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Research Article

Thrombolysis in ST-segment elevation acute coronary syndrome at Grand-Yoff General Hospital, Dakar, Senegal

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Abstract:

Introduction : Acute coronary syndrome with persistent ST-segment elevation (STEMI) is a major cardiovascular emergency. Its prognosis depends closely on the rapidity of myocardial reperfusion. When primary angioplasty is not available within the recommended timeframes, thrombolysis remains an essential strategy, particularly in resource-limited countries. The objectives of this study were to evaluate thrombolysis in STEMI in the Cardiology Department of Grand-Yoff General Hospital, Dakar, to describe the epidemiological, clinical and paraclinical characteristics of thrombolysed patients, and to analyse thrombolysis outcomes, complications and prognostic factors.

Methods : This was a retrospective, descriptive and analytical study conducted from 1 January 2021 to 31 December 2022 in the Cardiology Department of Grand-Yoff General Hospital. All patients admitted for STEMI during the study period who received thrombolytic therapy were included. Non-thrombolysed patients, as well as lost or unusable medical records, were not included. The diagnosis was based on clinical and electrocardiographic findings. The effectiveness of thrombolysis was assessed according to classical reperfusion criteria: relief of pain, regression of ST-segment elevation by at least 50%, and the possible presence of reperfusion arrhythmias. Data were analysed using Epi Info 7.2 and Excel 2016, with statistical significance set at $p<0.05$.

Results : During the study period, 1,158 patients were hospitalised, including 110 for STEMI, corresponding to a hospital prevalence of 9.49%. Among them, 76 patients received thrombolysis, giving a thrombolysis rate of 69.09%. Mean age was 57.98±12.99 years, with a range from 27 to 81 years. Men accounted for 72.37%, with a sex ratio of 2.61. The main cardiovascular risk factors were male sex (72.36%), risk-associated age (71.05%), smoking (42.11%), hypertension (38.16%), physical inactivity (26.32%) and diabetes (21.05%). Overall, 85.53% of patients had at least two cardiovascular risk factors. Mean admission delay was 5.43 hours. Typical anginal pain was present in 86.84% of cases. Echocardiography showed segmental wall motion abnormalities in 86.96% of patients, with a mean left ventricular ejection fraction of 49.58%. All patients received streptokinase. Mean thrombolysis delay was 6.03 hours. Successful thrombolysis was observed in 39.47%, while failure occurred in 60.53%. Haemorrhagic complications were found in 11.84%, with no haemorrhagic stroke. In-hospital mortality was 5.26%. Factors associated with mortality were Killip class IV, heart rate >100 beats/min and fasting blood glucose >3 g/L.

Conclusion : played a central role in the management of STEMI at Grand-Yoff General Hospital. However, late presentation and delayed thrombolysis were associated with a high failure rate. These findings highlight the need to strengthen reperfusion pathways, reduce prehospital delays and develop a pharmaco-invasive strategy adapted to the Senegalese context.

Key words: acute coronary syndrome; ST-segment elevation; thrombolysis; streptokinase; senegal

Introduction

Acute coronary syndrome with persistent ST-segment elevation (STEMI) is a major cardiovascular emergency, most often secondary to acute occlusion of a coronary artery by a thrombus developing on a ruptured or eroded atherosclerotic plaque [1–3]. It represents one of the most severe manifestations of ischaemic heart disease and remains associated with high morbidity and mortality despite diagnostic and therapeutic advances. The prognosis depends closely on the rapidity of myocardial reperfusion, as the duration of coronary occlusion determines the extent of myocardial necrosis and the risk of heart failure, arrhythmias and death [4–7].

The therapeutic strategy for STEMI is based on the earliest possible restoration of effective coronary blood flow. Primary angioplasty is the reference reperfusion strategy when it can be performed within the recommended timeframes by an experienced team [4,5]. However, in many resource-limited countries, continuous access to coronary angiography and primary angioplasty remains insufficient. In this context, thrombolysis remains an essential strategy, particularly when the expected delay to angioplasty exceeds guideline recommendations [6–8].

The effectiveness of fibrinolysis depends on several factors, including the pain-to-thrombolysis delay, the drug used, the infarct territory, the initial haemodynamic status, associated antithrombotic therapy and the possibility of a subsequent pharmaco-invasive strategy [9–14]. The earlier it is administered, the higher the likelihood of reperfusion. Conversely, delayed thrombolysis is associated with a higher failure rate and an increased risk of complications.

