

# Clinical Presentation, Risk Factor, and Outcomes of Acute Coronary Syndrome in Women at an Urban Referral Center in Dakar, Senegal



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## ABSTRACT

**Background:** Cardiovascular disease is on the rise in Sub-Saharan countries. Recently, consistent studies have reported sex differences in the epidemiology of acute coronary syndrome (ACS). Although, data on the incidence of ACS in Sub-Saharan countries are not rare, few focused closely on women.

**Objectives:** The purpose of this study was to examine risk factors, clinical presentations, and management strategies in women with ACS.

**Methods:** This was a retrospective study conducted at the Cardiology Department of Principal Hospital of Dakar over a period of 60 months (January 1, 2010, to December 31, 2014), in Dakar, Senegal. Medical records of female subjects admitted for ACS on the basis of anginal pain at rest, suggestive electrocardiographic changes, and elevated troponin I levels were included. We collected and analyzed the epidemiological, clinical, paraclinical, and evolutionary data of the patients.

**Results:** Hospital prevalence of ACS in women was 2.32%, meaning 38.1% of patients were admitted for ACS during the same period. The mean age of patients was  $68.8 \pm 9.5$  years; 52% of them were aged between 60 and 69 years. The risk factors in our patients were dominated by hypertension found (63.3%) and diabetes (54.1%). Active smoking was found in 6 patients (6.1%). One-half of patients had more than 1 risk factor. Chest pain was present in 94 patients (95.9%).

The average time delay before medical care was administered was  $53.9 \pm 18$  h. Thirty patients showed signs of left ventricular failure (Killip classes I and II). Electrocardiography revealed ACS with persistent ST-segment elevation in 53 patients (54.1%) and non-ST-segment elevation ACS in 45 patients (45.9%). Mean troponin I level was  $1.68 \pm 2.3$  ng/ml. Doppler echocardiography revealed impaired segmental kinetics in more than one-half of patients. The mean ventricular ejection fraction was  $43.8 \pm 10.1$ %. Thrombolysis was performed in 10 patients, accounting for 10.2% of patients with ST-segment elevation. The evolution during hospitalization after a mean hospital stay of  $9.5 \pm 3.7$  days was favorable in 66 patients (67.3%). Six deaths (6.1%) were recorded. Complications was dominated by pulmonary edema.

**Conclusions:** Our study confirms that ACS is not a “man’s only” disease in Sub-Saharan countries. The major concern is that there appeared to be continuing evidence of suboptimal treatment and intervention in women with ACS in current practice.

Cardiovascular disease (CVD) is the most common cause of death in women worldwide [1]. CVD is on the rise in Sub-Saharan countries that are currently undergoing rapid urbanization, industrialization, and lifestyle changes; in parallel with increasing life expectancies, the proportion of women with CVD is also increasing and constitutes an increased percentage of patients hospitalized for acute coronary syndrome (ACS). Recently, knowledge regarding sex differences in CVD has evolved. During the past 3 decades, numerous and remarkably consistent studies have reported sex differences in the epidemiology, clinical

manifestations, risk factors, diagnoses, outcomes, and prevention of ACS [2,3].

Furthermore, as women are being increasingly included in coronary artery disease trials, management strategies specific to women are emerging.

Current knowledge about the prevention of coronary heart disease and CVD is mainly derived from studies in European populations. However, the extent to which these findings apply worldwide is unknown.

Although, data on the incidence of ACS in Sub-Saharan countries are not rare [4,5], few focused closely on women.

The authors report no relationships that could be construed as a conflict of interest.

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## METHODS

This was a retrospective study conducted at the Cardiology Department of Principal Hospital of Dakar over a period of 60 months (January 1, 2010, to December 31, 2014), in Dakar, Senegal.

Dakar's Principal Hospital, located in Dakar, is a public health establishment with a special status open to public service and is, according to its motto, a reference hospital of the subregion, with all the necessary resources to function. It was originally a colonial hospital, and since 1971, it has become an instructional hospital of the Senegal Army. Its environment is marked by an increase in noninfectious pathologies, in particular degenerative and cardiovascular. This increase is explained by the very important urban development of the city of Dakar, which hosts nearly one-third of the country's population. At the time of this study, a cardiac catheterization unit was not available.

After approval by the Ethics Committee of the Ministry of Health and Social Welfare, Senegal, medical records of adult female subjects over a 5-year period admitted for ACS on the basis of anginal pain at rest, which is suggestive of electrocardiographic changes and elevated troponin I levels, were included. Patients with stable angina and those with semirecent or sequel of coronary syndrome were excluded from the study.

