

Acute Coronary Syndrome in Young Patients (≤ 45 Years): A Report of 82 Cases at the Renaissance University Hospital Center in N'Djamena, Chad

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Abstract

Introduction: Although acute coronary syndrome (ACS) occurs primarily in patients over 50 years of age, younger patients can also be affected. The objective of this study was to determine the epidemiological, clinical, paraclinical, therapeutic, and prognostic characteristics of acute coronary syndrome in young patients (≤ 45 years) at the Renaissance University Hospital Center in N'Djamena, Chad. **Patients and Methods:** This was a descriptive study with retrospective data collection conducted in the cardiology department of the Renaissance University Hospital Center over a period of 7 years, including all patient records of individuals aged 45 years or younger hospitalized for ACS. The variables studied were sociodemographic, clinical and paraclinical. **Results:** There were 82 patients that were included in this study, of whom 63 were men (male-to-female ratio of 3.3). The mean age was 39.4 ± 4.3 years. The main cardiovascular risk factor was diabetes (27%, $n = 22$). Acute chest pain was the main symptom for admission (95.1%, $n = 78$). The mean time for admission was 31.6 ± 29.4 hours. On the electrocardiogram, 79% of patients ($n = 65$) had an acute coronary syndrome (ACS) with ST-segment elevation myocardial infarction (STEMI), where 43.1% of patients ($n = 28$) had it predominantly localized to the anterior septal territory. Echocardiography revealed a reduced left ventricular ejection fraction in nearly one-third of cases (30.5%, $n = 25$). The 40.2% of patients ($n = 33$) received thrombolysis. The mean hospital stay was 6.8 ± 3.6 days, and the in-hospital mortality rate was 7.3% ($n = 6$). **Conclusion:** This study shows that ACS also affects young indi-

viduals in our region. Patients with ACS are predominantly male and have cardiovascular risk factors. They are most often admitted late, and the revascularization rate is low.

Keywords

ACS, Young Patients, N'Djamena, Chad

1. Introduction

Premature coronary artery disease is defined as coronary obstruction of atherosclerotic origin leading to exertional angina or unstable angina, the occurrence of an acute coronary syndrome in adults aged 45 years or younger [1]. Acute coronary syndrome constitutes to be a major public health challenge. Although myocardial infarction in young adults is less common, its incidence is steadily increasing [2] [3]. Its prevalence is estimated to be between 2% and 6% of all myocardial infarctions in the literature [4] [5]. The main cardiovascular risk factors for coronary artery disease are obesity, hypertension, diabetes, smoking, and dyslipidemia. In sub-Saharan Africa, few epidemiological data have been reported in this population, particularly in Chad. This is why we had conducted this study, with the objective to determine the epidemiological, clinical, paraclinical, therapeutic, and prognostic characteristics of acute coronary syndrome in young patients.

2. Patients and Methods

This was a descriptive study with retrospective data collection conducted in the cardiology department of the Renaissance University Hospital Center in N'Djamena, Chad, over a period of 7 years, from January 1st, 2019 to December 31st 2025.

We consecutively included the records of all patients aged 45 years or younger admitted for acute coronary syndrome, based on anginal pain and electrocardiographic changes, with or without troponin elevation. All patients had undergone an 18-lead electrocardiogram (ECG), a cardiac ultrasound, and a biological assessment (complete blood count, serum creatinine, blood glucose, troponin, cholesterol, triglyceride, prothrombin time, activated partial thromboplastin time, blood ionogram, C-reactive protein and uric acid levels). Incomplete and/or unusable files were excluded.

2.1. Variables Studied

Sociodemographic: Age, sex, occupation, residence, cardiovascular risk factors (hypertension, diabetes, smoking, obesity, dyslipidemia, consumption family history of heart disease, kidney failure), cardiovascular disease (stroke, myocardial infarction, chronic kidney disease with a glomerular filtration rate < 60 ml/min/1.73m²).

Clinical: Time to admission (time elapsed between the onset of symptoms and consultation), symptoms (chest pain, dyspnea, palpitations, syncope, epigastric pain, nausea, vomiting), signs of shock, signs of heart failure (crackles, acute pulmonary edema, lower limb edema, hepatojugular reflux, spontaneous jugular venous distension, hepatomegaly).