In sub-Saharan Africa, STEMI is becoming increasingly frequent in a context of epidemiological transition and rising cardiovascular risk factors [15–18]. In Senegal, data specifically evaluating thrombolysis remain limited. The main objective of this study was to assess thrombolysis in STEMI in the Cardiology Department of Grand-Yoff General Hospital, Dakar. The specific objectives were to describe the epidemiological, clinical and paraclinical characteristics of thrombolysed patients, determine the modalities of thrombolysis, and analyse its outcomes, complications and prognostic factors.

Methods

This was a retrospective, descriptive and analytical study conducted over a two-year period, from 1 January 2021 to 31 December 2022, in the Cardiology Department of Grand-Yoff General Hospital, Dakar. The department includes an inpatient unit, a cardiac intensive care unit and a functional investigations unit. Patients were initially received in the emergency department, where the diagnosis was made and emergency investigations were performed, before admission to the Cardiology Department for treatment.

The study included medical records of patients hospitalised for STEMI who received thrombolytic therapy. All patients admitted for STEMI during the study period and treated with thrombolysis were included. Patients admitted for STEMI who did not receive thrombolysis, as well as lost or unusable medical records, were not included. The diagnosis of STEMI was based on clinical and electrocardiographic findings, particularly anginal chest pain associated with persistent ST-segment elevation or recent left bundle branch block compatible with acute myocardial infarction [1,4,5].

The data collected included sociodemographic characteristics, cardiovascular risk factors, medical history, place of origin, mode and delay of admission, treatment received before admission, symptoms, clinical parameters, Killip class, and electrocardiographic, biological, echocardiographic and coronary angiographic findings. Admission delay was defined as the time between onset of chest pain and arrival at the department. Thrombolysis delay was defined as the time between onset of chest pain and initiation of thrombolytic therapy.

The effectiveness of thrombolysis was assessed using classical reperfusion criteria: pain relief within 60 to 90 minutes, regression of ST-segment elevation by at least 50%, and the possible occurrence of benign ventricular reperfusion arrhythmias [4,5,9]. Haemorrhagic events, allergic reactions, in-hospital complications and mortality were analysed. Data were collected using a survey form, then entered and analysed with Epi Info 7.2 and Excel 2016. Bivariate analysis used the chi-square test, with statistical significance set at $p<0.05$.

Results

During the study period, 1,158 patients were hospitalised in the Cardiology Department of Grand-Yoff General Hospital. Among them, 110 cases of STEMI were recorded, corresponding to a hospital prevalence of 9.49%. Of these patients, 76 received thrombolysis, giving a thrombolysis rate of 69.09% (Figure 1). Patients who did not receive thrombolysis had either presented beyond the recommended time window or had a contraindication to fibrinolysis.

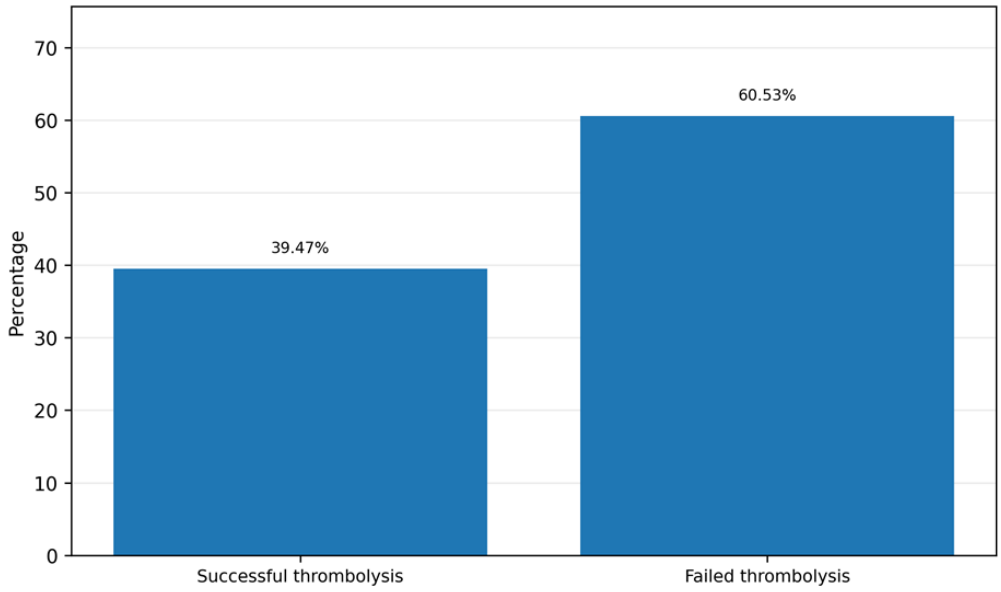

Figure 1: Thrombolysis outcome among STEMI patients (n=76)

