2023. The study comprised patients diagnosed with non-ST elevation myocardial infarction (NSTEMI) according to the ESC and universal criteria for acute myocardial infarction who attended Nil Ratan Sircar Medical College & Hospital between May 2022 and December 2023. When all patients with NSTEMI are included in the trial, the inclusion criteria are satisfied. This study enrolled forty patients during the course of the investigation.

The primary investigator was the only one tasked with gathering the necessary data. Using structured questionnaires, we collected data on the participants' demographics, medical history, clinical presentations, laboratory examination, Killip classifications, ECG, ECHO, diagnostic coronary angiography (CAG), treatment strategies, and medications. Our goal was to determine the patients' survival, readmission, and fatality rates after 30 days of follow-up. In order to participate in the study, participants had to be at least 18 years old and present to the centre with a confirmed diagnosis of NSTEMI (non-ST-elevation myocardial infarction). When searching for individuals, we used the UDI for type 1 myocardial infarction. Patients who did not meet the inclusion criteria or who declined to participate were the only ones left out.

The following data was analysed for the target population: demographics, clinical presentation, duration of symptoms, risk factors, laboratory investigations (creatinine, hematocrit, vital signs, Killip classifications, baseline electrocardiogram, echocardiogram, diagnostic cardiac arrhythmogram), medications used, final management strategies, inpatient mortality, and 30-day outcomes data.

Data analysis

Data were analyzed by using a computer program Statistical Package for Social Sciences (SPSS V. 21.0, IBM Corp., Armonk, NY). The analyzed data are

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presented in tables and figures designed by Microsoft Excel 2010.

RESULTS

The demographic characteristics of the study population

		Number of patients	Percentage
Sex	**Male**	**27**	**67.5**
	Female	**13**	**32.5**
Age in Group	**41–55**	**10**	**25.0**
	56–70	**24**	**60.0**
	>70	**6**	**15.0**

Heart rate and blood pressure for all patients

HR: heart rate, BP: blood pressure, SBP: systolic blood pressure, DBP: diastolic blood pressure

		Number of patients	Percentage
HR (bpm)	<60	1	2.5
	60-100	37	92.5
	>100	2	5.0
SBP (mmHg)	<90	1	2.5
	91-104	33	82.5
	>140	6	15.0
DBP (mmHg)	<60	1	2.5
	60-90	34	85.0
	>90	5	12.5
Creatinine (mg/dl)	0.4–0.79	2	5.0
	0.8–1.9	38	95.0
	Troponin (positive)	40	100
Risk score performed during a hospital stay	Yes	0	0.00
	NO	40	100
ECG: electrocardiography, RBBB: right bundle branch block	Sinus rhythm	40	100
	T-wave inversion	28	70
	ST depression	10	25
	In lateral lead	5	12.5
	In anterior lead	4	10.0
	In inferior lead	1	2.5
	RBBB	1	2.5
Echocardiogram performed during hospital stay (Yes)	Echocardiogram performed during hospital stay (Yes)	36	90.0

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	Category of LV systolic dysfunction (N=36)		
	Normal	30	83.3
	Mild	2	5.6
	Moderate	3	8.3
	Severe	1	2.8
	EF (%); (n= 36); median (min-max)	52 (25–75)	
	<30	1	2.8
	30–39	1	2.8
	40–49	3	8.3
	50–59	14	38.9
	60+	17	47.2

Thirteen women and twenty-seven men made up the forty patients diagnosed with NSTEMI; the bulk of the women, sixty percent, were between the ages of 56 and 70. Diabetes (n=24, or 60%) and hypertension (n=20, or 50%) were significant risk factors for cardiovascular disease.1). There was a history of heart failure in three patients (7.5%), a history of myocardial infarction (MI) in four patients (10%), and a history of percutaneous coronary intervention (PCI) in twelve patients (30%). In Table 2. 2, we can see that 92.5% of the patients had heart rates between 60 and 100 bpm, and that 85% of the patients had systolic blood pressures between 60 and 140 mm Hg, with 32.5% falling into this range and 34.5% falling into the 60 to 90 mm Hg range. 2. Interestingly, 34 out of 50 cases (72%) had symptoms that did not manifest until 6 hours later, whereas 11 cases (28%) occurred prior to 6 hours (<6 hours). Two patients (5% of the total) reported with acute heart failure, and one patient (2.5%) came with arrhythmia or cardiac arrest.

