

Acute Coronary Syndromes: Epidemiological, Clinical and Management Aspects in Thies (Senegal)

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Abstract

Purpose: To describe the epidemiological, clinical and management characteristics of acute coronary syndromes (ACS) in Thies, Senegal. **Methods:** This was a prospective study that included consecutively from October 1st, 2018 to March 03rd, 2019, patients aged 18 years or older admitted for an ACS at the DIABCARMET department of the Saint Jean de Dieu Hospital in Thies. **Results:** Of the 516 patients admitted, 29 had ACS, the prevalence was 5.62%. The average age of the patients was 64.2 ± 11.6 years. Nineteen patients (65.5%) were male and 10 (34.5%) were female, the sex ratio was 1.91. The number of direct admissions was 18 (62%) versus 11 patients (38%) referred. The mode of transport was a private vehicle in 19 patients (65.5%), an ambulance in 7 patients (24.1%) and public transport in 3 patients (10.3%). STEMI (ST segment elevation myocardial infarction) was the most common presentation observed in 19 patients (65.5%). Fifteen patients (51.7%) were admitted before the 12th hour. Of the 19 patients with STEMI, 11 (57.9%) had arrived in hospital before the 12th hour and 10 patients had streptokinase thrombolysis. No patients received primary PCI. Ten patients (34.5%) had heart failure and five patients (17.2%) died during hospitalization. **Conclusion:** Delayed consultation and high mortality characterize ACS in Thies. Prevention must be the rule.

Keywords

ACS, Myocardial Infarction, Thrombolysis, Thies, Senegal

1. Introduction

In recent years, many developing countries, and particularly those in sub-Saharan Africa (SSA), have experienced a sharp increase in acute coronary syndrome (ACS) in a context of rapid urbanization, changes in lifestyle and diet, an aging population and, above all, uncontrolled cardiovascular risk factors [1]. Coronary heart disease (CHD) is now 1 of the 3 leading causes of death in most SSA countries increasing the burden of health expenditures in regions that are also struggling with uncontrolled infectious diseases and malnutrition [2].

The multicentre sub-Saharan CORONAFRIC survey reveals an increase in the prevalence of coronary artery disease in Dakar [3]. The acute form of coronary artery disease is Acute Coronary Syndrome (ACS), an emergency whose prognosis is highly dependent on the time taken to manage [4]. We report on our experience in managing the ACS in Thies, Senegal.

2. Methods

This was a cross-sectional, prospective study with consecutive recruitment of hospitalized patients for ACS in the department for the management of diabetes and cardiometabolic diseases DIABCARMET of the Saint Jean de Dieu hospital of Thies during the period from October 1st, 2018 to March 03rd, 2019.

All patients with angina at rest and/or significant electrocardiographic changes to the ST segment (elevation or depression), or symmetric negative T-waves were included. And we excluded patients with stable angina, chest pain, with non-specific electrocardiographic changes, old myocardial infarction.

The parameters studied were:

- The consultation time: time between the beginning of the symptomatology and the patient's arrival at the hospital;
- Description of the symptoms;
- The mode of transport used by the patient to get to the hospital: private vehicle, hospital ambulance, ambulance, public transport (taxi and bus), others;
- Management time: time between patient arrival and completion of ECG and anti-thrombotic and/or fibrinolytic treatment;
- The characteristics of the electrocardiogram (ECG): the persistent ST segment elevation or the ST-segment depression, the territory concerned;
- Socio-demographic data: age in years by date of birth on the national identity card; the socio-economic level according to the World Bank's 2013 poverty index for every person living on less than \$1.25 (700 CFA) per day in developing countries [5];
- The cardiovascular risk factors: physical inactivity defined by physical activity less than 120 minutes per week [6]; smoking; obesity defined by BMI > 30 kg/m² and/or waist circumference > 102 cm in men and >88 cm in women [7]; hypertension retained before taking anti-hypertensive medication and/or arterial pressure \geq 180/110 mm Hg and/or arterial pressure \geq 140/90 mm Hg controlled at least twice outside of an episode of pain [8]; diabetes retained by

taking diabetes medication and/or fasting glucose ≥ 1.26 g/L twice [9]; dyslipidemia with HDL-cholesterolemia < 0.40 g/l in men and < 0.50 g/l in women and/or total cholesterolemia > 2 g/l and/or LDL-cholesterolemia > 1.6 g/l [10];

- Assessment of left ventricular systolic function by measurement of ejection fraction (LVEF) at echocardiography; systolic dysfunction corresponding to LVEF $< 50\%$ [11];
- The treatment administered, in this case the fibrinolytic used;
- The intra-hospital evolution: the efficiency of thrombolysis appreciated by the decrease of more than 50% of the ST segment elevation, the Killip classification of heart failure, mortality [4].

