Research Article ISSN 2639-8486

Cardiology & Vascular Research

Acute Coronary Syndromes in Senegal: A Cross-Sectional Study in Senegalese Urban Area

Papa Momar Guissé[1]*, Tacko Niang[1], Thierno Safaïou Doucouré[1], Awa Kane[2], Aliou Alassane Ngaïdé[3], Bouna Diack[3], Mouhamed Cherif Mboup[1] and Alassane Mbaye[3]

[1]*Hôpital Principal de Dakar.*

[2]*Centre Hospitalier Universitaire de Fann.*

[3]*Hôpital Général Idrissa Pouye.*

***Correspondence:**
Papa Momar Guissé, Hôpital Principal de Dakar, 1 Avenue Nelson Mandela, Dakar, Senegal, Tel : +221768305948.

Received: 04 Jun 2024; **Accepted:** 11 Jul 2024; **Published:** 19 Jul 2024

Citation: Papa Momar Guissé, Tacko Niang, Thierno Safaïou Doucouré, et al. Acute Coronary Syndromes in Senegal: A Cross-Sectional Study in Senegalese Urban Area. Cardiol Vasc Res. 2024; 8(1): 1-5.

Keywords
Acute coronary syndromes, Heart diseases, Hypertension, Diabetes.

Introduction
Acute coronary syndromes (ACS) are a clinical spectrum of unstable ischemic heart disease, in which myocardial ischemia/necrosis is caused by rapid narrowing/obstruction of coronary artery as a consequence of atheromatous plaque disruption and thrombogenesis [1]. It is estimated that more than seven million people are diagnosed with ACS each year worldwide [2]. According to the World Health Organization (WHO), cardiovascular diseases, particularly coronary artery disease, currently represent the most common cause of death worldwide [3]. A systematic review showed that the prevalence of ACS in 13 sub-Saharan African countries varied between 0.21% and 22.3% between 2011 and 2020 [4]. In Senegal, several studies show that the prevalence of acute coronary syndromes (ACS) is on the rise, as in other countries. Indeed, it increased from 3.17% to 16% between 1991 and 2017, as reported respectively in the CORONAFRIC I and II multicenter prospective surveys involving 11 sub-Saharan African countries [5,6]. In recent years, there has been progress in the management of ACS in our country, notably with the widespread use of coronary angiography and the increasingly frequent performance of coronary angioplasty. The cardiology department of General Hospital Idrissa Pouye (HOGIP) recently acquired a cardiac catheterization laboratory in 2019, where percutaneous coronary intervention (PCI) is routinely performed. The aim of this study was to determine the prevalence of ACS in the cardiology department of HOGIP and to describe the epidemiological, diagnostic, therapeutic and evolutionary aspects of patients admitted for ACS.

Patients and Methods
This was a cross-sectional, descriptive and analytical study conducted over a period of 12 months from August 1, 2020, to July 31, 2021, at the cardiology department of HOGIP. We included all patients admitted for ACS during the aforementioned period, whose diagnosis of ACS was established based on clinical, electrocardiographic, biological, and angiographic criteria according to the recommendations of the European Society of Cardiology (ESC) [7,8].

We studied the following:

- **Socio-demographic data:** Age and gender.
- **Type of ACS:** ST-elevation ACS (STE-ACS) also called ST-elevation myocardial infarction (STEMI) and non-ST-elevation ACS (NSTE-ACS) including non-ST-elevation myocardial infarction (NSTEMI) and unstable angina.
- **Cardiovascular risk factors:** hypertension, diabetes, dyslipidemia, family history of myocardial infarction, passive or active smoking, current or weaned smoking for at least 3 years, alcohol consumption, and obesity.
- Personal history of cardiovascular disease and the level of cardiovascular risk determined using to the ESC classification in 2019 [9].
- **Admission delay and admission examination data:** symptoms, vital signs (blood pressure, capillary glycemia, heart rate and oxygen saturation), Killip class, existence or not of recovered cardiac arrest.
- **Paraclinical data:** biological, electrocardiographic, echocardiographic, and angiographic findings (affected arteries and SYNTAX score in patients with triple vessel disease).
- GRACE prognostic score and length of hospital stay.

- **Therapeutic data:** thrombolysis, angioplasty, and adjunctive treatment.
- **Hospital course:** complications and mortality rate.