We studied data on age, past history including history of diabetes, hypertension, smoking, alcoholism, sedentarism (<30 min or more of moderate intensity physical activity on most days of the week), obesity; family history of coronary heart disease at a young age (before 55 years in men and 65 years in women); use of estrogen-progestin contraceptives; stable angina; and stress.

We sought the presence of chest pain, dyspnea, and gastrointestinal symptoms. We also noted the time delay before admission, the management administered, and the

vital parameters (blood pressure, heart rate, respiratory rate, temperature, body mass index).

All patients had a complete physical examination and a laboratory assessment. Troponin I assay was done using Architect STAT chemiluminescent microparticle immunoassay (Abbott, Lake Bluff, IL, USA). The other tests included blood glucose level on admission, total cholesterol and its fractions, and triglycerides. On the electrocardiograms, we looked for subepicardial or subendocardial lesions, subepicardial or subendocardial ischemia, abnormal Q waves, and rhythm and conduction abnormalities. We also looked for signs of venous stasis on the chest x-ray and evaluated, using Doppler echocardiography (which was performed during the first 24 h of admission), the left ventricle wall motion, left ventricular ejection fraction using the Simpson biplanar method, and the presence of intracavitary thrombus. Treatment modalities were evaluated as well as evolution during hospitalization.

We also compared mortality in women versus men in the basis of a parallel conducted study of ACS among men in the same hospital.

The studied parameters were entered into an electronic questionnaire using Epi Info version 3.3.5 of the World Health Organization (Geneva, Switzerland). Data analysis was performed using SPSS 15.0 (Statistical Package for Social Sciences, IBM, Armonk, NY, USA). Quantitative data were expressed as mean  $\pm$  SD and data analyses were performed using chi-square and Fischer exact tests.

## RESULTS

Table 1 summarizes the patient demographics.

Hospital prevalence of ACS in women was 2.32% (98 of 4,220 total medical patients), meaning 38.1% (98 of 257) of patients were admitted for ACS during the same period.

From 2010 to 2014, there was an overall rate increase of admissions for ACS in both women and men. The mean age of patients was  $68.8 \pm 9.5$  years with a range of 44 to 93 years. Fifty-one patients (52%) were aged between 60 and 69 years.

**TABLE 1.** Patient demographics

	Total	ST+	ST-
Study population	N = 98	53 (54.1)	45 (45.9)
Mean age	68.8 $\pm$ 9.5 yrs	65.3 $\pm$ 7 yrs	70 $\pm$ 6.5 yrs
<b>Risk factors</b>			
Hypertension	62 (63.3)	42 (79.2)	20 (44.4)
Diabetes	53 (54.1)	40 (75.4)	13 (28.9)
Dyslipidemia	26 (26.5)	16 (30.2)	10 (23.2)
Obesity	33 (33.7)	18 (33.9)	15 (34.9)
Tobacco smoking	6 (6.1)	5 (9.4)	1 (2.3)
Heredity	10 (10.2)	4 (7.5)	6 (13.9)
Stress	12 (12.2)	7 (13.2)	5 (11.6)

Values are n (%) and mean  $\pm$  SD, unless otherwise indicated.  
ST+, ST-segment elevation; ST-, non-ST-segment elevation.

**TABLE 2.** Complications encountered

Complications	
Congestive heart failure	5 (5.1)
Pulmonary edema	21 (21.42)
Cardiac arrhythmias	3 (3.06)
Atrial flutter	1 (1.02)
Atrial premature beats	1 (1.02)
Ventricular fibrillation	1 (1.02)
Cardiac conduction troubles	4 (4.08)
Second-degree AV block	2 (2.04)
Complete AV block	2 (2.04)

Values are n (%).  
AV, atrioventricular.

The risk factors in our patients were dominated by hypertension found in 62 patients (63.3%) and diabetes found in 53 patients (54.1%). Active smoking was found in 6 patients (6.1%). One-half of patients had more than 1 risk factor.

Chest pain was present in 94 patients (95.9%). In 52.1% of cases, it was typical anginal pain. Vomiting was present in 28.6% of cases. The average time delay from onset symptoms to time of treatment was  $53.9 \pm 18$  h.