Electrocardiographic findings: Rhythm or conduction disturbances, ST segment and T wave changes.

Echocardiographic findings: Dilation of the cardiac chambers, wall hypertrophy, left ventricular (LV) diastolic dysfunction, segmental wall motion abnormalities (hyperkinesis, hypokinesis, akinesis), LV systolic dysfunction ($ESR \leq 40\%$), pulmonary arterial hypertension and pericardial effusion. The echocardiographic criteria are those of the American Society of Echocardiography and the European Association for Cardiovascular Imaging [6].

Therapeutic and evolutionary factors: Medications used (antithrombotic, thrombolytic, beta-blocker, calcium channel blocker, ACE inhibitor, angiotensin II receptor antagonist, statins, antiarrhythmic, nitrates, analgesics), mean hospital stay, and in-hospital complications.

2.2. Operational Definitions

ST-segment elevation myocardial infarction (STEMI): persistent ST-segment elevation of ≥ 1 mm in limb leads and ≥ 2 mm in precordial leads in at least two contiguous leads, or new left bundle branch block.

Non-ST-segment elevation myocardial infarction (NSTEMI): ST-segment depression ≥ 0.5 mm in at least two contiguous leads and/or T-wave inversion, or a normal electrocardiogram with elevated troponins.

Unstable angina: same criteria as NSTEMI but without elevated troponins.

Diabetes: fasting venous blood glucose ≥ 1.26 g/L (7 mmol/L) measured on two occasions, or blood glucose > 1.26 g/L at any time of day, or glycated hemoglobin (HbA1c) $\geq 6.5\%$.

Hypertension is defined as a persistent increase in blood pressure—measured in the clinical setting—with systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg.

Obesity: Body Mass Index (BMI) ≥ 30 kg/m².

Dyslipidemia: LDL cholesterol ≥ 1.6 g/L, HDL cholesterol < 0.4 g/L, triglycerides > 1.5 g/L.

Renal insufficiency: glomerular filtration rate (GFR) < 60 mL/min.

Active smoking: current smoker or having quit smoking less than three years ago. Passive smoking: any exposure to tobacco smoke in the immediate home or work environment.

Criteria for successful thrombolysis: reduction or complete resolution of chest pain, reduction in ST-segment elevation of $\geq 50\%$, and occurrence of rhythm disturbances (such as ventricular extrasystoles, nonsustained ventricular tachycardia, or accelerated idioventricular rhythm).

Left ventricular ejection fraction categories: reduced ($\leq 40\%$), mildly reduced (41% to 49%), and preserved ($\geq 50\%$).

These data are derived from measurements taken at admission.

2.3. Statistical Analysis

Data was entered using Microsoft Excel 2010 and Microsoft Word 2010, and analyzed using SPSS 18.0. Quantitative variables were expressed as means, while qualitative variables were described as percentages. The results were presented in tables.

2.4. Declaration of Ethics

This study was authorized by the General Management of the La Renaissance University Hospital under reference number 942/MSSP/SE/SG/CHU-R/DG/2026. Data were handled confidentially in accordance with the requirements of the Declaration of Helsinki II.

3. Results

In total, we included 82 patient records. Among them were 63 men and 19 women, for a male-to-female ratio of 3.3. The mean age was 39.4 ± 4.3 years, with a range of 27 to 45 years. The main cardiovascular risk factors were diabetes (27%, $n = 22$), obesity (21%, $n = 17$) and smoking (18.3%, $n = 15$). The 36.5% of patients ($n = 30$) had at least two cardiovascular risk factors (**Table 1**).

Table 1. Patient characteristics.

