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ORIGINAL ARTICLE

Risk Factor outlines and their support strategies in myocardial infarction with and without ST elevation: an Algerian prospective cross-sectional analysis

Mahrez FISSAH[1], Salam BENNOUAR[2], Farouk MENZOU[1], Céline Benbouzid[2], Hassiba MELLOUL[2], Nazli ELAYADI[2], Mehdi RABHIA[3], Saliha LEHACHI[4], Samia ABDI[2], Ahcene CHIBANE[1]

ABSTRACT

Introduction: Acute Coronary Syndromes (ACS) represent one of the principal causes of death worldwide. ST-elevation myocardial infarction (STEMI) and non-ST-elevation myocardial infarction (NSTEMI) have completely different features, pathophysiology, and management. The aim of this study was to compare demographic and clinical presentation, cardiovascular risk factors, treatment strategies, and hospitalization outcomes between STEMI and NSTEMI patients in an Algerian population cohort. **Methods**: A cross-sectional study was conducted between July 2024 and July 2025 at two tertiary hospitals in Algeria. A total of 134 patients with confirmed ACS were enrolled (75 NSTEMI, 59 STEMI). Data were prospectively collected using a standardized electronic case report form. **Results**: STEMI patients were significantly more likely to be smokers (61.0% vs 34.7%, p=0.002), whereas NSTEMI patients showed higher prevalence of hypertension (65.3% vs 37.3%, p=0.001) and diabetes (54.7% vs 27.1%, p=0.001). NSTEMI patients had higher urea levels (0.46 g/L vs 0.35 g/L, p=0.007), while STEMI patients had significantly higher peak troponin levels. PCI rates were comparable between groups. In-hospital complication rates were not statistically different. **Conclusion**: In Algeria, smoking remains the main associated risk factor in STEMI patients, while metabolic-renal dysfunction predominates in NSTEMI patients. These findings highlight the necessity of phenotype determination for better prevention strategies personalized to the region.

Keywords: Acute Coronary Syndrome; ST-Elevation Myocardial Infarction; Non ST-Elevation Myocardial Infarction; Cardiovascular Risk Factors.

1. Department of Internal Medicine, University Hospital of Douera, Faculty of Medicine, University of Blida 1, Algeria. 2. Frantz Fanon Hospital, University Hospital Center of Blida, 09000 Blida, Algeria. 3. Faculty of Medicine, University of Algiers 1, Algeria. 4. Cardiology Department, Frantz Fanon Hospital, University Hospital Center of Blida, 09000 Blida, Algeria

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Correspondance to: Mahrez FISSAH
E-mail : fissah_mahrez@univ-blida.dz

1. INTRODUCTION

Acute Coronary Syndromes (ACS) are a real public health concern, causing millions of deaths every single year. Guidelines have come out to differentiate between STEMI and NSTEMI due to the therapeutic and prognostic consequences. Pathophysiology, clinical features, and outcomes are significantly different between these two entities, while the myocardial necrosis represents their common denominator.

While an acute atherosclerotic plaque breakage is the "premium movens" to a total coronary artery occlusion causing STEMI and imposing its urgent reperfusion, on the other side, NSTEMI results, most of the time, from an artery subocclusion with or without a supply-demand mismatch or a plaque crack, occurring more often in elderly patients with a particularly high cardiovascular risk assessment [1,2].

Many pertinent studies lead to the result that smoking is so far the predominant risk factor in younger men presenting with STEMI; otherwise, NSTEMI happens to occur much more in older, high-risk populations with comorbidities such as hypertension, diabetes, and renal dysfunction [3, 4]. Rapid urbanization, dietary changes, and high smoking rates highly influenced these disease patterns [5] in Africa in general, especially Algeria. This study aimed to compare STEMI and NSTEMI characteristics in a contemporary Algerian cohort.

2. METHODS

This cross-sectional study was conducted from July 2024 to July 2025 at two tertiary referral centers in Algeria. Both institutions provide comprehensive ACS management, including reperfusion therapies and coronary care units. Consecutive adult patients (≥18 years) admitted with suspected ACS were screened. Inclusion criteria required a confirmed diagnosis of STEMI or NSTEMI according to the Fourth Universal Definition of MI [6], with supporting ECG changes and troponin elevation. Patients with known chronic kidney disease (eGFR < 60 mL/min/1.73 m²) were excluded to avoid confounding factors in troponin and urea interpretation. However, this exclusion limits the generalizability of our metabolic-renal profile findings to ACS patients without advanced CKD.

Data were collected prospectively using a standardized electronic case report form by trained physicians. Variables included demographics, risk factors, clinical presentation, biochemical parameters, management strategies, and in-hospital outcomes.

