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Research Article

Acute Coronary Syndrome with Persistent ST-Segment Elevation: Epidemiological, Clinical, Paraclinical Features, and Management Modalities in Mauritania

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Abstract

Background: ST-Elevation Myocardial Infarction (STEMI), marked by manifestations linked to coronary atherosclerosis and sudden myocardial perfusion impairment, poses a significant global public health challenge due to its prevalence and lethality. In Mauritania, where the last study was conducted in 2017,

Aim: this research aims to delineate the epidemiological, clinical, and paraclinical profiles of hospitalized STEMI patients and evaluate the management and short- term in-hospital outcomes.

Materials and methods: The study, conducted at the National Cardiology Center in Nouakchott, Mauritania, from July to September 2022, is a single-center observational analysis focusing on STEMI management. Data from 86 patients were prospectively collected, encompassing sociodemographic, clinical, paraclinical, therapeutic, and short-term outcome variables. IBM SPSS 26 software was utilized for data analysis, employing statistical tests such as Student's t- test and Fisher's Chi-square test with a significance level set at $p < 0.05$.

Results: Hospital prevalence of ST-Elevation Myocardial Infarction (STEMI) was 10.2%, predominantly affecting males (ratio 4.06) with a mean age of 56.5 years. Men had a higher cumulative cardiovascular risk burden and smoking prevalence, while women showed higher rates of diabetes and hypertension. Most patients sought medical attention within 12 hours, and revascularization was performed in 84% of cases, resulting in favorable outcomes in 78%, with complications observed in 22% and a 13% mortality rate during the acute phase.

Conclusion: The management of STEMI in Mauritania has seen improvements, with increased rates of revascularization, notably primary angioplasty, rising from 5% to 36% in 5 years. However, the persistently high mortality rate stands at approximately 13%. Recommendations include strengthening primary prevention, anti-tobacco campaigns, ensuring emergency revascularization resources, and facilitating medical transport for timely treatment.

Keywords: stemi, coronary angiography; primary angioplasty; ischemic heart disease; Mauritania

Introduction

ST-Elevation Myocardial Infarction (STEMI) constitutes a clinical entity characterized by manifestations linked to coronary atherosclerosis, involving abrupt impairment of myocardial perfusion [1].

Given its prevalence, lethality, and socio-economic implications, STEMI poses a significant public health challenge, not only in industrialized nations but also in developing countries [2].

This study aims to update the epidemiological, clinical, paraclinical characteristics, and management of STEMI in Mauritania, providing insights into its evolution since the last study in 2017[3].

Materials and methods:

This is a single-center observational, descriptive, analytical study with prospective data collection involving patients hospitalized at the National

Cardiology Center in Nouakchott, Mauritania, from July 1, 2022, to September 30, 2022, focusing on the management of STEMI.

We collected sociodemographic, clinical, paraclinical, therapeutic, and short-term outcome variables from a sample of 86 patients,

Inclusion criteria: This study included patients hospitalized for the management of ST-elevation myocardial infarction (STEMI).

Exclusion criteria: Patients admitted for non-ST-elevation acute coronary syndrome (NSTEMI) were excluded.

Data analysis was performed using IBM SPSS 26 software. We employed the Student's t-test after conducting the homogeneity test to assess the independence between quantitative variables with two modalities. The Fisher's Chi-square test was used to evaluate independence between qualitative variables. A p-value Less-than sign 0.05 was considered significant

Results:

The hospital prevalence was 10.2%.

The male gender predominated with a ratio of 4.06.

The mean age was 56.5 ± 12.8 years, ranging from 27 to 85 years. The average age for men was 55.9 ± 12.5 years, and for women, it was 58.8 ± 13.4 years (p=0.4).

The mean number of risk factors per patient was 2.9 ± 1, being higher in men (3.06 ± 1) than in women (2.29 ± 1), with a correlation between the cumulative number of CV risk factors and gender.