Settings	Number (n)	Percentage (%)
Sex:		
Men	63	77
Women	19	23
Age (years):		
Means	39.4	
<30	2	2.4
30 - 34	6	7.3
35 - 39	23	28
40 - 44	32	39
45	19	23.2
Profession:		
Civil servant	41	50
Farmer	7	8.5
Shopkeeper	16	19.5

Continued

Housewife	18	22
Residence:		
Urban	75	91.5
Rural	7	8.5
Cardiovascular risk factors:		
Hypertension	12	14.6
Diabetes	22	27
Dyslipidemia	11	13.4
Active smoking	15	18.3
Obesity	17	21
Kidney failure	4	5

Clinically, acute chest pain was the main symptom for admission, accounting for 95.1% of cases (n = 78), followed by dyspnea in 26% of cases (n = 21) and palpitations in 20.1% of cases (n = 17). One patient (1.2%) presented with brachial monoplegia that occurred 48 hours after typical chest pain. The mean time from symptom onset to admission was 31.6 ± 29.4 hours, with a range of 1 to 96 hours. There were 9 patients (11%) that presented with acute pulmonary edema, and 6 patients (7.3%) showed signs of cardiogenic shock.

On electrocardiogram (ECG), 79% of patients (n = 65) had ST-segment elevation myocardial infarction (STEMI), which was localized to the anterior septal territory in 43.1% of cases (n = 28) and to an extended anterior territory in 18.5% of cases (n = 12) (**Table 2**). A non-ST-segment elevation myocardial infarction (NSTEMI) was present in 21% of cases (n = 17). Troponin levels were elevated in all patients.

Table 2. Electrocardiographic localizations of ST-Segment Elevation Myocardial Infarction (STEMI).

Territory	Number (n)	Percentage (%)
Anteroseptal	28	43.1
Extended Anterior	12	18.5
Circumflex	5	8
Inferior	9	14
Inferolateral-basal	7	11
Lateral	4	6.1

Echocardiography performed on admission showed that the left ventricular ejection fraction was preserved in the majority of cases (57.3%, n = 47), moderately reduced in 12.2% of cases (n = 10), and reduced in 30.5% of cases (n = 25).

There were 4 cases (5%) of moderate mitral regurgitation.

Regarding treatment, out of the 82 patients, 33 patients (40.2%) underwent thrombolysis. Thrombolysis was successful in 26/33 patients (79%). The molecules used were alteplase (67%, $n = 22$), streptokinase (21.2%, $n = 7$), and tenecteplase (12.1%, $n = 4$). All patients (100%) received concomitant medication including a beta-blocker, antiplatelet agents (aspirin and clopidogrel), heparin and a statin. Angiotensin-converting enzyme (ACE) inhibitors and angiotensin II receptor blockers were administered to 73 patients (89%).

Regarding outcomes, the mean hospital stay was 6.8 ± 3.6 days, and the in-hospital mortality rate was 7.3% ($n = 6$).

Coronary angiography was performed remotely overseas in 21/82 patients (25.6%) after a mean delay of 26 days ± 16.3 . Among these patients, 16/21 patients (76.2%) underwent angioplasty with stent placement, and 1 patient (5%) underwent coronary artery bypass graft surgery with triple-vessel disease. Medical treatment alone was chosen for the remaining 4/21 patients (19%).

4. Discussion

Acute Coronary Syndrome (ACS) in young patients (≤ 45 years) is a critical medical reality, representing a spectrum of clinical conditions that demand immediate emergency evaluation and intervention. ACS in young adults is a reality in our setting. Consequently, the incidence of coronary artery disease in young adults is on the rise [2] [7]. Indeed, Ali *et al.* in N'Djamena found that ACS cases in individuals under 45 years of age represented 4.1% of cases between 2014 and 2018 [8]. This increasing trend is thought to be linked to the epidemiological transition we are experiencing in our countries, particularly with changes in dietary habits and sedentary lifestyles.

In this study, the patients were predominantly male (male-to-female ratio of 3.3). This male predominance is reported by several studies concerning myocardial infarction in young adults [2] [9] [10]. In the 2015 FAST-MI survey, 85% of patients under 45 years of age were men [11]. This could be explained by poor behavioral habits (smoking, alcohol consumption, sedentary lifestyle, etc.) which are more prevalent among young adult males. The mean age was 39.4 ± 5.3 years. This result is comparable to that found in Tunisia, which was 39.5 ± 5.5 years [10], despite the difference in the age limits used in these studies (45 years versus 40 years). It should be noted that there is no consensus on the definition of acute coronary syndrome (ACS) in young adults. According to the authors, an age under 40, 45, or even 50 years has been considered.