Sample size was estimated using G*Power v3.1 (medium effect size, $\alpha=0.05$, power=0.80), requiring 128 patients; 134 were included. Continuous variables were expressed as mean ± SD or median (IQR) and compared using Student's t-test or Mann-Whitney U test. Categorical variables were expressed as n (%) and compared using χ^2 or Fisher's exact test. A p-value < 0.05 was considered significant. Analyses were performed using SPSS v26.

3. RESULTS

Demographics

Of 134 patients, 75 had NSTEMI (56.0%) and 59 had STEMI (44.0%). Mean age was 61.8 ± 11.5 years, with no significant difference between groups. Overall, 88.8% were male. BMI averaged 26.4 kg/m² without significant group differences (Table 1).

Table 1. Baseline Demographics and Anthropometric Characteristics (STEMI vs NSTEMI).

Characteristic	NSTEMI (n=75)	STEMI (n=59)	p-value
Age (years)	62.4 ± 11.1	61.0 ± 12.0	0.473
Male sex, n (%)	66 (88.0%)	53 (89.8%)	0.755
BMI (kg/m²)	26.5 ± 3.1	26.3 ± 3.0	0.672
Killip Class I, n (%)	48 (64.0%)	51 (86.4%)	0.004
Killip Class II--III, n (%)	27 (36.0%)	8 (13.6%)	0.004

Risk Factor Profiles : Significant differences were observed in risk factor distribution (Table 2). Smoking was more prevalent among STEMI patients (61.0% vs 34.7%, p=0.002). Hypertension (65.3% vs 37.3%, p=0.001) and diabetes (54.7% vs 27.1%, p=0.001) were more common in NSTEMI patients.

Table 2. Cardiovascular Risk Factor Prevalence.

Risk Factor	NSTEMI (n=75)	STEMI (n=59)	p-value
Smoking, n (%)	26 (34.7%)	36 (61.0%)	0.002
Hypertension, n (%)	49 (65.3%)	22 (37.3%)	0.001
Diabetes, n (%)	41 (54.7%)	16 (27.1%)	0.001
Dyslipidemia, n (%)	28 (37.3%)	20 (33.9%)	0.671
Family history of CAD, n (%)	15 (20.0%)	12 (20.3%)	0.960

Biochemical Parameters

NSTEMI patients presented more frequently in Killip class II-III, while STEMI patients had significantly higher troponin levels (median 7213.9 µg/L vs 1551.4 µg/L, p=0.030). Urea levels were higher in NSTEMI patients (0.46 vs 0.35 g/L, p=0.007) (Table 3).

Table 3. Admission Biochemical Parameters.

Parameter	NSTEMI (n=75)	STEMI (n=59)	p-value
Troponin I (µg/L)	1551.4 (720--3780)	7213.9 (4600--10900)	0.030
Urea (g/L)	0.46 ± 0.11	0.35 ± 0.09	0.007
Creatinine (mg/dL)	1.12 ± 0.28	1.05 ± 0.24	0.087
Fasting glucose (mg/dL)	128 ± 34	121 ± 29	0.197
Total cholesterol (mg/dL)	192 ± 42	187 ± 39	0.430
LDL-C (mg/dL)	118 ± 33	115 ± 30	0.567
HDL-C (mg/dL)	43 ± 10	44 ± 11	0.671
Triglycerides (mg/dL)	153 ± 62	148 ± 58	0.612

3.4. Management and Outcomes : Fibrinolysis was administered exclusively to STEMI patients (86.4%). PCI was attempted in both groups with comparable rates (49.3% vs 35.6%, p=0.111). Medical therapy was guideline-adherent in both groups. Complication rates were not significantly different between groups (Table 4).

Table 4. In-Hospital Management and Outcomes.

Variable	NSTEMI (n=75)	STEMI (n=59)	p-value
Fibrinolysis, n (%)	0 (0%)	51 (86.4%)	<0.001
PCI, n (%)	37 (49.3%)	21 (35.6%)	0.111
Dual antiplatelet therapy, n (%)	71 (94.7%)	57 (96.6%)	0.614
Statins, n (%)	72 (96.0%)	57 (96.6%)	0.883
Beta-blockers, n (%)	70 (93.3%)	55 (93.2%)	0.987
Arrhythmic complications, n (%)	9 (12.0%)	10 (16.9%)	0.398
Hemodynamic complications, n (%)	13 (17.3%)	6 (10.2%)	0.202
In-hospital mortality, n (%)	1 (1.3%)	3 (5.1%)	0.308

4. DISCUSSION

Wide borders separating STEMI and NSTEMI features in Algeria have been revealed in this study, confirming the region-specific patterns already exposed in other international observations. Comorbidity prevalence, revascularization strategies, and prognosis outcomes in our findings harmonize well with different pathophysiologies of these two distinguished entities and the global data registry.