Killip class I was found in 36 patients (or 90% of the sample), while Killip class II was found in 4 patients (or 10% of the sample). All forty patients (or 95% of the total) had creatinine levels in the range of 0.8 to 1.9 mg/dl, and out of the forty participants, 38 tested positive for troponin. According to Table 3.3, the average hematocrit was 38±5%, with a range of 32% to 45%. No patients in this study had their risk scores assessed while hospitalised, as shown in Tables 4, 4. None of the patients whose electrocardiograms revealed anything other than a sinus rhythm at baseline had a right bundle branch block. With the exception of one patient, all three leads (lateral, anterior, and inferior) showed T wave inversion (70%) and ST depression (25%).

Although all trial participants were given an echocardiography, only 36 out of 40 patients underwent the operation while hospitalised. Of the 31 patients (86.1% of the total) had ejection fractions greater than 50%, the median was 52% (range: 25% to 75%) (Table 6). Two patients had mild malfunction, three had moderate dysfunction, and one had severe dysfunction of the left ventricle, making up six patients (16.7%).6). While 15 patients (37.5%) did not have their stented, 38

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(or 95% of the total) had theirs placed during the diagnostic CAG.6). Percutaneous coronary intervention (PCI) was carried out in 23 patients (58% of the total) and coronary artery bypass graft in 4 patients (10%). Additionally, 13 patients (32% of the total) in our study group had medicinal therapy alone without mechanical revascularization.7). Each patient (n=40; 100%) received at least one aspirin, clopidogrel, parenteral anticoagulant given outside of the cath lab, and an angiotensin-converting enzyme inhibitor or an anti-rebleeding drug. The results are shown in Figure 8. Out of the total number of patients treated, 95 percent were given statins, 70 percent were given proton pump inhibitors, and 17.5% were given diuretics. The 2017 ESC Guideline is usually well-complied with by hospital staff, with the exception of risk classification (0% of patients). All forty patients survived their whole hospital stay, and no one died while they were there. After 30 days, 30 patients (or 75%) were discharged from the hospital, whereas 10 patients (or 25%) were readmitted.

DISCUSSION

The goal of this study is to describe the characteristics, management, and outcomes of non-ST elevation myocardial infarction (NSTEMI) in 40 patients examined at N.R.S. Medical College and Hospital, Kolkata. Patients with NSTEMI were mostly between the ages of 56 and 70 (60% of the total), and men outnumbered women (2:1). These findings corroborated those of Mirghani et al.'s investigation in Sudan.[22] and Ahmed et al. 23, when the incidence of myocardial infarction was highest among men aged 50 and up. In their study, Chung and Ying found that NSTEMI was more common in older patients (mean age=64.313.3) and men (M:F=1.9:1). [24]. According to Saman and Arnoud, men (78%) and older patients (mean age=67 12 years) had a high prevalence of NSTEMI. [25].

The second most common risk factor for cardiovascular disease was hypertension (n=20, or 50%) and diabetes (n=24, or 60%). These results corroborated those of a Spanish research that indicated that among patients suffering from non-ST-elevation myocardial infarction, the leading causes of death were dyslipidemia, hypertension, and diabetes. [26]. Hall et al. discovered that past or present smoking was the primary determinant of the likelihood of non-ST-elevation myocardial infarction (NSTEMI). [6]. This type of myocardial infarction (NSTEMI) is more common in people who have hypertension, diabetes mellitus (DM), smoking, hyperlipidemia, renal insufficiency, peripheral or carotid artery disease, a personal or family history of coronary artery disease, and high blood pressure. [1]. Heart rates (92.5%), systolic blood pressures (82.5%), and diastolic blood pressures (85%) were all within normal ranges for the majority of patients, as shown by the observations. Possible causes include underdiagnosis in the community and inadequate prehospital treatment. The majority of Sudanese patients (64%), according to another study, were chronically tardy. Mirghani et al. [22]. In Tunisia, however, Amsterdam et al. discovered a shorter delay (median= 4 hours) between the onset of chest symptoms and arrival at the emergency hospital. [27,28]. Killip class I was applied to 90% of the patients in this trial, whereas Killip class II was applied to 10%. Consistent with the findings of Polonski et al., 87% of patients with NSTEMI displayed Killip categories I and II. [15]