The data were collected and analyzed with the statistical tools of the software Epi info version 3.5.4 of 30 July 2012, CDC, Atlanta (USA). The Chi-square test was used for the comparison of proportions and the variant analysis test (ANOVA) or the non-parametric Kruskal-Wallis test, depending on whether the mean variances were homogeneous or not, for the comparison of a quantitative variable to a qualitative group variable. The significance threshold was set to $p \leq 0.05$.

3. Results

During the study period, 29 patients had an ACS in 516 hospitalized patients; the prevalence was 5.62%. Patients with STEMI were 19 (65.5%) and those with non-STEMI were 10 (34.5%) (Table 1).

These were 19 men (65.5%) and 10 women (34.5%), a sex ratio of 1.9. The average age of patients was 64.2 ± 11.6 years (extremes of 45 and 98 years) and the 55 - 64 age group was the most represented ($n = 12$; 41.3%). Among men, the average age was 63.3 ± 9 years (extremes of 51 and 80 years) and among women 66 ± 15.8 years (extremes of 45 and 98 years). Majority of patients ($n = 23$; 79.31%) resided in the city of Thies. Twelve patients (41.4%) lived below the poverty line compared to 17 (58.6%) who lived above it. Almost half of patients 13 (44.8%) were out of school. The number of patients enrolled was 16 (55.2%) of whom 5 (17.2%) were primary, 2 (6.9%) secondary and 9 (31%) university students.

A patient (3.4%) had a notion of early coronary disease in one of his parents. Other cardiovascular risk factors found were: physical inactivity ($n = 28$; 96.5%),

Table 1. Distribution of acute coronary syndromes.

Acute Coronary Syndromes	Number (n)	Percentage (%)
STEMI	19	65.5
NON-STEMI	10	34.5
Total	29	100

age (n = 26; 89.6%), hypertension (n = 20; 69%), diabetes (n = 12; 41.3%), dyslipidemia (n = 10; 34.5%), smoking (n = 10; 34.5%), obesity (n = 2; 6.9%) (**Figure 1**). The number of risk factors averaged 3.72 ± 1 risk factor per patient (extremes of 2 and 6 risk factors) (**Table 2**).

Patients admitted directly were 18 (62%) compared to 11 (38%) referred. Private vehicles were the most used means of transport, found in 19 patients (65.5%) while 7 patients (24.1%) were transported by ambulance and 3 patients (10.3%) by taxi (**Figure 2** and **Figure 3**). The average intake time from the onset of pain was 31 ± 34.7 hours (extremes of 02 hours and 96 hours). It was 20.9 ± 24 hours in patients with STEMI and 46.9 ± 43.8 hours in patients with non-STEMI. Among patients admitted before the 12th hour, 11 (37.9%) had a STEMI.

All patients (n = 29; 100%) had angina at rest. This pain was typical retrosternal chest in 21 patients (72.4%) and atypical in 8 patients (27.6%) of which 6 (20.7%) epigastralgia type. Only one patient (3.4%) had prior knowledge of the symptoms of coronary artery disease.