Data were entered and analyzed using SPSS Version 23.0 software. Qualitative variables were expressed as percentages and quantitative variables as means. We also conducted a multivariate analysis using binary logistic regression with a forward stepwise procedure to identify factors associated with mortality rate, including age, gender, type of ACS, admission delay, presence of cardiogenic shock and heart failure. A p-value less than 0.05 was considered statistically significant.

Results

During the study period, 139 patients were diagnosed with ACS and included, representing a hospital frequency of 17%. The clinical presentation was predominantly characterized by STEMI, which affected 75.5% of the patients. NSTEMI and unstable angina affected 23% and 1.4% of the patients respectively. There was a male predominance (64%). The mean age was 59.5 years ± 12.6, with the most represented age group being 60 to 69 years (34.4%). Patients aged under 50 years were 34, accounting for 24.4%. Coronary artery disease history was found in 9.4% of patients, ischemic stroke in 4.3%, peripheral arterial disease in 1.4%, and chronic kidney disease in 0.7% of patients.

Among the cardiovascular risk factors, dyslipidemia, hypertension, and diabetes were the most common, as illustrated in Table 1. Regarding the level of previous cardiovascular risk, 18.7% of patients had low risk, 33.1% had moderate risk, 36.7% had high risk and 11.5% had very high cardiovascular risk.

Table 1: Frequency of Cardiovascular Risk Factors Identified.

Cardiovascular Risk Factors	N (%)
Dyslipidemia	95 (68)
High blood pressure	67 (48)
Diabetes	61 (44)
Obesity	26 (19)
Smoking	21 (15)
Family history of myocardial infarction	3 (2)
Alcohol	3 (2)

The mean admission time to the service was 42.9 hours ± 56.9. It was 40 hours ± 59 for patients admitted for STEMI and 52 hours ± 49 for those admitted for NSTE-ACS. Among patients who presented with STEMI, 55.2% were admitted within less than 12 hours.

Chest pain was reported in 93.5% of patients. It was typical of angina in 64.1% of them. The three other most common symptoms were dyspnea (24.4%), vomiting (23%), and syncope (3.6%). The majority of patients (83%) were classified as Killip class 1 upon admission. Only one patient was classified as Killip class 4. No case of cardiorespiratory arrest was noted upon admission. Upon admission, hyperglycemia (random capillary blood glucose ≥180 mg/dl) was found in 36% of patients who had capillary blood glucose measured. Systolic blood pressure was elevated (≥140 mmHg) in 43.3% of patients, and it was low (≤90 mmHg) in 3.6%. Tachycardia was found in 30.2% of patients, and bradycardia in 7.2%. Obesity was found in 19% of patient.

The mean LDL-cholesterol level was 140 mg/dl ± 0.52. The mean values of other biological parameters are represented in Table 2.

Table 2: Summary of biological Test Results.

Biological Test	Mean
Fasting glycemia (mg/dl)	121 ± 62
Total cholesterol (mg/dl)	204 ± 60
HDL-cholesterol (mg/dl)	44 ± 15
LDL-cholesterol (mg/dl)	40 ± 52
Triglyceridemia (mg/dl)	112 ± 062
Serum creatinine (mg/l)	9,65 ± 3,53
CRP (mg/l)	57,2 ± 75,5
Hemoglobin (g/dl)	13,5 ± 2,1

Regarding the electrocardiogram, the most commonly found anomaly suggesting myocardial ischemia was subepicardial lesion (75.5%), followed by subepicardial ischemia (23.7%). The most affected territory was the anterior territory (45.3%), followed by the inferior territory (41.7%) and then the lateral territory (23%). Arrhythmias (atrial fibrillation/flutter, ventricular premature beats, ventricular tachycardia) at the time of admission, affected 10.2% of patients, while conduction disturbances (any type of atrioventricular block, right or left bundle branch block) affected 15.3%. The mean left ventricular ejection fraction (LVEF) was 50 ± 11.8%, and 50.4% of patients had an LVEF ≤ 40%. Left ventricular filling pressures were elevated in 10.1% of patients. A left ventricular thrombus was present in 11.5% of patients. Left ventricular dilatation was observed in 7.9% of patients.

Coronary angiography was performed in 110 patients (79%), and the left anterior descending artery was the most affected (77%), followed by the right coronary artery (60.4%), and finally the circumflex artery (41%). Left main coronary artery involvement was noted in 3 patients (2.2%). Coronary angiography did not show significant lesions (stenosis < 50%) in 7 patients (5%). Single-vessel disease was more frequent (37%) followed by triple-vessel disease (31.5%). Among the latter, the mean SYNTAX score was 25.7 ± 9.4, and 34.5% of them had lesions of high complexity (SYNTAX score > 32).