The mean age of thrombolysed patients was 57.98±12.99 years, with a range from 27 to 81 years. Men were predominant, with 55 cases (72.37%), compared with 21 women (27.63%), giving a male-to-female sex ratio of 2.61. The 55–65-year age group was the most represented. Most patients came from urban areas (85.53%). Regarding occupation, 42.11% were self-employed and 21.05% were retired. Financial coverage was mainly based on patients' own resources (44.74%) or support from a third party (42.11%) (Table 1).

Variable	Number / value	Percentage / detail
Patients hospitalised in cardiology	1158	—
STEMI cases	110	9.49% of hospitalisations
Thrombolysed patients	76	69.09% of STEMI cases
Mean age	57.98 ± 12.99 years	Range: 27–81 years
Most represented age group	55–65 years	30.26%
Men	55	72.37%
Women	21	27.63%
Male-to-female ratio	2.61	—
Urban origin	65	85.53%
Self-employed/liberal profession	32	42.11%
Retired	16	21.05%
Self-funded care	34	44.74%

Table 1: Epidemiological and sociodemographic characteristics of thrombolysed patients

Cardiovascular risk factors were dominated by risk-associated age (71.05%), male sex (72.36%), smoking (42.11%), hypertension (38.16%), physical inactivity (26.32%) and diabetes (21.05%). The mean number of cumulative cardiovascular risk factors was four, and 85.53% of patients had at least two cardiovascular risk factors (Table 2). The mean admission delay was 5.43 hours after symptom onset, with a range from 1 hour 15 minutes to 12 hours. Forty-seven patients (61.84%) were referred from another healthcare facility, while 29 (38.15%) presented directly to the emergency department.

Variable	Number / value	Percentage / detail
Risk age	54	71.05%
Male sex	55	72.36%
Smoking	32	42.11%
Hypertension	29	38.16%
Physical inactivity	20	26.32%
Diabetes	16	21.05%
≥2 cardiovascular risk factors	65	85.53%
Typical anginal pain	66	86.84%
Mean admission delay	5.43 h	1 h 15 min–12 h
Referred patients	47	61.84%
Subepicardial injury on ECG	70	92.11%
Pathological Q wave	48	63.16%
Reciprocal changes	50	65.79%
Rhythm disorders	17	22.36%
Conduction disorders	20	26.31%

Table 2: Cardiovascular risk factors and clinical/paraclinical presentation

Typical anginal pain was reported in 66 patients (86.84%). Mean systolic blood pressure was 141.23±29.01 mmHg and mean heart rate was 83.32±15.40 beats per minute. On admission electrocardiography, subepicardial injury was noted in 70 patients, while six had recent left bundle branch block. Pathological Q waves were found in 63.16% of cases and reciprocal changes in 65.79%. Rhythm disorders were present in 22.36% of patients and conduction disorders in 26.31%.

Doppler echocardiography, performed in 69 patients, showed segmental wall motion abnormalities in 86.96% of cases. Mean left ventricular ejection fraction was 49.58%, with severe impairment in 13.23%. Deferred coronary angiography, performed in 18 patients, mainly showed involvement of the left anterior descending artery.

All patients received loading doses of aspirin, clopidogrel and a statin. No patient underwent prehospital thrombolysis or primary angioplasty. Streptokinase was used in all patients at a dose of 1.5 million units. The

mean thrombolysis delay was 6.03 hours. Thrombolysis was successful in 30 patients (39.47%) and failed in 46 (60.53%). Haemorrhagic complications occurred in nine patients (11.84%), with no haemorrhagic stroke (Figure 3). In-hospital mortality was 5.26%. Prognostic factors significantly associated with mortality were Killip class IV (p=0.027), heart rate >100 beats/min (p=0.019) and fasting blood glucose >3 g/L (p=0.039) (Table 3).