The prevalence of various risk factors is detailed in **Table 1.**

CVRF	Men n=69(%)	Women n=17(%)	Total n=86(%)	Pvalue
Family history of MI ina first- degree relative	2(2,8)	0	2(2,3)	0,64
Smoking	46(66,6)	4(23,5)	50(58,1)	**0,001**
HTN	10(14,4)	9(52,9)	19(22)	**0,002**
Diabetes	17(24,6)	9(52,9)	26(30,2)	**0,037**
Dyslipidemia	0(0)	1(5,8)	1(1,1)	0,198
Obesity	10(14,4)	4(23,5)	14(16,2)	0,463
Overweight	2(2,8)	2(11,7)	4(4,6)	0,173
Abdominal Obesity	5(7,2)	0(0)	5(5,8)	0,578

Table 1: Prevalence of Cardiovascular Risk Factors

Men had a higher cumulative CV risk factor burden (P=0.008) and were more likely to be smokers (P=0.001), while women tended to have a higher prevalence of diabetes (P=0.037) and hypertension (P=0.002).

The mean consultation delay was 33 hours, ranging from 1 hour to 10 days, with a median value of 15 hours.

A total of 37 patients (43%) sought medical attention within the first 12 hours, including 35 patients in Nouakchott and 2 patients within a distance of less than 250 km from the capital.

The number of patients consulting beyond 12 hours was 49 (57%), with 23 patients (27%) in Nouakchott, 6 (7%) within a distance of less than 250 km, 7 (8%) between 250 and 500 km from Nouakchott, and 13 patients (15%) beyond 500 km from Nouakchott.

The percentage of medical transfers from other hospitals to the CNC was 57%. Chest pain was present in 98% of patients, with 80% having a typical character, and no significant difference between genders (p=0.46). Dyspnea was present in 21% of cases. Vagal syndrome, syncope, and palpitations were found in 10.5%, 3.5%, and 1% of cases, respectively. The clinical examination revealed an average systolic blood pressure (SBP) of 142±26 mmHg and an average diastolic blood pressure (DBP) of 85±17 mmHg. The mean heart rate was 88±17 bpm, with 22% of patients experiencing tachycardia. The average oxygen saturation (SpO2) was 96±4%, and 13% of patients had an SpO2 below 92%. The prevalence of Killip 2 was 9%, Killip 3 was 5%, and Killip 4 was 1%.

Electrocardiographically, the Q wave was present in 64% of cases. The prevalence of territories with ST-segment elevation is represented in the **table 2.**

ECGTerritory	Male n=69(%)	Female n=17(%)	Total n=86(%)
Anterior	24(35)	5(29)	29(34)
Inferior	18(26)	6(35)	24(28)
Extendedanterior	15(22)	4(24)	19(22)
Circumferential	4(6)	2(12)	6(7)
Posterior	4(6)	0	4(5)
ExtensiontoRV	4(6)	0	4(5)

Table 2: Distribution of patients based on the electrocardiographic territory of ST-segment elevation

Echocardiography (ETT) was performed in 91% of cases, and left ventricular ejection fraction (LVEF) was preserved in 44% of patients, moderately impaired in 15%, and impaired in 32%.

Biological assessment revealed incidental findings of diabetes in 13% and dyslipidemia in 15% of patients.

Coronary angiography was conducted in 95% of cases, revealing monovessel lesions in 52%, double-vessel lesions in 16%, and triple-

vessel lesions in 24%. It was normal4(6 in 2% of exclusively female patients.

Coronary angiography indicated percutaneous coronary intervention (PCI) in 79% of patients, coronary artery bypass grafting (CABG) in 6%, medical treatment alone in 6%, and viability testing in 3%.

Revascularization was performed in 84% of patients, including 3% undergoing thrombolysis, 77% PCI (with 36% being primary), and 3.5% coronary artery bypass grafting (CABG).

Favorable outcomes were observed in 78% of cases.