The most prevalent cardiovascular risk factors in our study population were diabetes (27%), obesity (21%), and smoking (18.3%). These are, of course, major risk factors for atherosclerosis, which play a significant role in the instability and rupture of atherosclerotic plaques. In Mediterranean countries, the main cardiovascular risk factor is smoking, in France, it accounts for 77% of patients under 45 years of age in the 2015 FAST-MI survey [11], and 83.78% of patients in Tunisia

[12]. Patients with a premature coronary event in North African and Middle Eastern countries are characterized by a lower prevalence of diabetes, hypertension, and dyslipidemia [13]. In young subjects, other non-traditional risk factors, such as substance abuse, thrombophilia, coronary anomalies, immune diseases and psychosocial stress, contribute uniquely to the risk profile of coronary heart disease in young adults [14].

Patients were symptomatic in almost all cases, with acute chest pain being the most prevalent (95.1%). This finding corroborates data from the literature [15]. The mean time from symptom onset to admission was late (31.6 ± 29.4 hours). This could be explained by a lack of awareness of coronary artery disease in the general population, who initially consider gastric irritation in cases of chest pain and only seek medical attention if the pain persists despite treatment with a gastric protectant. We noted on the ECG that ST-segment elevation myocardial infarction (STEMI) was the most frequent finding (79%). This finding was also reported by Zasada *et al.* [16]. Unlike young african individuals, non-ST-segment elevation myocardial infarction (NSTEMI) was predominant in young caucasians [17]. The anterior territory was most frequently affected, as reported in the literature. Indeed, this most often involves single-vessel disease with preferential involvement of the left anterior descending artery [16] [18] [19].

Therapeutic management was primarily medical. The thrombolysis rate was relatively low (40.2%), especially given the lack of other revascularization techniques, particularly coronary angioplasty, in our setting. This is due to the late admission time or, sometimes, the limited availability of thrombolytics, which are also very expensive.

In our patients, we observed complications, including heart failure with a reduced left ventricular ejection fraction (30.5%), cases of moderate mitral regurgitation (5%), and in-hospital deaths (7.3%). This may be a consequence of the patients' late presentation and the insufficient availability of revascularization options, particularly coronary angioplasty.

5. Limitations

Despite its small sample size, single-center design, and retrospective nature, this study allowed us to identify the clinical, therapeutic, and prognostic characteristics of acute coronary syndrome (ACS) in young patients at the Renaissance University Hospital Center in N'Djamena, Chad. To reduce the impact of ACS in our context, our country should focus on screening and awareness campaigns, management of cardiovascular risk factors, and improvement of the technical infrastructure, particularly the installation of cardiac catheterization labs in our hospitals. The challenge regarding acute coronary syndrome in young individuals is primarily etiological, often involving unusual causes such as MINOCA (myocardial infarction with non-obstructive coronary arteries) including the rupture or erosion of a non-obstructive atherosclerotic plaque, spontaneous coronary artery dissection, coronary spasm (vasospasm), coronary or hematological embolism, or

conditions that mimic ACS (such as myocarditis or Takotsubo cardiomyopathy). This underscores the importance of performing an urgent coronary angiogram, potentially supplemented by intracoronary imaging or cardiac MRI (magnetic resonance imaging).

6. Conclusion

This study shows that ACS also affects young individuals in our region. The patients affected are predominantly male with cardiovascular risk factors. They are most often admitted late, with ST-segment elevation myocardial infarction (STEMI) in nearly 8 out of 10 patients, and also with a low revascularization rate. Due to difficulties related to access to health care, delayed presentation, and the lack of a coronary angiography suite. This increases the risk of complications and death.

Author Contributions

Adam Ahamat Ali: Conceptualization, Methodology, Formal analysis, Writing—original draft, Writing—review & editing; Doune Narcisse: Conceptualization, Methodology, Formal analysis, Writing—original draft, Writing—review & editing; Brahim Nassour Aware: Data collection, Formal analysis; Mbaidedjim Sylvain: Writing—original draft, Writing—review & editing; Oumar Mahamat-Azaki: Writing—original draft, Writing—review & editing; Yusra Aboulbachar: Writing—original draft, Writing—review & editing.

Conflicts of Interest

The authors declare no conflict of interest.

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