For the management of STEMI:

- Thrombolysis with streptokinase was performed in 31 patients, which accounts for 53% of those admitted within the first 12 hours and 29.5% of all patients admitted for STEMI. However, it was successful in only 48% of them.
- Primary angioplasty was performed in 19 patients which accounts for 33% of those admitted within the first 12 hours and 18.1% of all patients admitted for STEMI.
- Rescue angioplasty was performed in 2.9% of all patients admitted for STEMI, i.e. 3 patients.

Overall, PCI (primary, rescue, and elective) was attempted in 44 patients (31.7%) of all patients with a success rate of 86.4%. Stent placement was done in 71.1% of patients, and all stents were drug-eluting stents. Coronary artery bypass grafting was not performed in any patient despite being indicated in 14.4% of them.

In total, 23 patients (16.7%) underwent complete revascularization, 20 patients (14.5%) underwent incomplete revascularization, 9 patients (6.5%) did not require revascularization, and 86 patients (62.3%) were not revascularized. Regarding ACS treatment, 96.4% received low-molecular-weight heparin and aspirin, 94.2% received clopidogrel, 3.6% received ticagrelor, 90.6% received angiotensin-converting enzyme inhibitor, 90% received beta-blockers, and 97.1% received statins. The average length of hospital stay was 8.06 days ± 3.14. The mean GRACE score was 139 ± 29, and 65 patients (46.8%) were at high risk according to the GRACE score. The two most frequent complications were heart failure and cardiogenic shock, affecting 16.5% and 8% of patients, respectively. The rest of the complications are listed in Table 3.

Table 3: In-hospital complications.

In-hospital complications	n (%)
Heart failure	23 (16.5)
Cardiogenic shock	11 (8)
Ischemic stroke	5 (3.5)
Acute pericarditis	2 (1.4)
Left ventricle clot	16 (11.5)
Left ventricle aneurysm	1 (0.7)
Major bleeding	2 (1.4)
Recurrent ischemia	1 (0.7)
Acute kidney injury	2 (1.4)
Ventricular tachycardia	3 (2.1)
High degree atrio-ventricular block	2 (1.4)
Atrial flutter	1 (0.7)

Seven patients died during hospitalization, resulting in a hospital mortality rate of 5%. The most common cause of death was cardiogenic shock (6 patients). One patient died as a result of severe acute respiratory distress secondary to SARS-CoV-2 pneumonia. In multivariate analysis, only the presence of cardiogenic shock was associated with death, as illustrated in Table 4.

Table 4: Factors associated with death in multivariate analysis.

Variables	Adjusted Odds Ratio (IC 95%)	p value
Male gender	0,36 (0,001 - 1,9)	0,101
ST-elevation ACS	0,027 (0,001 - 2,85)	0,129
Age	0,675 (0,417 - 1,093)	0,110
Admission Delay	1,001 (0,975 - 1,028)	0,911
Heart failure	3,96 (0,031 - 5,86)	0,578
Cardiogenic shock	***18,48 (3,09 - 30,86)***	***0,021***

Discussion

In Senegal, there has been an increase in the hospital frequency of ACS over the years. For instance, Mboup [10] found a frequency of 4.05% in 2006, Hakim found 7.61% in 2009 [11], and Sène found 16% in 2018 [12]. Our study confirms this increase with a hospital frequency of 17%. This rise in frequency could be explained, on one hand, by profound changes in our lifestyle favoring the emergence of cardiovascular risk factors and, on the other hand, by improvements in diagnostic methods and technical capabilities. In sub-Saharan Africa, data vary among countries. In Côte d'Ivoire, N'Guetta et al. [13] found a hospital frequency of 13.5% in 2016; in Togo, Pessinaba et al. [14] found 3.5% in 2018; in Mauritania, Ba et al. [15] found 10.2% in 2019. Generally, the relative incidences of STE-ACS and NSTE-ACS are respectively decreasing and increasing in surveys on myocardial infarction in the Western countries. In France, the proportion of patients with NSTE-ACS increase from one-third in 1995 to more than half in 2015 [16]. This is mainly explained by the honing of NSTE-ACS diagnosis, particularly with the availability of high-sensitivity troponin and modern cardiac imaging techniques. In Senegal, however, as our study demonstrates, STE-ACS remains more frequent. Similar data exist in other sub-Saharan African countries [13-15]. The main reason for this difference with Western countries would be the less available diagnostic tools for NSTE-ACS in our regions.