Complications were observed in 22% of cases, with heart failure being the primary complication in 16% of patients. Second and third-degree atrioventricular block (AVB) occurred in 3% of patients, and ventricular tachycardia (VT) occurred in 1% of patients.

The prevalence of mortality during the acute phase was 13%, and statistical tests revealed a significant association with a history of hypertension (P=0.03), oxygen desaturation (P=0.02), tachycardia (P=0.01), and Killip class greater than 1 (P=0.001), making them poor prognostic indicators **(see table 3).**

	Living patients =75 (%)	Deceased patients n=11(%)	p value <0,05
Age(years)	56±13	61±9	0,19
Sexratio	4,77	1,75	0,1
Number of CVRF	2,9±1	2,8±0,7	0,77
Time from symptoms to admission (hours)	28	72	**0,03**
Smoking	47(62)	4(36)	0,08
HTN	15(20)	4(36)	**0,03**
Diabetes	20(23)	6(54)	0,06
Dyslipidemia	1(1)	0(0)	1
Obesity	11(15)	3(27)	0,3
Overweight	4(5)	0(0)	1
Abdominal obesity	6(8)	0(0)	1
SBP (mmHg)	144±25	123±26	0,27
DBP (mmHg)	86±17	78±14	0,49
SpO2(%)	97±3	90±6	**0,02**
HR (bpm)	76±16	99±21	**0,01**
Killip>1	68(90)	5(45)	**0,001**
Pathological Q-waves	45(62)	8(73)	0,3
Preserved LVEF	35(47)	3(27)	0,17
Moderately Reduced LVEF	13(17)	0(0)	0,34
Reduced LVEF	22(30)	5(45)	0,28
Biological Inflammatory Syndrome	54(72)	7(64)	0,18
eGFR(ml/min)	79±29	68±26	0,07
Coronary Angiograms Performed	70(93)	10(91)	0,39
Single Vessel Disease	41(55)	5(50)	1
Double Vessel Disease	13(17)	1(10)	0,36
Triple Vessel Disease	17(23)	4(40)	0,25
Revascularization	46(85)	8(73)	0,3
PCI	59(79)	7(64)	0,39

Table 3: Epidemiological, clinical and paraclinical data of living and deceased patients

Discussion:

This study has updated the epidemiological, clinical, paraclinical, and short-term prognostic profile of patients with STEMI, as well as assessed their management during the acute phase at the CNC.

The mean age of patients in our series was 56±13 years, a result close to that of A. Daty's thesis [3] (p=0.07), as well as the Maghreb registry ACCESS (p=0.27) [4], the Ivorian study by

A. Ekou [5], and the Senegalese study by M. Dioum [6] (p=0.07).

A significant male predominance was identified, with a male-to-female sex ratio of 4.06. This male predominance aligns with consistent findings in the literature [7,8].

The cumulative number of cardiovascular risk factors was 2.9±1. Men had a higher average number of risk factors compared to women, with respective means of 3±1 and 2.3±1. A significant relationship between gender and the average number of cardiovascular risk factors was observed (P=0.008). This finding suggests that the male gender is an important factor associated with cardiovascular risk factors.

Studies/Registries	Tabaco	HTA	Diabetes	Dyslipidemia	Obesity
FAST-MI France [9]	52,7	40,4	13,6	38	19,7
FAST-MI Tunisia [10]	64,9	38,6	36,6	17	-
ACESS [4]	51	37	34	24,6	-
M, Dioum [6]	20,1	54,4	24,7	30	-
A, Ekou [5]	34,3	49,4	24,7	16,7	-
A, Daty [3]	82,5	37,5	45	2,5	-
Our study	58	22	26	1	16

Table 4: Prevalence of cardiovascular risk factors according to studies.