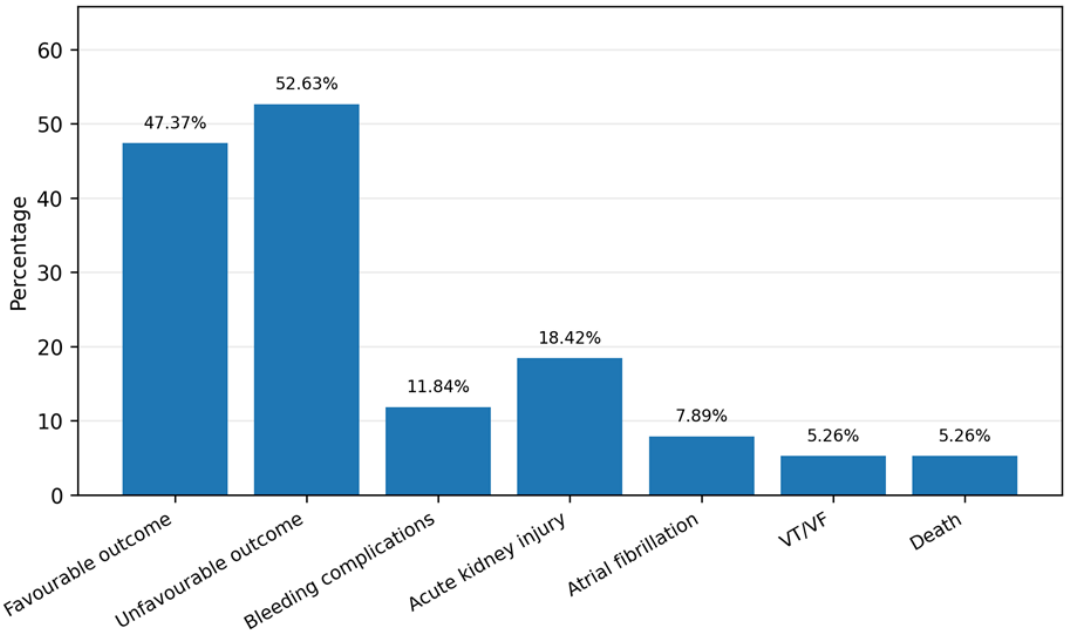

Figure 3: Main in-hospital outcomes and complications

Variable	Number / value	Percentage / detail
Prehospital thrombolysis	0	0%
Primary angioplasty	0	0%
Streptokinase	76	100%
Dose used	1.5 million IU	30–60 min infusion
Mean thrombolysis delay	6.03 h	1 h 45 min–12 h
Successful thrombolysis	30	39.47%
Failed thrombolysis	46	60.53%
Failure when thrombolysed between 6 and 12 h	32/38	84.21%
Bleeding complications	9	11.84%
Haemorrhagic stroke	0	0%
Severe allergic reaction	1	1.31%
In-hospital mortality	4	5.26%
Mortality prognostic factors	—	Killip IV (p=0.027); HR>100/min (p=0.019); fasting glucose >3 g/L (p=0.039)

Table 3: Thrombolysis modalities, outcomes and prognostic factors

Discussion

This study shows that STEMI represented an important cause of cardiology hospitalisation at Grand-Yoff General Hospital, with a hospital prevalence of 9.49%. Among patients admitted for STEMI, nearly seven out of ten received thrombolysis. This finding highlights the central role of fibrinolysis in our setting, where primary angioplasty was not available as an emergency procedure. Although primary angioplasty is the reference reperfusion strategy when it can be performed within the recommended timeframes, thrombolysis remains an essential alternative in healthcare systems where access to cardiac catheterisation is limited [1–6].

The mean age of approximately 58 years and the male predominance observed in our series are comparable to findings usually reported in African and international STEMI series [7–10]. This male predominance may be explained by a higher frequency of smoking and other cardiovascular risk factors among men, but also by differences in exposure, healthcare-seeking behaviour and symptom recognition. The high burden of cardiovascular risk factors, with a mean of four risk factors per patient and more than 85% of patients having at least two risk factors, confirms the importance of primary prevention and early screening for modifiable risk factors [11–14].

The main finding of this study concerns delayed management. The mean admission delay was 5.43 hours and the mean thrombolysis delay was 6.03 hours. These delays are long compared with guideline recommendations, which emphasise reperfusion as early as possible, ideally within the first hours after symptom onset [1–6]. The effectiveness of fibrinolysis decreases rapidly over time, which probably explains the high failure rate observed in our series. Indeed, 50% of patients were thrombolysed between the sixth and twelfth hour, with failure in 84.21% of cases (Figure 2). This result illustrates the need to reduce both prehospital and in-hospital delays [15–18].

