

## Research Article

# Basic Clinical Characteristics and Hospital Outcomes of Acute Coronary Syndrome Patients - Sudan

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### Abstract

**Background:** There are Variation in the presentation of the acute coronary syndrome between countries. The present study aimed to investigate the basic clinical characteristics and in-hospital outcomes among acute coronary syndrome patients in the Sudan. **Material and Methods:** A cross-sectional comparative study conducted among 202 consecutive acute coronary syndrome patients at a reference coronary care unit in Omdurman Teaching Hospital between July 2014 and August 2015. Participants signed a written informed consent, and then a case report form was filled. Information collected include vascular risk factors, vital signs, echocardiographic findings, and in Hospital complications. The local ethical committee approved the research, and the chi-square test was used to compare ST-segment Elevation (STSEACS) and None ST-Segment Elevation Acute coronary syndrome (NSTSEACS). **Results:** (out of 202 women (53.75%) in (NSEACS)  $P = 0.009$ ). Prior myocardial infarction, hypertension, diabetes mellitus, and, smoking were evident in 19.8%. 53.%, 30.2%, and 16.6% of acute coronary syndrome respectively, 97% of patients presented with chest pain, 54% presented to the hospital after 24 hours. Hypotension, heart failure, low ejection fraction, and in-hospital complications were more in (STSEACS) than (NSTSEACS), while (NSTEACS) patients received less Thrombolysis and Percutaneous coronary angioplasty  $P$ -value  $< 0.05$ . **Conclusions:** Acute coronary syndrome patients were younger and had more complications than others in the West. ST-Segment Elevation Myocardial Infarction Patients are more likely to develop in-hospital complications and to receive reperfusion therapy. The limitation of the study is the lack of follow-up information after discharge.

**Keywords:** Acute coronary syndrome, primary, hospital outcomes

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## الملخص

**الخلفية:** هناك تباين في أعراض متلازمة الشريان التاجي الحادة بين البلدان. هدفت الدراسة الحالية إلى التعرف على الخصائص السريرية الأساسية والنتائج داخل المستشفى بين مرضى متلازمة الشريان التاجي الحادة في السودان.

**المواد والطرق:** دراسة مقطعية أجريت بين ٢٠٢ مريضا متتابعاً من مرضى متلازمة الشريان التاجي الحادة في الوحدة المرجعية للرعاية التاجية في مستشفى أم درمان التعليمي بين يوليو / تموز ٢٠١٤ وأغسطس / آب ٢٠١٥. ووقع المشاركون موافقة خطية مستنيرة، ثم تم ملء نموذج تقرير الحالة. وشملت المعلومات التي تم جمعها عوامل الخطر الوعائية، والعلامات الحيوية، ونتائج تخطيط صدى القلب، والمضاعفات في المستشفى بعد موافقة اللجنة الأخلاقية المحلية على البحث. وتم استخدام اختبار كاي سكوير لمقارنة النوعين من التغييرات في تخطيط القلب الكهربائي من متلازمة الشريان التاجي الحادة (ارتفاع وصلة س تي وعدم ارتفاع وصلة س تي).

**النتائج:** من أصل ٢٠٢ كانت نسبة الذكور (٥٧,٥٪). (٥٣,٧٥٪) من النساء يمتلزمة الشريان التاجي الحادة مع عدم ارتفاع وصلة س تي  $P = ٠,٠٠٩$ . تاريخ سابق لاحتشاء عضلة القلب وارتفاع ضغط الدم وداء السكري، والتدخين كانت واضحة في ١٩,٨٪، ٣٠,٢٪، و ١٦,٦٪ من متلازمة الشريان التاجي الحادة على التوالي، و ٩٧٪ من المرضى الذين يعانون من آلام في الصدر، و ٥٤٪ قدمت إلى المستشفى بعد ٢٤ ساعة. وكان انخفاض ضغط الدم، وفشل القلب، وجزء الطرد المنخفض، والمضاعفات داخل المستشفى أكثر في متلازمة الشريان التاجي الحادة مع ارتفاع وصلة س تي من تلك التي بدون ارتفاع لوصلة س تي، في حين تلقى المرضى بمتلازمة الشريان التاجي الحادة بدون ارتفاع لوصلة س تي نسبة أقل العلاجات الحالة للجلطات الجلطات والدعامات التاجية عن طريق الجلد  $P > ٠,٠٥$ .

