

## Diagnostic and Therapeutic Challenges of NON-ST-Elevation Myocardial Infarction in Sub-Saharan Africa

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### ABSTRACT

**Introduction:** Non-ST-elevation myocardial infarction (NonSTEMI) is most often associated with a non-occlusive coronary lesion. However, mortality remains high. The aim of this study was to evaluate the diagnostic and evolutionary aspects of patients presenting with NonSTEMI.

**Patients and methods:** This was a descriptive cross-sectional study conducted from January 01, 2021 to June 31, 2021 in the cardiology department of Aristide Le Dantec Hospital. It included all patients hospitalized for NonSTEMI in the study period. The data studied were clinical, paraclinical, therapeutic and evolutionary.

**Results:** A total of 52 patients were included. Mean age was 60.69 years, with extremes of 32 and 86 years. The most common risk factors were hypertension (58.85%), diabetes (34.62%) and smoking (30.7%). Chest pain was the main symptom (73.1%). On physical examination, signs of heart failure were noted in 19.2% of cases. Troponinemia was positive in 94.2% of patients. Repolarization disorders occurred most frequently in the lateral territory (55.4%). ST-segment depression was most common (75%). Doppler echocardiography revealed segmental kinetic disorders in 22 patients (42.3%). Coronary angiography was performed in 36 patients. Significant lesions were found in 63.8% of cases, most often tri-truncular (56.5%). Fourteen patients underwent angioplasty. In-hospital mortality was 3.8%.

**Conclusion:** NonSTEMI is a frequent clinical form of acute coronary syndrome, occurring most often in high-risk patients. It is the expression of coronary lesions that are often severe.

### Keywords

NonSTEMI, Hypertension, Diabetes, Tri-truncular.

### Introduction

Acute Coronary Syndrome (ACS) is caused by lesions, most often, of atherothrombotic origin, which may or may not be occlusive [1], defining two types. These are ST-elevation myocardial infarction (STEMI) corresponding schematically to a coronary occlusion, and non-ST-elevation myocardial infarction (NonSTEMI) associated

most often with a non-occlusive lesion. Among these NonSTEMI, a distinction must be made between cases with the presence of myocardial cell necrosis, and the less frequent unstable angina, without cardiomyocyte damage [2,3].

NonSTEMI are still one of those paradoxical clinical situations where diagnostic doubt may persist between real coronary artery disease, likely to lead in the short term to serious evolutionary events, and trivial chest pain unrelated to the heart [4].

The proportion of patients presenting with NSTEMI increased between 1995 and 2015. In the same period, the use of early angioplasty (within 72 hours) increased markedly from 9% in 1995 to 60% in 2015; and 6-month mortality fell from 17.2% to 6.3% [5].

In sub-Saharan Africa, even if the technical platform is improving, there are still difficulties in diagnosing ACS in certain regions [6]. There are many data in the literature concerning STEMI, but much less concerning NonSTEMI. The aim of this study was to evaluate patients presenting with NonSTEMI in the cardiology department of the Aristide Le Dantec hospital.

### Patients and Methods

To achieve this objective, we conducted a descriptive cross-sectional study over a six-month period from January 01, 2021 to June 31, 2021 in the cardiology department of Aristide Le Dantec Hospital.

We included all patients aged at least 18 years with NonSTEMI who agreed to participate in the study.

- The parameters studied were:
- Clinical: cardiovascular risk factors, clinical presentation
- Paraclinical: biomarkers, electrocardiographic, echocardiographic and angiographic data
- Therapeutic: molecules used, angioplasty
- Evolution: risk assessment by GRACE score [3], complications and mortality.

Data were collected on a pre-established form. They were entered using Excel software. Data analysis was performed using SPSS epi Info version 7 software.

### Results

During the study period, 543 patients were hospitalized in the cardiology department of Aristide Le Dantec Hospital. Of these, 119 (21.9%) presented with acute coronary syndrome (ACS), including 52 (43.6%) with NonSTEMI.

The mean age was 60.69 years, with extremes of 32 and 86 years. The most common age group was 60-70 (44.2%). Male predominance was noted, with a sex ratio of 1.26. A minority of patients (13.5%) had medical insurance. Socioeconomic status was predominantly low (55.8%). Patients were referred from other health facilities in the majority of cases (73.1%); transport was medicalized in 32.7% of cases. Hypertension, diabetes and smoking were noted in 53.85%, 34.6% and 30.7% of cases respectively (figure 1).