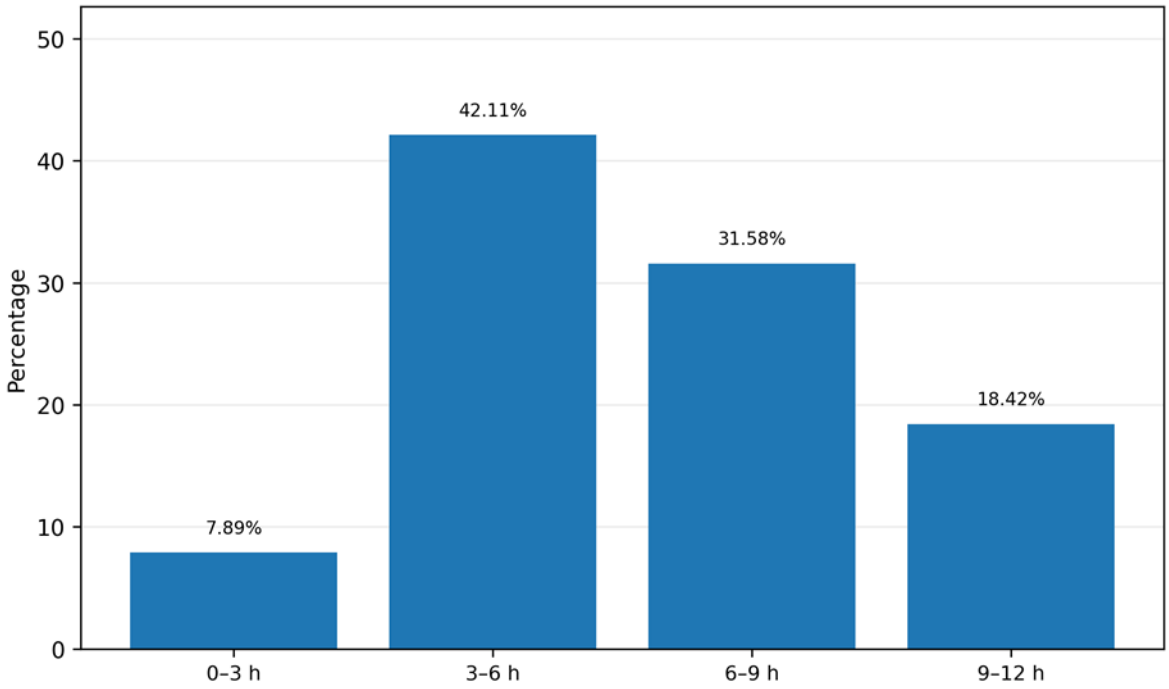

Figure 2: Distribution of patients according to thrombolysis delay (n=76)

The exclusive use of streptokinase probably reflects constraints related to availability and cost. Streptokinase has demonstrated its effectiveness in historical trials, but fibrin-specific agents such as alteplase, reteplase and tenecteplase are associated with higher reperfusion rates and simpler administration [19–23]. However, their cost limits their widespread use in many resource-limited countries. The absence of prehospital thrombolysis and primary angioplasty also highlights the insufficient development of structured STEMI care pathways.

Complications were dominated by heart failure, acute kidney injury, rhythm disorders, conduction disorders and haemorrhagic events. In-hospital mortality was relatively moderate at 5.26%, but unfavourable outcome concerned more than half of the patients. Killip class IV, tachycardia and severe hyperglycaemia were significantly associated with mortality, in line with classical prognostic factors in acute myocardial infarction [24–30]. These findings support the implementation of a structured STEMI pathway integrating community awareness, medicalised transport, early electrocardiography, rapid thrombolysis, tele-expertise and a pharmaco-invasive strategy.

Conclusion

STEMI was a frequent cardiovascular emergency in the Cardiology Department of Grand-Yoff General Hospital, Dakar. In this retrospective series of 76 thrombolysed patients, the population was predominantly male, relatively young, and characterised by a high burden of cardiovascular risk factors, mainly risk-associated age, male sex, smoking, hypertension, physical inactivity and diabetes.

Thrombolysis played a central role in the reperfusion strategy, in the absence of emergency primary angioplasty. However, admission and thrombolysis delays were long, with a mean thrombolysis delay exceeding six hours. This was associated with a high failure rate, despite the systematic use of streptokinase. Complications were dominated by heart failure, acute kidney injury, rhythm disorders, conduction disorders and haemorrhagic events. In-hospital mortality was 5.26%, with Killip class IV, heart rate above 100 beats/min and fasting blood glucose above 3 g/L identified as significant prognostic factors.

These findings highlight the need to reduce delays in seeking care, improve access to coronary reperfusion and develop a pharmaco-invasive strategy adapted to the Senegalese context

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