In sub-Saharan Africa, admission delays are significantly longer than those in Western countries, as evidenced by our study. In France, according to the FAST-MI registry, the median delay between pain onset and admission for STEMI was 168 minutes in 2015 [16]. Some factors involved in lengthening admission delays in our country may include, among others: less public awareness of suggestive signs of ACS, leading them to consult and access care services later, both prehospital and hospital; unavailability of electrocardiograms in some health facilities and difficulty in obtaining interpreted resting 12 lead electrocardiogram; poorly codified prehospital transport systems.

The proportion of patients undergoing coronary angiography is gradually increasing in Senegal. In the same center (HOGIP), it was 2.2% in 2009 [11], 20% in 2018 [12], and finally 79% in our study. This significant increase is due to the acquisition of a catheterization laboratory in 2019. It varies considerably across sub-Saharan Africa depending on the country and period. For example, it was 93% in South Africa according to the national ACCESS registry [17] in 2007; 48% in a center in Kenya [18] between 2008 and 2010; 25.6% in a center in Côte d'Ivoire between 2010 and 2013 [13]; and 71% in a center in Mauritania in 2017 [15]. These differences are explained, on one hand, by the timing of acquiring catheterization laboratory among different countries and even within different centers in the same country, and on other hand, by the fact that the procedure is often costly. In the same context, the proportion of patients undergoing PCI, especially primary PCI, has increased, going from 0% in 2018 [12] to 18.1% in our study in the same center. However, despite these improvements, we still lag far behind Western data. For instance, in France in 2015, the proportion of patients admitted for STEMI who underwent PCI was 76% [16]. The reasons for this difference between our country and Western countries are partly financial and also because a significant number of patients arrive outside the recommended reperfusion delays due to delayed consultation

or transfer to a PCI center. Thrombolysis, which is an important reperfusion strategy in managing STEMI, has meanwhile declined in its administration, likely in favor of primary PCI. Indeed, it has decreased from 58% of patients in 2018 [12] to 29.5% in our study in the same service.

The efficacy of coronary reperfusion treatments (thrombolysis and PCI) has led to a significant reduction in complications and 30-day mortality in ACS. Heart failure represents a frequent complication of ACS. According to a European registry conducted between 2011 and 2015, heart failure complicated 14.4% of ACS cases [19]. Also, in Europe, the incidence of cardiogenic shock is estimated at approximately 5 to 10% in STEMI and 2 to 4% in NSTEMI 20]. In the cardiology center of HOGIP, heart failure has experienced a reduction, decreasing from 26% in 2018 [12] to 16.5% in our study. The same trend is observed for cardiogenic shock, which decreased from 14% in 2018 [12] to 8% in our study.

Overall, worldwide, ACS mortality has decreased according to several registries. In France, 30-day mortality from ACS decreased from 14% to 3% for STEMI and from 11% to 3% for NSTEMI between 1995 and 2015. In the cardiology center of HOGIP, in-hospital mortality has also decreased, from 9% to 5% between 2018 [12] and 2021, indicating an improvement in management.

One of the mains limitations of our study was that patient care was mostly at the patients' expense. Furthermore, the difference in socioeconomic levels thus impacted the treatment, especially regarding coronary reperfusion. Likewise, a larger-scale study would be desirable to confirm our results.

Conclusion

Becoming increasingly common in our country, acute coronary syndromes are experiencing improved management, as evidenced by our study. However, despite these advances, we still remain far from international guidelines, particularly concerning intervention delays and coronary reperfusion. Therefore, it is essential for all parties involved to intensify their efforts to improve the management of ACS and thereby facilitating a decrease in morbidity and mortality.

What is known about this topic

- The prevalence of acute coronary syndromes (ACS) is increasing over the years in Senegal.
- The management of ACS represents a real challenge in Senegal.

What this Study Adds

- It confirms this increase in prevalence.
- It demonstrates an improvement in management.
- It also shows a reduction in morbidity and mortality.

Authors' Contributions

All authors have made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data.