**الاستنتاجات:** كان مرضى متلازمة الشريان التاجي الحادة أصغر سناً وأكثر تعقيداً من غيرهم في الغرب. مرضى متلازمة الشريان التاجي الحادة مع ارتفاع وصلة س تي أكثر عرضة لتطويع المضاعفات في المستشفى والحصول على علاج إعادة التروية. الحد من الدراسة هو عدم وجود معلومات المتابعة بعد الخروج من المستشفى.

## 1. Introduction

Irrespective of the income classification, ischemic heart disease nowadays is the world leading cause of adult and old age morbidity and mortality, representing 12.7% of global mortalities, the burden is involving all countries and communities [1].

Compared to male, many studies showed that females have a higher incidence of non-ST-segment elevation myocardial infarction than unstable angina or ST-segment elevation myocardial infarction, while males had a higher incidence of ST-segment elevation myocardial infarction (STEMI) than non-ST-segment elevation myocardial infarction (NSTEMI) or unstable angina. Men affected by all variety of ischemic heart disease at a younger age than women, due to the higher incidence of risk factors and protective effect of estrogens [2, 3].

There has been a shift in the clinical presentation of acute coronary syndrome towards milder forms and unstable angina [4, 5]. Lower case fatalities in patients admitted with acute coronary syndrome had also been observed [6].

Differences in acute coronary syndrome presentation had been found not only between developed and developing countries but also between north-south areas of Western European countries [7, 8].

National socioeconomic characteristics in various countries, the severity of acute coronary syndrome, and the subsequent management are to blame as the primary causes of the differences in the clinical presentation and outcome in coronary syndrome [9–11].

Sudan is taking about 2% of the earth's surface with economic, social, and ethnic diversity. Furthermore cardiac care centers are lacking and mainly focused in the Capital of the country, there is poverty of staff trained in cardiac care, and transportation is either insufficient in outreaching underserved areas or overcrowded with marked traffic congestion in the major cities, thus, we conducted this research to study the pattern of acute coronary syndrome in Omdurman Teaching Hospital in Sudan to see whether the above-mentioned differences and barriers to coronary care affect the presentation and outcome of acute coronary syndrome patient.

## 2. Material and Methods

A cross-sectional descriptive longitudinal study was conducted at the coronary care unit in Omdurman Teaching Hospital during the period from July 2014 to August 2015. The acute coronary care unit is serving a vast area including Omdurman City and the adjacent Western regions. The study included 202 (125 males, and 87 females) consecutive patients with the diagnosis of the acute coronary syndrome. The patients (18 years and above) were approached in a ratio of 1:1 and severely ill patients and those who were unable to give their consent were excluded. The diagnosis of ST-Segment Elevation Myocardial Infarction (STEMI), unstable angina, None ST-Segment Elevation Myocardial Infarction (NSTEMI) was based on typical chest pain, electrocardiographic (ECG) changes, and elevated cardiac biomarkers following The American College of Cardiology Guidelines [13]. NSTEMI and unstable angina were collectively referred to as None ST-Segment Elevation Acute Coronary Syndrome (NSTEMACS).