Risk Factor Dichotomy and Metabolic-Renal Profile in NSTEMI

Our NSTEMI group was characterized by its higher prevalence of hypertension (65.3%) and diabetes (54.7%) compared to the STEMI group risk profile, representing one of the strongest findings in international literature. The pathophysiological mechanism in question highlights well this association. Endothelial dysfunction, persistent inflammation state, and diffuse multivessel atherosclerotic disease are more likely to be caused by diabetes mellitus and hypertension, which can also cause plaque erosion or subocclusion of coronary arteries in the head of NSTEMI events rather than STEMI ones [7]. Our study aligns with GRACE and SWEDEHEART registries showing that NSTEMI patients are older, with a heavier metabolic burden of comorbidities than STEMI patients [8,9]. Higher levels of UREA in the NSTEMI group demonstrate well the strong link between renal dysfunction, metabolic syndrome, and the NSTEMI phenotype[10,11]. At an opposite point, smoking prevalence in STEMI (61%) patients demonstrates its involvement in occlusion thrombosis through platelet activation and inflammation [12].

Revascularization Strategies: Reflecting Healthcare Realities

The difference in PCI rates and their frequent use of fibrinolysis for STEMI (86.4%) reflect both treatment strategies and how the healthcare system is structured. In Algeria, as in many countries with limited resources, round-the-clock access to primary PCI is still such a challenge. As a result, fibrinolysis is still the main reperfusion option for STEMI in most hospitals, in line with international guidelines that support its use when timely angioplasty is not possible. At the opposite, high-risk NSTEMI patients are usually managed with an invasive strategy that takes place after initial medical stabilization. The PCI rate seen in our NSTEMI group therefore reflects this planned, rather than urgent, approach to revascularization. Similar patterns have been reported in other registries, where in-hospital PCI rates are often higher in NSTEMI than in STEMI when fibrinolysis is the predominant reperfusion strategy [13].The high rate observed here is a direct reflection of this logistical context.

Hemodynamic Complications: The Determining Role of Comorbidities in NSTEMI

NSTEMI patients were more likely to present with a particularly fragile profile; the higher rate of hemodynamic complications and higher KILLIP class II/III in NSTEMI patients (36.0% vs 13.6%, p=0.004) illustrate it very well. These were older patients with more comorbidities, such as hypertension and potential subclinical renal dysfunction, probably altering the cardiac reserve and the left ventricle ejection function (LVEF) [14] even before the ischemic injury, drawing the path to heart failure by decompensating in an already precarious state. In contrast, younger STEMI patients with fewer comorbidities tolerate acute necrosis better, probably because of their preserved cardiac function. The OPERA registry documents this phenomenon really well, showing that heart failure at admission was more frequent in NSTEMI, and an NRMI analysis confirmed cardiogenic shock could occur with smaller infarcts in patients with comorbidities [2].

Statistical Analysis Rationale

The primary aim of this study was to provide a comparative description of the demographic, clinical, and management profiles between STEMI and NSTEMI patients in our specific cohort. Consequently, the statistical approach was focused on univariate comparisons to highlight the distinct characteristics of each group at a baseline level. While multivariable analyses are powerful for identifying independent predictors, they were not the primary objective of this initial descriptive analysis. Our goal was to establish and report the fundamental differences and similarities between these two entities in the Algerian context, providing a foundation for future research aimed at predictive modeling.

In-Hospital Mortality Rates

The lower-than-expected in-hospital mortality observed in our cohort may be attributed to the relatively preserved clinical status of the included patients, as evidenced by the high proportion presenting in Killip class I. This specific finding warrants further investigation in larger, nationwide registries.

Clinical and Public Health Implications

Personalized prevention strategies must be prioritized as soon as they're going in pairs between aggressive smoking cessation programs and prevention of STEMI events and population-based interventions for diabetes/hypertension control to reduce NSTEMI incidence. In parallel, expanding PCI networks remains the main step while simultaneously strengthening chronic disease management.

Study Limitations

This study has limitations. The modest sample size from two centers may limit generalizability to the broader Algerian population. The cross-sectional design identifies associations but not causality. Potential selection biases and unmeasured confounders (e.g., socioeconomic status) could influence results. The lack of long-term follow-up restricts insights into chronic outcomes. Larger, multicenter studies with extended follow-up are needed for validation. Furthermore, the exclusion of patients with known chronic kidney disease, while methodologically intended to ensure specific ACS diagnosis, may have limited our ability to fully characterize the metabolic-renal profile associated with NSTEMI

5. CONCLUSION

STEMI and NSTEMI are completely distinct clinical phenotypes, especially in Algeria. STEMI is more likely to be associated with smoking, while NSTEMI is the reflection of a higher cardiovascular risk due to comorbidities, essentially hypertension, diabetes, and renal dysfunction leading to a weakened cardiac tolerance. These insights should become the source of tailored prevention and support strategies. Future research should validate these findings in larger multicenter registries with long-term follow-up.

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