On admission, average systolic blood pressure was  $132.04 \pm 24.3$  mm Hg and diastolic blood pressure was  $83.4 \pm 11.5$  mm Hg. Average body mass index was  $26.1 \pm 3.4$  kg/m<sup>2</sup>. Obesity was found in 33 patients (33.7%). An abdominal obesity was found in 77.6% of patients according to the criteria of the International Diabetes Federation and in 52% according to the criteria of the National Cholesterol Education Program.

Systemic examination was strictly normal in 60 patients (61.2%). Thirty patients however showed signs of left ventricular failure (Killip classes I and II). Mean troponin I level found was  $1.68 \pm 2.3$  ng/ml, creatine phosphokinase and creatine phosphokinase myocardial band  $666.5 \pm 665.8$  UI/L and  $126.8 \pm 159.9$  UI/L, respectively. Average blood glucose level was  $1.15 \pm 0.49$  g/l. Mean total cholesterol, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol and, triglyceride were  $2.06 \pm 0.2$  g/l,  $0.91 \pm 0.2$  g/l,  $0.42 \pm 0.07$  g/l, and  $1.47 \pm 0.18$  g/l, respectively. Dyslipidemia was present in 26 patients (26.5%). Mean uricemia level was  $61.5 \pm 7.9$  g/l.

Electrocardiography revealed ACS with persistent ST-segment elevation in 53 patients (54.1%) and non-ST-segment elevation ACS in 45 patients (45.9%).

Topographically, the anterior and inferior territories were the most represented and found respectively in 67 patients (68.4%) and 24 patients (24.4%). We also noted 1 case of ventricular fibrillation and complete atrioventricular block in 1 patient. Doppler echocardiography revealed impaired segmental kinetics in more than one-half of patients. The mean ventricular ejection fraction was  $43.8 \pm 10.1$ %. Left ventricle enlargement was found in 44.9% of cases.

Concerning treatment, thrombolysis using streptokinase was performed in 10 patients, accounting for 10.2% of patients with ST-segment elevation. Low molecular weight heparin was used in 96 patients (98%), aspirin in 98 patients (100%), clopidogrel in 98 patients (100%), beta-blockers in 64 patients (65.3%), angiotensin-converting enzyme inhibitors in 98 patients (100%), statins in 97 patients (99%), and analgesics in 98 patients (100%).

The evolution during hospitalization after a mean hospital stay of  $9.5 \pm 3.7$  days was favorable in 66 patients (67.3%). Six deaths (6.1%) were recorded. Complications were dominated by pulmonary edema, which was found in 21.42% of cases (Table 2).

Most of the complications were seen in the ST-segment elevation subtype.

## DISCUSSION

In our study, the prevalence of ACS in women was 2.32% with an incidence of 38.1% on all patients with coronary heart disease hospitalized during the same period. Data on the incidence of ACS in women are rare in Africa. However, Mboup et al. [4], in a study realized in 2006 found an incidence of 5.7%.

In a French nationwide study from 2004 to 2014, Gabet et al. [6] found an incidence of ACS in women of 32.2%. This incidence was of 27% in the FAST-MI (French Registry on Acute ST-Elevation Myocardial Infarction) [7].

The increase in ACS hospitalizations in women observed in our study is in keeping with data from European and American published reports [6-8] and could be related to a concomitant rise in the prevalence of cardiovascular risk factors secondary to an overall lifestyle changes.

However, reliable data on the evolution of risk factors are unfortunately lacking in Africa.

The mean age of our patients was 68.8 years with a greatest incidence of ACS in those aged 60 to 69 years old. This is close to what is found in African published reports [4].

Although, the mean age on the occurrence of ACS in women is still high in France, analyses of mean annual trends by age group from 2004 to 2014 showed a significant increase in the rate of patients hospitalized for ACS in women aged between 45 and 64 years old. The greatest increase was observed among those aged 45 to 54 years old (+1.7% per year) [6].

This increase in young women is likely related to a concomitant rise in the prevalence of cardiovascular risk factors, particularly smoking. In a 2014 French national survey estimating health characteristics in a representative sample of the French population, the prevalence of regular tobacco smoking increased considerably in women aged 45 to 74 years from 2005 to 2014 and doubled in the 55 to 64 years age group [9].

As emphasized in our work, this rate (6.1%) seems less important in Africa where there are strong levels of moral condemnation and social rejection of women smoking.

Hypertension was found to be the main risk factor and is often found in the occurrence of coronary events in women [7,10-12]. This is reflected in our work where hypertension is found in 63.3% of cases.