All patients signed a written informed consent, then interviewed and examined by the assigned acute coronary care unit physician. A case report form was filled including Basic clinical and cardiovascular risk factors, (hypertension, diabetes mellitus, family history of myocardial infarction, and smoking). The presenting complaint, vital signs (pulse, blood pressure, respiratory rate) were recorded and followed. The ejection fraction (EF) has been registered by echocardiography, as was the intramural

thrombus. The ejection fraction (EF) was categorized to severe left ventricular (LV) dysfunction: (EF) < 30%, moderate LV dysfunction: EF = 30-40%, mild LV dysfunction: EF = 40-55%, and normal LV function: > 55% [2]. Treatment by thrombolytic therapy or Percutaneous coronary angioplasty (PCI) was recorded, patients were then followed for the development of complications (including arrhythmias, heart failure, cardiogenic shock, and death).

The following definitions were adopted for the purpose of this research; Diabetes mellitus: self-reported or being on oral hypoglycemic agents and/or insulin, hypertension: self-reported, on antihypertensive therapy, history of systolic blood pressure more than 140 mmHg or diastolic blood pressure more than 90 mmHg, current smoking: cigarette, cigar, pipe, or shisha smoking during the last year, family history of premature coronary artery disease: history of angina, myocardial infarction, or sudden cardiac death in first-degree relatives at age less than 65 years in females and less than 55 age in males, heart failure: shortness of breath on exertion and/or at rest, paroxysmal nocturnal dyspnea associated with clinical signs of pulmonary and/or peripheral edema requiring treatment with diuretic therapy, and cardiogenic shock: persistent hypotension unresponsive to fluid administration and requirement for intravenous inotropic therapy or insertion of intra-aortic balloon pump. Various parameters were then compared between STEMI and NSTEMACS.

The ethical committee of Omdurman Teaching Hospital approved the research and, the Statistical Package for Social Science (SPSS) version 20 was used for data analysis, the Chi-Square test was used to compare categorical data. The data were presented as ranges, percentages or mean  $\pm$  SD with a P-value < 0.05 considered significant. The primary objective of the research was to study the pattern of the acute coronary syndrome patients admitted to the coronary care unit in Omdurman Teaching Hospital, Sudan. The secondary objectives were to assess the basic clinical characteristics, symptoms at the presentation, the time the patients were presented to the Hospital, the mode of therapy received, and the complications that developed inside the Hospital. The research was self-funded and not supported by any organization.

### 3. Results

Out of two hundred and two acute coronary syndrome patients, 57.5% were males. Women dominance was evident in NSTEMACS (53.75 vs. 31.25) P-value = 0.009. Prior myocardial infarction, hypertension, diabetes mellitus, and, smoking were evident in 19.8% (P-value = 0.158), 53.% (P-value = 0.573), 30.2% (P-value = 0.762) and 16.6% (P-value = 0.180 respectively with no significant statistical difference between STEMI and NSTEMACS patients. The majority of patients presented with ischemic chest pain (96.8% in STEMI vs. 95.2 % NSTEMACS with no significant difference between the two

groups P-value = 0.778. It is interesting to show that: the majority (58%) of acute coronary syndrome patients presented to the hospital later than 24 hours with no significant difference between groups, P-value = 0.636. Table (1) illustrated the basic clinical characteristics of the acute coronary syndrome patients.

Table (2) depicted the hospital course of acute coronary syndrome patients in which tachycardia and irregular pulse were detected in 44.3%, and 23.7% of patients with no significant statistical difference between STEMI and NSTEMI (P-value = 0.120). Hypotension was more common among patient with STEMI (35.3% vs.16%) with statistical significant difference P-value = 0.012, as were low ejection fraction (71.8% vs, 53.7%) P-value = 0.009, and intraventricular thrombus (7.2% vs.3.7%) in STEMI and NSTEMI P-value = 0.357. A high significant statistical difference was found between STEMI and NSTEMI regarding reperfusion therapy: thrombolytic was given to 25% and 1.8% of the patient respectively, P-value < 0.001, while 15.6% and 5.6% of STEMI and NSTEMI underwent PCI respectively P-value = 0.023.

