Research Article ISSN 2639-8486

Cardiology & Vascular Research

Study of Diagnostic Delays and Management of Myocardial Infarction in Dakar: Multicenter Study of 159 Cases

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Received: 05 Jan 2025; **Accepted:** 17 Feb 2025; **Published:** 27 Feb 2025

Citation: Papa Guirane Ndiaye, Momar Dioum, Pape MD Fall, et al. Study of Diagnostic Delays and Management of Myocardial Infarction in Dakar: Multicenter Study of 159 Cases. Cardiol Vasc Res. 2025; 9(1): 1-5.

ABSTRACT

Introduction: *Myocardial infarction (MI) is the most serious form of coronary artery disease with its dramatic consequences both functionally and prognostically. The management of this disease, as always stated, is a race against the clock. The objective of this study was to evaluate the diagnostic and management delays of patients with MI in the city of Dakar and its suburbs.*

Methodology: *This is a prospective, cross-sectional, descriptive and analytical study over a period of 06 months from April 1st, 2023 to September 31th, 2023. All patients admitted to the four major cardiology departments in Dakar for MI were included. Data were entered with the Kobotoolbox software and analyzed using SPSS software ($p < 0.05$).*

Results: *One hundred and fifty-nine patients were collected. Chest pain was the main symptom. The mean time between pain onset and first medical contact was 10.57 hours with extremes of 30 min and 144 hours. The mean time between first medical contact and completion of the first ECG was 129.23 min with extremes of 2 min and 6912 min, or 115,2 H. On average, 35.78 H was required between the onset of pain and patient admission to a cardiology centre. The mean time between pain onset and admission in cath lab was 45.34 H with a minimum delay of 2 hours and a maximum delay of 432 hours. Thrombolysis was performed in 51 patients (32%). Only one patient had a thrombolysis within 2H of pain onset, in 17 patients it was performed between H2 and H6 and in 29 patients between H6 and H12. The rate of completion of angioplasty was 38.2% with 24.2% primary coronary intervention. The mean angioplasty delay was 27.45 H with extremes of 2H and 144H. The outcome was mostly favorable, with complications of renal failure (40.6%), heart failure (11.4%) and cardiogenic shock (7.6%). The total number of deaths was 17, representing a hospital mortality rate of 10.8%.*

Conclusion: *Myocardial infarction, a global scourge, is characterized in our countries by significant delays in diagnosis and management. To correct these delays, which have a serious impact on the prognosis of this disease, more communication and awareness is needed.*

Keywords
Myocardial infarction, Angioplasty, Dakar.

Introduction
ST-elevation myocardial infarction (STEMI) or myocardial infarction (MI) remains a worldwide scourge with dramatic consequences both functionally and prognostically. It is a disease in good progression in Africa and particularly in sub-Saharan Africa [1-3]. Enormous progress has been made in these countries, particularly in Senegal, to improve the management of this disease. However, some difficulties remain: significant delays in diagnosis and management, lack of a real care system for these diseases, insufficient use of interventional revascularization techniques due to the lack of qualified medical personnel and an adapted technical plateau [4-6]. The objective of this study was to evaluate the diagnostic and management delays of patients with myocardial infarction in the city of Dakar and its suburbs, an agglomeration area of a sub-Saharan African country.

Methodology
Our work was carried out in the four major cardiological departments of Dakar, including the national university hospital in Fann, the main hospital in Dakar, the Dalal Jamm hospital in Guediawaye and the General Idrissa Pouye hospital in Dakar.

This was a cross-sectional, multicentre, prospective, descriptive and analytical study over a period of 06 months (from April 1st, 2023 to September 30th, 2023).

All patients treated for MI in these cardiology departments during the study period were included in this study. The diagnosis of MI was based on clinical evidence (pain and its equivalents) and changes in the electrocardiogram (ECG) with persistent ST segment elevation. The parameters studied were sociodemographic data, history and risk factors of coronary disease, chest pain, time to management (the time between the onset of pain and the first medical contact, the time between the first medical contact and the completion of the first ECG, the time between the onset of pain and admission to cardiology, the time between the onset of pain and admission to cath lab), the modes of admission, segmental kinetics disorders and left ventricular systolic function at echocardiography. Coronary angiography was used to assess the coronary lesion [7]. The treatments received by patients were evaluated in the pre-hospital and hospital phases (thrombolysis, revascularization by angioplasty or coronary artery bypass graft and other treatments received). The evolutionary data and complications were also recorded.

Data collection was done in a registry: The "DAKAR-STEMI REGISTRY" which was designed at the four centers to collect data from all patients admitted for an STEMI over a one-year period from April 1st, 2023 to March 31th, 2024 using the KoboToolbox software.

Data analysis was performed by SPSS software. The categorical variables, presented in terms of numbers and percentages, were compared by the Chi-square test or the exact Fisher test. Continuous variables, presented as averages were compared by the Student test. The threshold of significance was set at a value of $p < 0.05$.