References

1. Kimura K, Kimura T, Ishihara M, et al. JCS 2018 Guideline on Diagnosis and Treatment of Acute Coronary Syndrome. Circ J. 2019; 83: 1085-1096.
2. Bellemain-Appaix A, Collet JP, Montalescot G. Syndromes coronaires aigus. Cardiologie. 2010; 11-030-D-10.
3. https://www.who.int/fr/news-room/fact-sheets/detail/the-top-10-causes-of-death
4. Yao H, Ekou A, Niamkey T, et al. Acute Coronary Syndromes in Sub-Saharan Africa: A 10-Year Systematic Review. Journal of the American Heart Association. 2022; 11: e021107.
5. Ticolat P, Bertrand E, Longo-Mbenza, et al. Aspects épidémiologiques de la maladie coronaire chez le Noir Africain: à propos de 103 cas. Résultats de l'enquête multicentrique prospective Coronafric. Cardiol trop. 1991; 17: 7-20.
6. Kassé Maryam. La maladie coronaire en Afrique: résultats de l'enquête multicentrique CORONAFRIC II réalisée dans 11 pays de l'Afrique sub-saharienne [Doctoral thesis]. Dakar: Université Cheikh Anta Diop. 2016.
7. Ibanez B, James S, Agewall S, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). Eur Heart J. 2018; 39: 119-177.
8. Collet JP, Thiele H, Barbato E, et al. 2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. Eur Heart J. 2021; 42: 1289-1367.
9. Mach F, Baigent C, Catapano AL, et al. 2019 ESC/EAS Guidelines for the management of dyslipidaemias: lipid modification to reduce cardiovascular risk. Eur Heart J. 2020; 41: 111-188.
10. Mboup MC, Diao M, Dia K, et al. Les syndromes coronaires aigus à Dakar: aspects cliniques thérapeutiques et évolutifs. Pan Afr Med J. 2014; 19: 126.
11. Hakim Radwane. Aspects diagnostiques, thérapeutiques et évolutifs des syndromes coronaires aigus avec et sans sus-décalage persistant du segment ST : étude retrospective portant sur 134 cas [Doctoral thesis]. Dakar: Université Cheikh Anta Diop. 2009.
12. Sène Fama. Prévalence et prise en charge des états d'hyperglycémie au cours des syndromes coronaires aigus : étude rétrospective à propos de 141 cas au service de cardiologie de l'Hôpital Général de Grand-Yoff [Doctoral thesis]. Dakar: Université Cheikh Anta Diop. 2018.
13. N'Guetta R, Yao H, Ekou A, et al. Prevalence and characteristics of acute coronary syndromes in a sub-Saharan Africa population. Ann Cardiol Angeiol (Paris). 2016; 65: 59-63.
14. Pessinaba S, Atti YDM, Yayehd K, et al. Les syndromes coronaires aigus: aspects épidémiologiques, cliniques, paracliniques et thérapeutiques au CHU Campus de Lomé, Togo. Médecine et Santé Tropicales. 2018; 28: 285-288.

15. Ba H, Yahia F, Wade A, et al. Quality of management of acute coronary syndrome at the Nouakchott National Heart Center (Mauritania). Tunis Med. 2019; 97: 1383-1388.
16. Puymirat E, Simon T, Cayla G, et al. Acute Myocardial Infarction: Changes in Patient Characteristics, Management, and 6-Month Outcomes Over a Period of 20 Years in the FAST-MI Program (French Registry of Acute ST-Elevation or Non-ST-Elevation Myocardial Infarction) 1995 to 2015. Circulation. 2017; 136: 1908-1919.
17. Schamroth C. ACCESS South Africa investigators. Management of acute coronary syndrome in South Africa: insights from the ACCESS (Acute Coronary Events - a Multinational Survey of Current Management Strategies) registry. Cardiovasc J Afraoût. 2012; 23: 365-370.
18. Bahiru E, Temu T, Gitura B, et al. Presentation, management and outcomes of acute coronary syndrome: a registry study from Kenyatta National Hospital in Nairobi, Kenya. Cardiovasc J Afr. 2018; 29: 225-230.
19. Chioncel O, Mebazaa A, Harjola VP, et al. Clinical phenotypes and outcome of patients hospitalized for acute heart failure: the ESC Heart Failure Long-Term Registry. Eur J Heart Fail. 2017; 19: 1242-1254.
20. Zeymer U, Bueno H, Granger CB, et al. Acute Cardiovascular Care Association position statement for the diagnosis and treatment of patients with acute myocardial infarction complicated by cardiogenic shock: A document of the Acute Cardiovascular Care Association of the European Society of Cardiology. Eur Heart J Acute Cardiovasc Care. 2020; 9: 183-197.