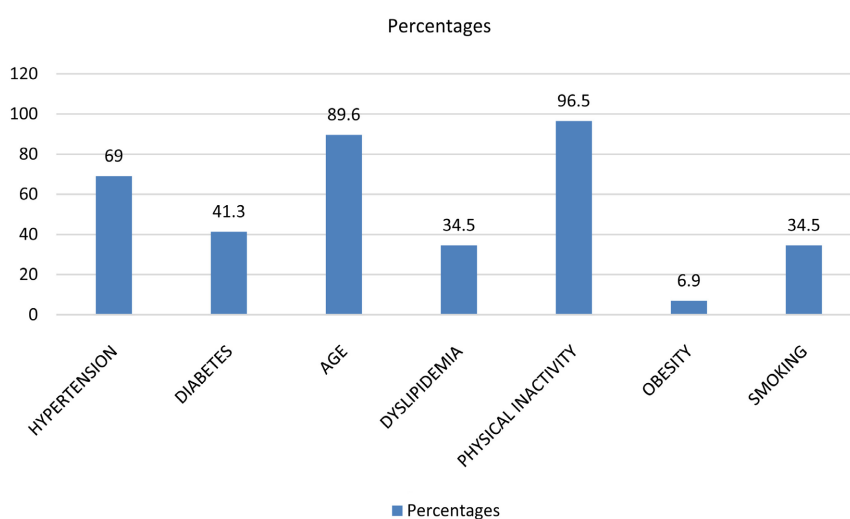


Figure 1. Distribution of modifiable risk factors.

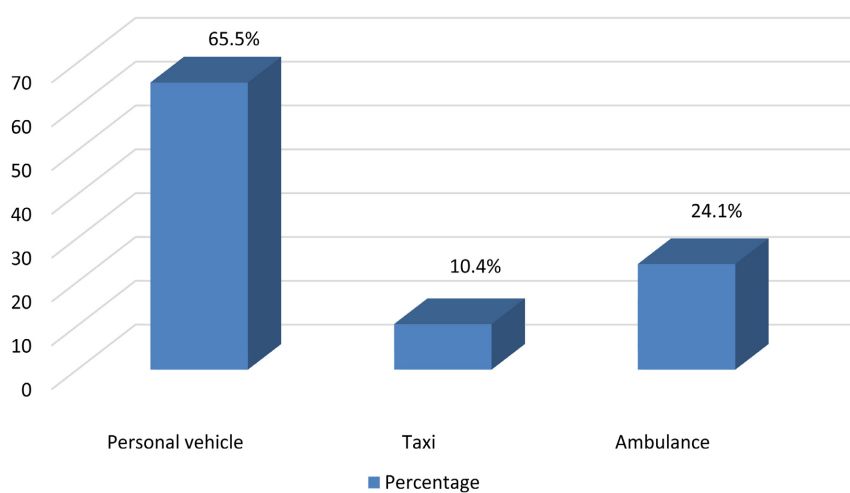


Figure 2. Distribution of modes of transport used.

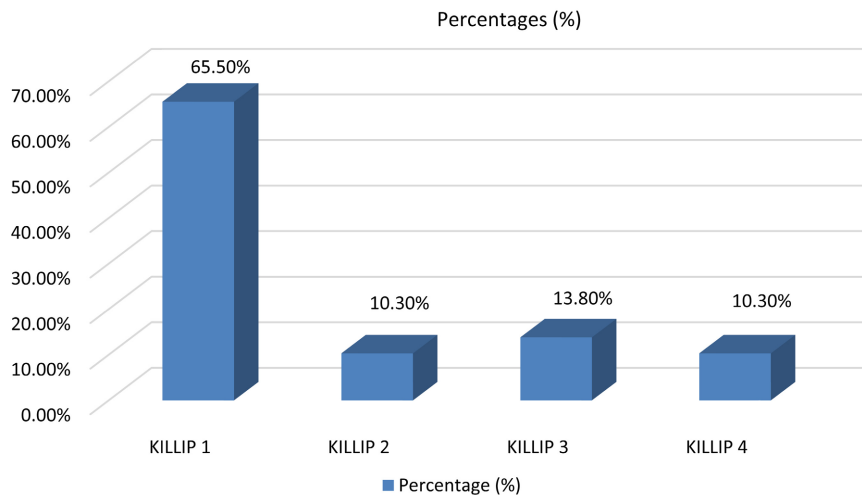


Figure 3. Distribution of patients by Killip classification.

Table 2. Distribution of cardiovascular risk factors in patients with ACS.