Ten patients (19.2%) had a history of coronary disease, including 5 cases of ACS. Two patients had renal disease, while 2 others had hereditary coronary disease. Chest pain was a constant symptom. It was typical in 38 patients (73.1%). Ten patients (19.2%) showed signs of heart failure.

In terms of electrocardiography, abnormalities occurred most frequently in the lateral territory (55.4%). ST-segment depression

was found in 75% of cases while aVr ST elevation in was noted in 17.3% of cases.

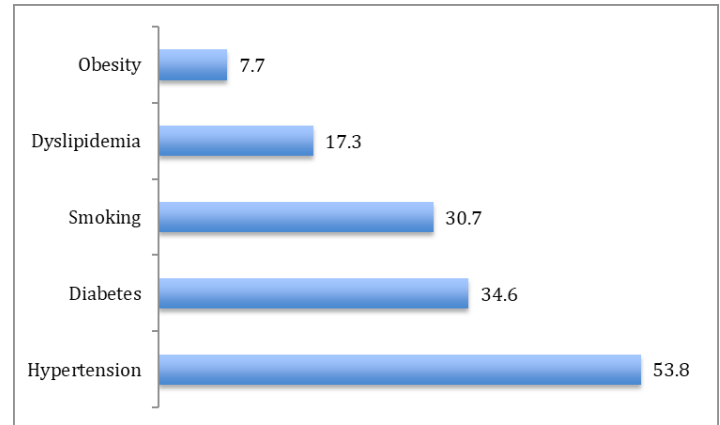


Figure 1: Risk factors frequency.

Biologically, troponin was positive in 94.2% of cases. Moderate anemia and impaired renal function were noted in 17.6% and 16% of cases respectively. One patient had SARS-Cov2 infection associated with ACS. Echocardiography was abnormal in 22 patients (42.3%), showing segmental wall motion abnormalities. In addition, left ventricular systolic dysfunction was noted in 14 cases (26.9%). Assessment of ischemic risk using the GRACE score concluded that 30 patients (57.6%) were at high risk (score greater than 140). It was intermediate and low in 19.3% and 23.1% of cases respectively.

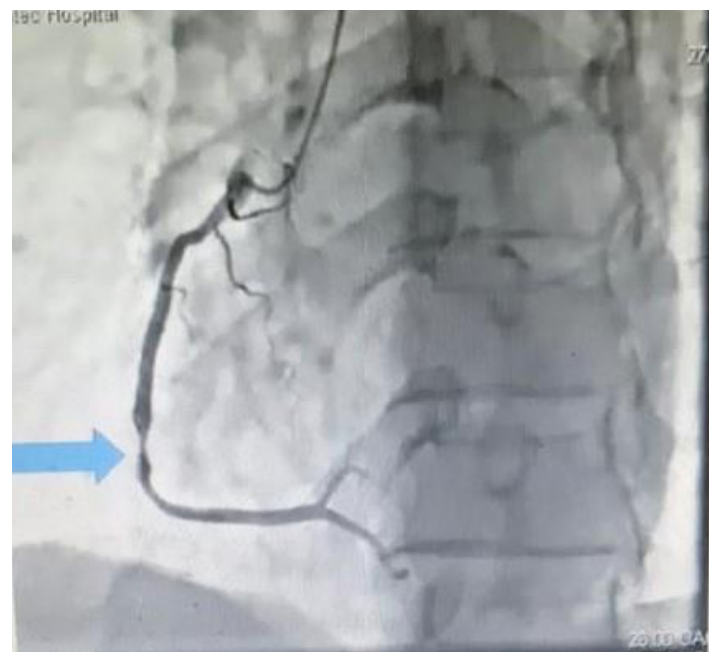


Figure 2: Image of Angiography Showing a Severe Stenosis of the Right Coronary Artery.

Coronary angiography was performed in 36 patients (69.2%). In the other cases, it was not performed due to lack of financial

resources. Coronary angiography was mainly performed via the radial route (in 35 patients, or 97.2% of cases). It was abnormal in 29 cases (80.5%). Significant lesions were found in 23 cases (63.8%). Coronary flow in the culprit artery was classified as TIMI 2 in 82.6% of cases and TIMI 1 in 17.3%. The majority of patients were tri-truncular (56.5%). The number of bi-trunculars and mono-trunculars was 26.1% and 17.4% respectively. The culprit artery was the right coronary (figure 2) in 17 patients (32.7%) followed by the anterior interventricular in 14 patients (26.9%) and the circumflex in 11 patients (21.2%). Two patients (5.55) had a culprit lesion in the Common Trunk. Figure 2 shows a coronary lesion in one patient.