Hypertension has long been established as a strong, independent, etiologically significant risk factor for CVD. Obesity and diabetes are the next most important risk factors in men and women, but their relative effect varies in different regions of the world. In fact, the present study shows that the 3 most important risk factors in Sub-Saharan women are hypertension, diabetes, and obesity.

In the present study, obesity was found in 33.7% of cases. One possible reason is different dietary habits, especially in Sub-Saharan women with high-fat diet and sedentary lifestyle and obesity in black women and men has something to do with perceptions of beauty and attractiveness. There is a powerful anecdotal evidence that obesity signals wealth, beauty, influence, and power.

Clinically, the picture of ACS is dominated by pain in both men and women [4,7].

However, atypical symptoms are more frequent in women than in men [13,14] as is the case in our study where atypical symptoms were found in 47.9% of cases. Regarding the type of ACS diagnoses at presentation, the proportion of women with ST-segment elevation myocardial infarction (STEMI) was higher than that with non-STEMI (54.1% vs. 45.9%) whereas it was 56.6% versus 43.4% in men, respectively. It seems that women are less likely than men are to present with STEMI. The results from other trials concurred with this finding [15-17].

Diagnosis and risk assessment of coronary artery disease in women has traditionally been more difficult than in men. The sensitivity and specificity of stress testing is lower in women [18,19].

Cardiac biomarkers play an important role in the risk stratification and choice of treatment strategies for patients with ACS. Although not an entirely consistent finding, prior studies have shown that women were less likely to have biomarker evidence of myocyte necrosis, elevated creatine kinase-myocardial band, or troponins, but they were more likely to have elevations in newer markers used for risk stratification in ACS: high sensitivity C-reactive protein and B-type natriuretic peptide [19].

In our study, mean troponin I level found was  $1.68 \pm 2.3$  ng/ml.

Atypical presentation and low elevations in biomarkers were caused by long time delay before medical care.

Many studies have shown that women with ACS are less likely to undergo cardiac catheterization, as well as to receive timely reperfusion therapy [16,20,21]. The impact of thrombolytic therapy on mortality with a time-dependent effect has been reported by several studies [22-24]. It is now clear that thrombolysis can significantly reduce mortality of patients with ACS. In our work, no patients underwent cardiac catheterization, and streptokinase, being the only available thrombolytic in our hospitals, was used in 10.2% of patients admitted with an ST-segment elevation

ACS. The reasons for the low use of thrombolytics in this study were due to many factors including low awareness level of the population about ACS, poor transport and communication network to reach referral centers, lack of available electrocardiography in health centers that are located close to patients, delayed referral from health centers of suspected cases, and inability to meet the high cost of thrombolytic treatment. In the hospital where this study was performed, patients benefit from government help and pay out pocket for 20% of all charges, but this help does not include thrombolytic treatment.

Mortality in our study was of 6.1%. This rate is bringing our numbers in the range of the European and American publications [8,25,26]. There are conflicting evidence and unconvincing explanations regarding the effect of sex on mortality following ACS. Generally, unadjusted comparisons of mortality after ACS have shown that women have worse outcomes than men do.

In the NCVD-ACS (National CardioVascular Disease Database - Acute Coronary Syndrome) registry [27], women with STEMI had higher unadjusted in-hospital mortalities than men did. However, after adjusting for differences in age and other covariates, the STEMI group's in-hospital mortality odds ratio was not significantly different between women and men (adjusted odds ratio: 1.06; 95% confidence interval: 0.67–1.70; p value <0.769). In our study there was no difference in mortality between women and men in the same period.

In contrast, many studies on Western, Middle Eastern, and Asian patients found that women had a significantly higher rate of in-hospital mortality even after adjusting for age and other comorbidities [20,28,29]. Nevertheless, other researchers found that the sex difference in ACS mortality was dependent on the clinical presentation and severity of angiographically documented disease [30,31]. Some studies have suggested a link to the less aggressive hospital care of women, including the underuse of reperfusion, as an explanation for their increased mortality [30,31]. It is possible that other factors, including ethnicity, culture, psychosocial, educational, and socio-economic statuses contribute to the sex differences in ACS mortality.

### Study Limitation

This study is not representative of Senegal where 50% of the population are rural and about 30% are living in poverty.

### CONCLUSIONS

Our study confirms that ACS is not a “man’s only” disease in Sub-Saharan countries.

The major concern is that there appeared to be continuing evidence of suboptimal treatment and intervention in women with ACS in current practice. Though further research is needed to fully understand the reasons for the sex difference in ACS, there is a need to improve

primary vascular prevention in women, particularly considering that the main risk factors are modifiable.

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