Number of cardiovascular risk factors	Number (n)	Percentage (%)
1	0	0
2	3	10.34
3	9	31.03
4	11	37.93
5	5	17.24
6	1	3.45
Total	29	100

Nineteen patients (65.51%) were in Killip stage I with no signs of heart failure, while 10 (34.49%) had signs of heart failure, including 3 patients (10.3%) in Killip stage II, 4 in stage 3 (13.8%) and 3 patients in stage 4 (10.3%) (**Table 3**).

At electrocardiogram, the most concerned location were anteroseptal apical (n = 10; 34.5%), inferior (n = 8; 27.6%) and anteroseptal (n = 4; 13.79%) (**Table 4**).

Twenty-five patients had received echocardiography and LV systolic dysfunction was observed in 13 patients (52%) with an average LVEF was $51.2\% \pm 13\%$ (extremes 22% and 68%).

Of the 19 patients (65.5%) with STEMI, 11 (57.9%) arrived before the 12th hour and 8 (42.1%) after the 12th hour. The average time between onset of pain and initiation of treatment was 31.3 ± 30 hours (extremes of 3 hours and 96 hours). This average treatment time was 5.6 ± 3.1 hours in patients arriving before the 12th hour. Of the 11 patients with STEMI, 10 (90.9%) had received fibrinolytic treatment. Streptokinase was used in all patients (n = 10; 100%). One patient (9.1%) among the 11 did not receive fibrinolytic treatment due to persistent severe hypertension. The significant decrease in the ST segment was however observed in only 2 of the 10 thrombolysed patients (20%).

Table 3. Treatment time from onset of pain.

Delay	Headcount (n)	Percentage (%)
Before the 6 th Hour	10	34.5
6 - 12 th Hour	5	17.2
12 - 24 th Hour	4	13.8
More than 24 Hours	10	34.5
Total	29	100

Table 4. Electrocardiogram location of the myocardial injury.

Location	Headcount (n)	Percentage (%)
Posteroseptal	1	3.4%
Anteroseptal	4	13.8%
Anteroseptal-apical	10	34.5%
inferior	8	27.6%
Circumferential	2	6.9%
Lateral	2	6.9%
Apical	2	6.9%
Total	29	100%

Thrombolysis had to be stopped in 1 patient (3.4%) who had anaphylactic shock, 1 patient (3.4%) had hemorrhage. Five patients died during hospitalization: a mortality of (17.2%) including 4 patients (21%) with STEMI and 1 patient (10%) with non-STEMI. A patient was transferred to another centre. The average length of hospitalization was 5.6 ± 2 days (extremes of 1 day and 8 days).

4. Discussion

The prevalence of 5.62% of ACS in our study was higher than that found by Mboup *et al.* in Dakar in 2014 [12] and by Pessinaba *et al.* in Lomé in 2018 [13] which were 4.05% and 3.5% respectively. In contrast, N'guetta *et al.* in Abidjan [14] found a higher prevalence of 13.5% that could be explained by the fact that this was work done in an angioplasty reference centre. The increase in the prevalence of coronary artery disease in African countries south of the Sahara was highlighted by the multicentre study CORONAFRIC II [3] with a hospital prevalence that had increased from 3.17% in 1991 to 4.05% in Dakar. This increase in the prevalence of coronary heart disease may be due to increasing urbanization and changes in the way of life of populations.

The patients in our work, whose average age was 64, were older than those in the African series. Indeed, Mboup *et al.* in Dakar [12], Nguetta *et al.* in Abidjan [14] and Yaméogo *et al.* in Ouagadougou [15] recovered an average age of 57.1

years, 55 years and 56 years respectively. On the other hand, the patients in our work were slightly younger than in the western series especially in France where he was 66 years old [16]. The prevalence of coronary artery disease increases with age and improved life expectancy of populations. Similarly, the higher prevalence of ACS in males and their younger age found in our work corroborate the literature [4] [12] [13].

Ninety-one percent (91%) of the patients in our study had at least two cardiovascular risk factors as found in the early [17] and recent work in Senegal [12]. The main risk factors in our work were, in order of frequency, physical inactivity, age, and hypertension as found in the INTERHEART study [18]. All our patients had at least 2 cardiovascular risk factors. These results are also comparable to the results of the CORONAFRIC [3] survey and the work of Mboup *et al.* [12]. In work at the same centre as this study in 2016, Affangla *et al.* found at least 3 other risk factors in 85.86% of hypertensive patients [19].