Results
The total number of patients included in this study was 157 out of a total of 1,340 hospitalized patients during the period, representing a hospital prevalence of 11.7%. Mean age of patients was 58.3 ± 12.3 years [24 - 90 years]. The largest age group was 55-65, representing 34.3% of the population. Male prevalence (71.3%) with a sex ratio of 2.49. Most patients lived in Dakar and its suburbs (70.8%). Overall management was at the patient's expense in 79% of cases and only 11% of patients had medical coverage.
The average number of medical facilities consulted prior to admission to cardiology was 2 [1-4] and 64.7% of patients had consulted at least two health facilities before diagnosis was confirmed. The transfer of patients was mainly medical (67.7%). The admission schedule of patients was mainly between 08H-20H in 68.2% of cases. The clinical presentation of patients was dominated by chest pain, found in almost all patients (156 patients, or 99%). The characteristics of this pain were very typical of a heart pain in 89.9% of cases. Four patients (2.5%) were admitted after a recovered cardio-respiratory arrest. The average time between pain onset and first medical contact (FMC) was 10.57 hours [30 min; 144 H]. The ECG within 10 minutes after the FMC was performed in only 13% of patients (Figure 1). Patients were admitted for the most part (79.6%) within 12 hours of pain onset as shown in Figure 2. The different delays are summarized in Table 1. Cardiovascular risk factors were dominated by physical inactivity (72.6%), followed by hypertension (47.1%) and diabetes (28.7%).

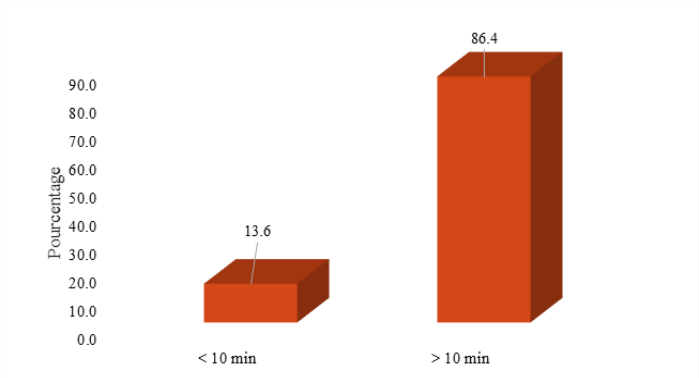

Figure 1: Distribution of patients according to the completion of the ECG within 10 minutes after the first medical contact (FMC).

Table 1: Summary of different management delays.

Time limits for patients management	
Onset of pain and FMC (H)	10.57 hours [0.5H-144H]
FMC and first realization of ECG (min)	129.23 [2 min - 6912 min]
Time to admission in cardiology (H)	35.78 H [1H - 144 H]
Delay in coronary admission (H)	45.34 H [2 H - 432 H]
Average PCI Time	27.45 H [2H - 144H]

FMC: first medical contact; PCI: percutaneous coronary intervention.

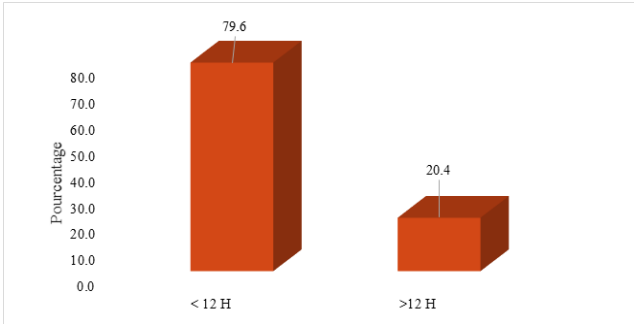

Figure 2: Distribution of patients by consultation before or after the first 12 hours.

The number of patients who had a coronary angiography was 101 or 64.3% achieved. It was abnormal in 94% of patients. The left anterior descending artery (LAD) was more affected (57.3%), followed by the right coronary artery (29.1%). It was predominantly one-vessel coronary artery disease (51%). Therapeutically, the administration of the charge doses was effective in almost all patients (153 patients) and was mostly pre-hospital in 113 patients (73.9%). Thrombolysis was performed at a rate of 32.5% of which more than half were pre-hospital. Only one patient had a successful thrombolysis within 2 hours of pain onset. The thrombolysis delays and their results are summarized in Table 2. Percutaneous coronary intervention (PCI) was performed in 60 patients (38.2%), of which 38 primary PCI (24.2%) and 6 rescue angioplasties (3.8%).

Table 2: Distribution of Results by Thrombolysis Delay.

Thrombolysis delay		**Results**		**Total**
		Failure	**Success**	
< H2	Staff	0	1	1
	%	0,0 %	100,0 %	100,0 %
H2–H6	Staff	6	11	17
	%	35,3 %	64,7 %	100,0 %
H6–H12	Staff	17	12	29
	%	58,6 %	41,4 %	100,0 %
> H12	Staff	3	1	4
	%	75,0 %	25,0 %	100,0 %
Total	Staff	26	25	51
	%	51,0 %	49,0 %	100,0 %

Table 3: Summary table of the different complications in per-hospitalization.