In terms of management, of the 23 patients with significant coronary lesions:

- 14 patients (60.8%) had undergone angioplasty, including 3 ad hoc (21.4%) and 11 cases (78.5%) scheduled.
- 6 patients (26%) had an indication for coronary artery bypass grafting (CABG)
- 3 patients (13%) were on medical treatment alone.

With regard to angioplasty, all stents implanted were active stents. Direct stenting was used in the majority of patients (8, 57.1%). The success rate of angioplasty was 92.8%.

In terms of medication, aspirin (100%), clopidogrel (92.3%) and statins (96.1%) were used. Beta-blockers and ACE inhibitors were prescribed in 57.6% and 73.08% of cases respectively. One major complication, ischemic stroke, occurred during the procedure. Two deaths were noted, including the subject suffering from SARS-Cov2 infection, representing a hospital mortality rate of 3.8%. The average hospital stay was  $6.9 \pm 2$  days (3 to 14 days).

## Comments

Acute coronary syndrome was reputed to be rare in sub-Saharan Africa. In the multicenter CORONAFRIC 1 study carried out in 1991, its frequency was estimated at 3.17% [7]. Subsequently, several studies have shown an increasingly high frequency. In Senegal, precisely at the CHU Aristide Le Dantec, its frequency rose from 4.10% in 2005 to 21.19% in 2015, an increase of 17.09% patients. In our work, Non STEMI represents 9.57% of all ACS. This frequency is close to that already reported by Mboup in 2006 (10.2%) [8], but higher than that noted by Pessinaba et al. in Lomé, which was 3.5% [9]. This difference could be linked to under-diagnosis of these forms of ACS. In fact, diagnosis requires, in addition to the electrocardiogram, the assay of biomarkers, notably troponinemia, which is sometimes unavailable in practice [6]. However, the ECG may be normal in almost a third of cases [10-12].

Hypertension and diabetes were found in high proportions (53.8% and 34.6% of cases respectively). Hypertension is one of the main risk factors for ischemic heart disease. According to the INTERHEART study, hypertension increases the risk of coronary heart disease by a factor of 3 [13]. Some African series highlight this high frequency of hypertension, reaching 66% at most [9,14].

The same applies to diabetes, as reported in some series [9,14]. Diagnostically, prolonged pain (> 20 minutes) is often the main symptom [15]. It is all the more important when associated with risk factors (age, heredity, hypertension, diabetes, dyslipidemia), renal disease or carotid or peripheral arterial disease [16,17]. From a paraclinical point of view, the ECG has a dual role: diagnostic and prognostic. Patients with ST-segment elevation have a worse prognosis than those with a normal ECG. Beyond that, the extent and depth of the ST depression reflect the extent of myocardial ischemia and are prognostic elements. The same applies to ST-segment elevation in aVr [18-21].

Pain and electrocardiographic changes are essential diagnostic features in our African context. Troponin levels are not always available [6]. Biomarker assays, in particular ultra-sensitive troponinemia, are a diagnostic and prognostic element, and guide the management of patients with suspected NonSTEMI [3]. The latter is more sensitive and specific than myoglobin [1,2,22-24].

Prognosis in NonSTEMI is highly variable, hence the importance of establishing a score. The GRACE score used in our work is reputed to offer better performance. It guides the diagnostic and therapeutic strategy, in particular the timing of coronary angiography [24-26].

Although coronary angiography is routinely available in our Dakar setting, we were unable to perform it in all cases. This is essentially due to its still high cost. The cost of diagnostic coronary angiography alone is 550 to 750 euros, while the cost of an active stent is around 1,800 euros. Yet most patients (86.5% in our series) have no health insurance. In our series, coronary lesions were frequent and severe, with a predominance of tri-truncular patients. Angioplasty has significantly reduced mortality in NonSTEMI [3]. Accessibility of angioplasty in sub-Saharan Africa is a major challenge in the management of ACS.

## Conclusion

ACS is an increasingly common condition in our sub-Saharan African countries. Its form without persistent ST-elevation was the most frequent in our series. Our work shows that NonSTEMI occurs most often in patients at risk (hypertension-diabetes) and that the lesions are frequent and severe. Coronary angiography is available but not accessible to all patients.

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