In the literature, smoking is present in 20% to 82% of patients with STEMI according to various studies [9–12]. In our study, the prevalence of chronic tobacco exposure was 58%, encompassing all forms of tobacco use (cigarettes, pipes, snuff). This prevalence was notably high compared to other identified risk factors. This prevalence aligns with observations in French, Maghrebian, and Tunisian registries, with respective values of 52.7%, 51%, and 64.9% [4-9-10] (see Table 4).

Furthermore, a significant difference in the prevalence of smoking was noted based on gender, with a prevalence of 67% among men and 24% among women (p=0.001). These findings underscore the importance of considering the gender-based differences in smoking prevalence when implementing smoking prevention and cessation policies, specifically targeting groups with higher prevalence. Current anti-tobacco policies in Mauritania focus on health warnings displayed as large-scale awareness signs, neutral packaging for tobacco products, and the prohibition of tobacco advertising, promotion, and sponsorship [13]. However, these measures appear to be insufficient and require reinforcement through more stringent policies.

Diabetes exerts a significant burden on the world, not only due to its increasing incidence but also because of its substantial involvement in the development of cardiovascular diseases, particularly coronary artery disease [14]. A diabetes prevalence of 30% was observed in our series, with a higher prevalence among women than men, at 53% and 25%, respectively (p=0.037). These results were comparable to those in Maghreb countries and the sub-region and were markedly higher than those in the French registry (see Table 4). Additionally, incidental discovery of diabetes was found in 13% of patients, confirming the latent nature of this disease, which remains underdiagnosed in Mauritania. A screening policy is necessary to reduce its morbidity and mortality. Hypertension is widely recognized as a major risk factor in the development of ischemic heart diseases [15].

Our study found a prevalence of hypertension (HTN) of 22% (14% in men and 53% in women). This prevalence is lower compared to the results of French, Maghrebian, and sub-regional studies [3-6,9,10] (see Table 4). This difference may be explained, in part, by underdiagnosis of HTN and, on the other hand, by the sampling of a single-center study. Moreover, we observed a significant relationship between hypertension and gender, with hypertension present in 14% of men and 53% of women (p=0.002).

Several studies have demonstrated that dyslipidemia is strongly linked to cardiovascular morbidity and mortality in general, particularly in coronary artery disease, with a threefold increase in relative risk [16,17]. In our study, the prevalence of patients followed for dyslipidemia was 1%, which aligns with the findings of A. Daty's study [3], reporting a result of 2.5%. In contrast, French, Maghrebian, Senegalese, and Ivorian studies found a prevalence ranging from 16.8% to 38% [3-4-5-6-9-10] (see Table 4). During hospitalization, lipid profiles conducted on 65 patients revealed abnormalities in 14% of the patients. This underscores the underdiagnosis of dyslipidemia in Mauritania.

Chest pain was reported in 98% of patients, with a prevalence of 97% in men and 100% in women. A typical pattern was observed in 81% of cases, affecting 83% of men and 76% of women. However, no significant correlation was found between chest pain characteristics and gender (p=0.46). While it has been widely accepted that women may exhibit atypical or less obvious manifestations of ACS compared to men [18,19], recent studies have challenged this notion by demonstrating that both men and women can present with similar symptoms of ACS [20,21].

We observed a prevalence of 15% for patients with Killip ≥2, which is close to the findings of the French FAST-MI registry with 13.2% [9], the Tunisian FAST-MI registry with 15% [10], and A. Daty's thesis with 17.5% [3]. The Maghreb ACCESS registry [4] and the study by A. Ekou [5] reported a higher percentage of patients with Killip ≥2: 20% and 27.1%, respectively.

Coronary angiography was performed in 95% of our patients. Comparing this result with the one found by A. Daty [3], which was 76%, we can infer that the rate of performing coronary angiography in the management of STEMI has increased by 17% over 5 years. This could be explained by the improvement in the quality of care through the establishment of an operational cardiac catheterization room 24/7, as well as the implementation of a recovery and social affairs service that supports indigent patients without health insurance, making coronary angiography more accessible.