Complications	**Staff (*n* = 157)**	**Percentage**
Kidney failure	64	40,6
Heart failure	18	11,4
Thrombopenia	18	11,4
Cardiogenic shock	12	7,6
Pericardial effusion	11	7
Thrombocytosis	9	6
Conduction disorders	5	3,1
Rhythm disorders	4	2,5
Hemorrhage	3	1,9
Ventriculo-septal defect (Septal Rupture)	1	0,6
Ischemic stroke	1	0,6
Peripheral arterial disease	1	0,6

The evolution was mostly favorable, often with complications in per-hospitalization summarized in Table 3. We had recorded 17 deaths, representing a hospital mortality of 10.8%. The factors identified in our study were: number of medical facilities consulted before admission to cardiology (p value = 0.04), presence of conduction disorders (p value = 0.006) and the absence of angioplasty (p value = 0.04).

Discussion

The prevalence of MI is 11.7% in our study. This is a good illustration of the disease progression in our continent, confirming the long-announced epidemiological transition in the various studies on the subject [5-8]. Several hypotheses have been put forward to explain this development. Apart from the change in lifestyle seen in African countries with a Western trend, we can also note the improvement and availability of diagnostic examinations with the electrocardiogram which is found everywhere making it easier to perform especially in the context of chest pain. Which means that many more patients are diagnosed. However, we continue to see huge delays in the diagnosis and management of patients. The mean time between pain onset and FMC was 10.57 hours in our study, with a significant proportion of patients (79.6%) admitted within 12 hours after pain onset. This delay is significantly improved compared to the 48-hour delay found in 2012 in Ouagadougou [9] and much longer than the 1.53-hour delay found in France 2019 [10]. The lengthening of consultation times in our African countries is inherent to many phenomena: the lack of knowledge of this disease both at the level of the population and hospital practitioners who are also responsible for certain delays and misdiagnosis, poverty with a population almost without medical insurance as in our study population where the overall management was at the expense of patients in 79% of cases. This contributes to the eviction of health structures because of the expenses which are often very colossal. Other delays were also observed and would be mainly related to problems of organization of the system with a real lack of a patient management channel. This is the time taken to complete the electrocardiogram after the FMC, which is 129 min, whereas the recommendations suggest a delay of 10 min [11].

The average age of patients was 58, a relatively young age as in most African studies [4,9-12]. In the European and North American series, patients are older, about a decade [13,14]. This disparity could be explained on the one hand by the much higher life expectancy in these countries, but also by the very early presence of risk factors in the African population and the lack of prevention policies. The coronary angiography completion rate was 64.3% in our series. This rate is relatively low compared to the results of the French FAST-MI 2010 registry [13] which found a coronary angiography completion rate of 96% but remains by count higher than the results of Yao in Ivory Coast who had found a rate of 44.1% [6]. The low rates of coronary angiography in Africa are mainly related to the economic context of our countries where poverty rates remain high [15] and coronary angiography remains a very expensive examination in a country where the majority of the population is without medical insurance. We also note in our

series that the time of admission to the catheterization room was particularly long, estimated at 45H. This phenomenon also reported in other African series [6] is partly explained by the large number of patients received out of time, the many difficulties encountered in the regulation and transport of patients with often tensions of places in cardiology services and sometimes also for logistical problems related to EMS (no ambulances available, crew problem...) [16]. This coronary angiography was mostly abnormal in 94% of cases and normal in 5% of cases. The lesions were mainly located on the LAD (57.3%) and the right coronary was affected in only 29% of cases. Therapeutically, the administration of the charge doses was done in 97.4%. Thrombolysis was performed at a rate of 32.5% of which more than half were pre-hospital. Thrombolysis could still maintain its indications in Africa, especially if it is carried out in a prehospital to meet the recommendations [11] in view of the enormous difficulties both in terms of diagnosis and patient transport. This pre-hospital thrombolysis remains a good alternative in our developing countries where interventional cardiology centers do not cover all regions. PCI remains the gold standard [17]. It was performed in 38.2% of patients, including 24.2% primary PCI and 3.8% rescue angioplasties. In Europe, according to the FAST-MI 2015 registry, primary PCI was performed in 76% of patients [13]. In the ACCESS study [18], 40% of patients had primary PCI. This rate was 58–64% in the Euro Heart Survey (EHS-ACS-II) [19]. These better results observed in developed countries are supported by the existence of a well-organized network of care including the EMS in a quasi-systematic way with a larger offer of care. These difficulties encountered in the management of these patients and especially the delays in management with their known impact on morbidity and mortality of patients [20,21], are not resolved by consequences with non-negligible complications and a mortality rate of 10,8%. This rate remains high and should be a further incentive to review the weaknesses of this care stream in order to find corrections as quickly as possible.

Conclusion

Myocardial infarction, a global scourge, is characterized in our countries by significant delays in diagnosis and management. To improve these delays, which are known to have an impact on patient morbidity and mortality, more communication and awareness is needed for better patient management.

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