In-hospital complications developed in 68.7% of STEMI and 50.9% of NSTEMI patients with significant statistical difference P-value = 0.015

Arrhythmias were found in 27% of STEMI and 34% of NSTEMI; heart failure was evident in 51% and 47% of patients with STEMI and NSTEMI respectively. Cardiogenic shock developed in 11.4% of STEMI and 10.3 of NSTEMI while in hospital mortality was reported in 7.3% and 5.6% of patients with STEMI and NSTEMI respectively (Table3).

## 4. Discussion

The current study showed that acute coronary syndrome patients in Sudan were younger and had more complications than their Western counterparts. ST-Segment Elevation Myocardial Infarction Patients are more likely to develop in-hospital.

In the current study NSTEMI (52.5%) was commoner than STEMI in accordance with the previous studies [16]. The high rate of STEMI can be explained by the younger age of this sample that is less by more than a decade compared to developed countries; similar results had been observed in Gulf states and Malaysia [17].

In this study, NSTEMI was more common in females similarly El-Menyar et al., and Dey et al. reported the higher prevalence among women [18, 19].

Regarding coronary risk factors, hypertension was detected in 53.5% of acute coronary syndrome patients in agreement with AlHabib et al. [20] who published a study in Saudi Arabia and reported high blood pressure in 55.3% of acute coronary syndrome patients, but diabetes mellitus was almost double the rate of the present study that may be due to obesogenic diet and adoption of work involving inactivity in Saudi Arabia.

| Variable                    | Overall % | STEMI % | NSTEACS % | P-value | Odd ratio |
|-----------------------------|-----------|---------|-----------|---------|-----------|
| Sex                         |           |         |           |         |           |
| Males                       | 57.5      | 68.8    | 46.3      | 0.009   |           |
| Females                     | 42.5      | 31.2    | 53.7      |         |           |
| Prior myocardial infarction | 19.8      | 23.9    | 16        | 0.158   | 0.669     |
| Diabetes mellitus           | 30.2      | 31.2    | 29.2      | 0.762   | 0.936     |
| Hypertension                | 53.5      | 55.7    | 51        | 0.573   | 1.09      |
| Smoking                     | 16.6      | 18.7    | 14.5      | 0.18    |           |
| Ischemic chest pain         |           | 96.8    | 95.2      | 0.778   |           |
| Duration of pain            |           |         |           |         |           |
| <6 hours                    | 3         | 2.1     | 3.9       | 0.636   |           |
| 6-12 hours                  | 39        | 37.5    | 40.5      |         |           |
| >12 hours                   | 58        | 60.4    | 55.6      |         |           |

TABLE 1: Basic clinical characteristics of acute coronary syndrome patients.

The lower rates of smoking (16.6%), especially among females (1.2%), may be due to the conservative society in Sudan, higher rates were reported by Akram H. Al-Khadra [21] and Mohammed et al. [22] in Saudi Arabia.

In this study STEMI patients were more likely to have hypotension, low ejection fraction, and high in-hospital complications (35.4%, 71.8%, and 68.7% respectively as compared to NSTEMI counterparts (16%, 53.7%, and 50.9% respectively) P-values < 0.05), in agreement with study conducted in Western European countries and found lower rates of complication in NSTEMI as compared to STEMI [22].

In the current study only 3.5% of acute coronary syndrome patients arrived at hospital before 6 hours, this could be due to lack of knowledge about how dangerous is chest pain, shortage of life support health teams, and traffic congestion, furthermore 25% and 1.8% of STEMI and NSTEMI received thrombolytic therapy, and 15.6% and 5.6% of STEMI and NSTEMI received PCI respectively. The rates of thrombolysis and PCI were lower than the rates in Western European countries in [22] which thrombolysis and PCI were recorded in 20.8% and 53.3% respectively).