As recommended by ESC [10] and AHA guidelines [27], For NSTE-ACS, early risk assessment is crucial for predicting results and selecting therapies by directly identifying treatable targets in higher-risk people, as the efficacy of intense therapy changes with risk. We need to incorporate scoring methods like GRACE and TIMI into our procedure as none of the patients in our study had their risk scores reviewed while they were in the hospital. As a diagnostic criterion for non-Tachycardia-induced myocardial infarction (NTEMI), all forty patients in this investigation exhibited sinus rhythm. The majority of patients (91.2%) exhibited a steady sinus rhythm, according to Polanski et al. [15]. Seventy percent of our study groups had T-wave inversion as their most common ECG abnormalities. As mentioned in the 2016 ESC rule, a prominent change in electrocardiograms (ECGs) in non-ST-elevation myocardial infarction (NSTEMI) is the flattening or inversion of the T-wave. [10]. T-wave abnormalities were the most prevalent ECG anomalies among NSTEMI patients, according to Chung and Ying's research (65.6%). [24]. The European Society of Cardiology (ESC) recommended in 2017 that all hospitalised patients undergo echocardiography. Echocardiograms were performed on 90% of the people who participated in our study. Three patients showed significant LV systolic

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dysfunction, one had severe, and slightly less than 20% had mild systolic dysfunction. The median ejection fraction (EF) was 52% (range: 25% to 75%), and 86.1% of the patients surveyed had EFs higher than 50%. It was in line with the results found by Abbott et al. in the National Heart, Lung, and Blood Institute Dynamic Registry that the median EF was 51%. [29]

Out of the 38 patients that had diagnostic CAG, 23 (or 58% of the total) did not undergo surgery, whereas 38 (or 95%) had stents implanted. Notably comparable to our results, Rogers et al. found that 57.4% of patients had stents implanted. [30], greater than the 29% found in the study by Polonski et al. [15], and lower than that reported by Saman and Arnoud (78%) [25]. These differences might be explained, in part, by shifts in how we approach research. In our study group, 23 patients (58%) had heart catheterization as their main method of end-of-treatment. Percutaneous coronary intervention (PCI) performed by a qualified cardiologist no later than 72 hours following first medical contact is the gold standard for reperfusion treatment. [24]. Our findings were more favourable than those of Mirghani et al. (20.4%), who performed study in Sudan.. [22] and Polonski et al. (23.1%) [15]. 10% of our patients underwent coronary artery bypass grafting as one of the revascularization treatments. Both Saman and Arnoud came to the same conclusion: 17% of patients with NSTEMI underwent CABG. [25]. Aspirin, clopidogrel, an ACEi or ARB, and any parenteral anticoagulant given outside of the cath lab were all given to every single patient (n=40; 100%). These findings are in line with the recommendations made by the ESC and the AHA. [10,27]. There was no mortality among the patients in the 30-day follow-up; nevertheless, ten patients (or 25% of the total) required readmission because of angina. The 30-day or in-hospital mortality rate of non-ST-elevation myocardial infarction has been steadily declining. Patients diagnosed with non-ST-elevation myocardial infarction (NSTEMI) have in-hospital mortality rates ranging from 5.2% to 13.1% and 30-day mortality rates ranging from 7.6% to 17.0%, according to previous study. [31,32]. The in-hospital death rate was 7.1% from 1994 to 2006, while the 30-day mortality rate was 10.0% and 7.6% from 1999 to 2008, respectively, according to the registries of Yeh et al. [31] and McManus et al. [32].

CONCLUSION

Males and the elderly had a higher prevalence of NSTEMI, and ED symptoms did not appear until later in life in both demographics. Hypertension and diabetes mellitus were major contributors to the risk. Except for one patient's electrocardiogram (ECG) revealing a T-wave inversion, all of the others showed normal sinus rhythm. The standard procedure for NSTEMI, which most patients followed, did not include risk classification. PCI was the main approach to end-of-life care. It was the first 30 days, and no one died while hospitalised. In every instance of NSTEMI, it is advised to use and document the initial risk classification. An acute coronary syndrome (ACS) national registry is necessary in Sudan. The time to presentation could be decreased with better prehospital care and public education regarding ischemic heart disease. Finally, we need additional large-scale, prospective trials that last for a long time.

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