The average intake time in our study was 31 34.7 hours. Mboup and Nguetta [12] [14] had a later admission period of 53.2 ± 21.3 hours and 44.7 ± 47.9 hours respectively. One patient in two in our work ($n = 15$; 51.7%) was admitted before the 12th hour. Ngaide [20] and Mboup [12] had a lower consultation rate before the 12th hour, of 42% and 37.9% respectively.

In our work the direct admission rate of 62% was comparable to that found by Mboup *et al.* in Dakar (57%) but higher than that reported by Ngaide and Nguetta, which were respectively 45.5% and 30% [14] [20]. The high rate of direct admission high in our work could be explained by the fact that the DIABCARMET center of the Saint Jean de Dieu Hospital is the only cardiology service in the region of Thies practicing thrombolysis in the management of STEMI.

The private vehicle was the most common mode of transportation in our work ($n = 19$; 65.5%) as in all sub-Saharan works [12] [13] [14] [15]. The preferred mode of transportation for a patient with ACS is the ambulance. The significant disparity with the practices observed in Tunisia and Europe [21] [22] could be explained by the low socio-economic level of the populations of sub-Saharan Africa and the lack of an organised ACS management system [15].

Clinically, pain was the main symptom as found in the literature [16] [18]. It is present in all patients (100%) of our study, as in the series of Pessinaba [13] and Yaméogo [15] while Mboup finds it in 96.6% of patients. Epigastralgia were found in our study (20.7%). Hakim found similar results (19%) [18]. The frequency of epigastric localization of pain in ACS highlights the relevance of performing an ECG in front of acute epigastric pain. In our study, reaching the previous territory was the most common (48.3%), followed by reaching the lower territory (27.6%). The predominant anterior location of the ACS is found in all work [13] [14] [15] [16]. Like Pessinaba *et al.* [13], we found no cases of right ventricular extension in contrast to Mboup and Ngaide, which were found in 13.6% and 16% of patients [12] [20]. The prevalence of heart failure in our work ($n = 10$; 34.5%) was higher than the Mboup [12] and Nguetta [14] series, which

had a prevalence of 16.9% and 27.8% and lower respectively than the Pessinaba [13] series, which had a heart failure prevalence of 50%. One in two patients (52%) in our work had LV systolic dysfunction in echocardiography. Heart failure secondary to left ventricular systolic dysfunction, a consequence of sudden coronary occlusion, is potentially reversible during ACS justifying early revascularization strategies. It is clearly established that thrombolysis significantly reduces complications and mortality in patients with ACS [4] [15].

The rate of consultation before the 12th hour in patients with STEMI was 57.9% in our work and only 9.3% in the work of Yaméogo *et al.* in Ouagadougou [15]. The average treatment time compared to the onset of pain was 5.6 3.1 hours in our work compared to 3.4 1 hour in the work of Mboup *et al.* in Dakar [12]. There is then a great disparity in the time frames for consultation and management of the ACS in sub-Saharan countries, which would be linked to differences in the organization of health structures and the insufficient information of populations. Only one patient in our work (3.44%) had knowledge of the symptoms of ACS.

Streptokinase was the only fibrinolytic used in our study (100%) as in the Pessinaba, Yameogo and Ngaidae series [13] [15] [20]. This exclusive use of streptokinase can be explained by its low cost and availability compared to other fibrinolytics which are more used in the Western series and in the work of N'Guetta (8.2%).

The success rate of thrombolysis in our work was 20% much lower than the 59.02% found by Ngaidé in Dakar and Bohajja in Tunisia [20] [21]. We recorded a mortality rate of 9.68% close to that of Ngetta but lower than the mortality of 18% recovered by Mboup and 11% by Yaméogo and higher than the mortality of 6% recovered by Ngaidé [20].

5. Conclusion

Acute coronary syndromes were common in Thies. The diagnosis was often late. The management was medical with still high mortality. The organization of a management system and prevention must be the priority.

6. Limitation of the Study

Low patient numbers; unavailability of new generation fibrinolytics; very poor patient access to coronary angiography.

Conflicts of Interest

The authors declare that they have no conflict of interest in relation to this work.

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