The delayed arrival at hospital and the subsequent management could explain the higher rates of complications in acute coronary syndrome patient (low ejection fraction in 62.6%, cardiogenic shock in 10.8%, and in-hospital death in 6.5%), AlHabib et al. [20]. in Saudi Arabia reported death in 3% and cardiogenic shock in 4.3% and were lower than our results.

| Character                 | Overall % | STEMI % n = 96 | NSTEMI % n = 106 | P-value | Odd ratio |
|---------------------------|-----------|----------------|------------------|---------|-----------|
| Tachycardia               | 44.3      | 48.1           | 40.5             | 0.102   |           |
| Irregular pulse           | 23.5      | 29.1           | 17.9             | 0.102   |           |
| Hypotension               | 25.7      | 35.4           | 16               | 0.012   |           |
| Thrombolysis              | 13.4      | 25             | 1.8              | 0       | 0.075     |
| PCI                       | 10.6      | 15.6           | 5.6              | 0.023   | 0.362     |
| Low ejection fraction     | 62.7      | 71.8           | 53.7             | 0.009   |           |
| Intraventricular thrombus | 5.5       | 7.2            | 3.7              | 0.357   | 0.518     |
| Hypertriglyceridemia      | 16.4      | 17.7           | 15.1             | 0.704   | 0.852     |
| Hypercholesterolemia      | 17.8      | 17.7           | 17.9             | 0.1     | 1.012     |
| Renal impairment          | 20.5      | 25             | 16               | 0.119   | 0.642     |
| In-hospital complications | 59.8      | 68.7           | 50.9             | 0.015   | 0.741     |

TABLE 2: Hospital course of acute coronary syndrome patients.

| Complication      | Overall % | STEMI % | NSTEMI % | P-value |
|-------------------|-----------|---------|----------|---------|
| Arrhythmias       | 30.5      | 27      | 34       | 0.31    |
| Heart failure     | 49        | 51      | 47       |         |
| Cardiogenic shock | 10.9      | 11.4    | 10.3     |         |
| Death             | 6.5       | 7.3     | 5.6      |         |

TABLE 3: In-hospital complications of acute coronary syndrome patients [1] complications and to receive reperfusion therapy.

## 5. Conclusion

This study presented a sample of acute coronary syndrome Sudanese patients with many unwanted features including the late presentation to hospital, reduced rates of reperfusion therapy and high in-hospital complications. Raising the awareness of the public about the seriousness of chest pain, recruitment and training of acute coronary care management providers, and the establishment of an effective basic life support network are needed to improve management and thus the outcome of acute coronary syndrome. Adherence to coronary care management guidelines is badly needed to avoid under treatment particularly of those with NSTEMACS patients. Larger multicenter studies are highly required to assess the causes of the delayed presentation to

the Hospital and the low rate of reperfusion therapy among patients with the acute coronary syndrome.

Limitation of this study is that it was conducted at a single tertiary care center so generalization cannot be insured, the relatively small sample of patients is also.

of note. We did not record the effects of drug therapy and followed patients for long-term complications, this calls for larger multi- center studies to assess the obstacles to an efficient coronary care program.

## 6. Ethical Approval

The ethical Committee of Omdurman Teaching Hospital approved the research.

## 7. Competing Interests

The authors declared that there is nothing to disclose in term of funding or any relationship or activity that interfere with the present study.

## 8. Availability of Data Material

The authors declare that all the data collected including the questionnaires, master sheet, and the statistical output are available.

## 9. Funding

The current study is self-funded by the researchers and not supported by anybody or organization.

## 10. Abbreviations and Symbols

**STSEACS:** ST-segment Elevation Acute Coronary Syndrome

**NSTEACS:** Non-ST-segment Elevation Acute Coronary Syndrome

**STEMI:** ST-segment elevation myocardial infarction

**NSTEMI:** Non-ST-segment elevation myocardial infarction

**ECG:** Electrocardiograph

**EF:** Ejection Fraction

**LV:** Left Ventricle

**PCI:** Percutaneous Coronary Angioplasty



**SPSS:** Statistical Package for Social Sciences

**SD:** Standard Deviation

**Bioethics:** All the participants signed a written informed consent after the approval clearance was obtained from Omdurman Teaching Hospital Ethical Committee.

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