Coronary angioplasty was performed in 77% of cases, with 36 Percentage being primary PCI. Complete revascularization strategy was applied in 60 Percentage of cases. These results are comparable to the data from the 2014-2015 Tunisian FAST-MI registry. Specifically, the percentage of PCI was 79.3 Percentage including 35% primary PCI, and revascularization was carried out in 55 Percentage of cases [10].

A. Daty's [3] reports that coronary angioplasty was performed in 70% of cases in 2017, with 5% being primary angioplasties, reflecting the improvement in the management of STEMI in Mauritania.

Among our patients, the prevalence of performing coronary artery bypass grafting (CABG) was 3%, which represents a decrease compared to the result of A. Daty's thesis, which noted a rate of 11% [3]. In Tunisia, the prevalence of performing CABG is 1.6% [10]. In Ivory Coast, it is approximately 1.7% [5]. Across the Maghreb region, this percentage is 1.3% [4]. In France, CABG is performed in 4% of patients [9]. The decrease in the prevalence of CABG in Mauritania could be explained by certain surgical indications that have become accessible to coronary angioplasty.

In our study, we observed a favorable outcome in 78% of cases. Complications in the acute phase were present in 22% of cases, with 15%

of patients having Killip ≥ 2, 3% with 2nd and 3rd-degree AV block, and 1% with ventricular tachycardia (VT). Left ventricular ejection fraction (LVEF) was impaired in 32% of cases.

In A. Daty's study, the outcome was favorable in 81% of cases, with complications occurring in 19%, including 17.5% of patients with Killip ≥ 2 and 1.25% with VT [3]. In France, 13% of patients had a Killip classification >1, 3.9% had 2nd and 3rd-degree AV block, and LVEF impairment was noted in 17% of patients [9]. In Tunisia, 10.5% of patients had a Killip class

>1, 3.7% had conduction disturbances like 2nd and 3rd-degree AV block, and VT was noted in 4.2% of patients [10]. In Ivory Coast, a Killip class >1 was found in 27% of patients, VT was around 2%, 2nd and 3rd-degree AV block was at 2%, and LVEF impairment had a prevalence of 28% [5].

The observation of severe cases in our series may be related to the prolonged time to treatment compared to the Maghreb and developed countries. The mortality in the acute phase in our study was 11%, which is close to the results of A. Daty's thesis and the Senegalese study by A. Dioum, reporting 12%, but considerably higher than Tunisia at 7%, France at 2.8%, and Ivory Coast at 2.6% [3,5,6,9,10].

We conducted a comparative analysis between deceased and surviving patients (Table VII) and found significant differences between the two groups concerning:

- Consultation delay (P=0.03)
- Hypertension (P=0.03)
- Oxygen desaturation (P=0.02)
- Tachycardia (P=0.01)
- Killip class > 1 (P=0.001)

We can conclude that the above-mentioned elements represent prognostic factors in STEMI

Limitations of the study:

This study has certain limitations, including its single-center design, which may not fully represent the entire Mauritania population. Additionally, the sample size remains relatively small, and the retrospective nature of data collection might introduce selection bias. Future multicentric studies with larger cohorts are needed to validate these findings.

Conclusion:

The management of STEMI has improved in Mauritania, evidenced by the increased rates of revascularization, particularly primary angioplasty, which rose from 5% to 36% over 5 years. However, the mortality rate remains high at around 13%.

Based on this study, we formulate the following recommendations:

Enhance primary prevention through screening campaigns for diabetes and dyslipidemia to diagnose and treat them in a timely manner.

Organize more anti-tobacco awareness campaigns and implement more aggressive deterrent measures following WHO recommendations.

Ensure the availability of more emergency revascularization resources in other healthcare centers, especially in major cities in the interior of the country (primary angioplasty or, if not available, intravenous thrombolysis).

Ensure medical transport for patients to shorten the time to treatment.

Collaborative Contributions and Expertise:

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