Outcomes of patients admitted with acute coronary syndrome to a district level hospital in a lower to middle income country

In partial fulfilment of the requirements for the degree

Master of Medicine (MMed) in Medicine

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Author Contributions

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List of tables and figures

Tables

Figures

Abbreviations

CVD - Cardiovascular disease

NCD - Non communicable disease

IHD - Ischemic heart disease

CAD - Coronary artery disease

ACS - Acute coronary syndrome

STEMI - ST-elevation myocardial infarction

NSTEMI - Non-ST-elevation myocardial infarction

UAP - Unstable Angina pectoris

PCI - Percutaneous intervention

CABG - Coronary artery bypass graft

MACE - Major adverse cardiovascular events

VIMRI - Victoria hospital internal medicine research initiative

VHW - Victoria Hospital Wynberg

DAPT - Dual antiplatelet therapy

LMIC - Low-middle-income countries

HMIC - Higher middle- income countries

UGIB - Upper gastrointestinal bleed

ECCR - Electronic continuity of care record

SPV - Single patient viewer

NHLS - National health laboratory service

SSA - Sub-Saharan Africa

ESC - European society of cardiology

GSH - Groote Schuur Hospital

Glossary of terms

Acute coronary syndrome : A condition related to sudden, reduction in blood flow to the heart. [1]classified as STEMI (complete or prolonged occlusion of blood supply to the heart), NSTEMI (partial or temporary occlusion of blood supply to the heart) and UAP (Chest discomfort) [2]

Atherosclerosis : A disease due to the buildup of plaque inside blood vessels.[3]

Angiography : Imaging of the blood vessels after injecting contrast .[3]

Arrhythmia : An abnormal heart rhythm.[3]

Coronary artery disease : Narrowing of the arteries in the heart due to atherosclerosis.[3]

Coronary artery bypass graft : Surgery done to restore blood flow to the heart . [3]

Coronary revascularisation : A procedure done to restore blood flow to the heart.[3] PCI/CABG

Coronary intervention : Thrombolysis /PCI and CABG [4]

Myocardial infarction : A heart attack. The damage or death of the heart muscle (myocardium) resulting from blocked blood supply to the heart.[3]

Pharmaco -invasive therapy : A procedure by which thrombolytic therapy is combined with PCI (in failed thrombolysis) within the first 2 to 24 hours after thrombolysis (in successful thrombolysis).[3]

Stent : Metal object used to keep the artery open. [3]

Thrombolytic/ Fibrinolytic : Medicines used to dissolve blood clots. [3]

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Abstract

Background: Acute coronary syndrome (ACS) has become a leading cause of death in low-and middle-income countries. There is a lack of data regarding the outcomes of ACS in Africa. This study aims to assess the outcomes of ACS patients admitted to a resource-limited district hospital in Cape Town, South Africa.

Methods: We conducted a retrospective observational study of patients admitted with ACS to the Department of Medicine at Victoria Hospital, Cape Town, from the 1st September 2020 to 30 November 2020.

Results: Eighty eight patients with a diagnosis of ACS was admitted, of who 52 had NSTEMI/UAP and 36 patients had STEMI. The median age was 60 years, with a male predominance of 61.36%. The major risk factors for CAD were hypertension and smoking. The overall 1-month, 6-month, and 12-month mortality rates for our cohort were 4%, 17%, and 19%, respectively. Patients that received coronary intervention (thrombolytics/PCI/CABG) had better outcomes than in those who were managed conservatively.

Conclusion: This study describes the experience of ACS management in a resource-limited public hospital in Cape Town, South Africa. Our patients had multiple cardiovascular risk factors with a higher mortality than published data. The lack of receiving coronary intervention was associated with worse outcomes.

Key words : acute coronary syndrome, outcomes, ischemic heart disease, mortality, MACE

Introduction

Background and significance

The Mayo Clinic describes acute coronary syndrome (ACS) as a cardiac disease that occurs due to insufficient blood flow. This can range from an unstable angina to a myocardial infarction (heart attack) and is a medical emergency that requires prompt diagnosis and care.[4] Multiple studies have shown that morbidity and mortality from ACS are extremely high, and ACS is now one of the leading causes of death. [5,6] In 2019, ischemic heart disease (IHD) ranked as the number one cause of global mortality, responsible for 8.9 million deaths, and is still projected to be among the top three leading causes of death in 2030. [6, 7] Although there has been a steady decline in mortality rates in higher middle-income countries (HMIC), mortality from ACS is increasing in the developing world. [8, 9, 10, 11] It was reported that 80% of deaths from cardiac disease occur in low-middle-income countries (LMIC). [12] In Sub-Saharan Africa (SSA), there are limited data for evaluating the outcomes of patients with ACS.[11, 12, 13] It is now imperative that more studies be done to understand the impact of acute coronary syndromes in LMICs.

Sub-Saharan Africa (SSA) faces a dual burden of infectious and non-communicable diseases (NCDs). [14] NCDs are now the leading cause of death in Africa. [6], [15] The mortality rate of IHD in Sub-Saharan Africa is expected to rise to 70% in African males and 74% in African females by 2030. [15] South Africa (SA) is experiencing a health transition. The burden of NCD is on the rise due to an increase in risk factors for atherosclerotic disease in urban and rural South Africa. [14] Heart disease, diabetes, and stroke are the leading causes of death in SA. [16] In 2019, STATS SA reported IHD as the leading cause of death in the Western Cape. [16] Furthermore, the Heart and Stroke Foundation of South Africa reported that in every hour, five patients develop a heart attack, and ten patients develop a stroke. Ten of these patients will die. [17]

There is a wide variability in the management and outcomes of patients admitted with ST-elevation myocardial infarction (STEMI) in HMIC and LMIC. [5] LMICs have limited access to PCI/CABG, possibly resulting in high mortality. Studies have shown that prompt reperfusion reduces mortality in both STEMI and non-ST segment-elevation

myocardial infarction (NSTEMI) patients.[18], [19] South Africa has a two-tiered health system.[20] Stassen and colleagues conducted a study on the coverage of PCI facilities in South Africa, and noted a disparity between the state and private sector. He reported that seventy seven percent (77%) of PCI facilities are privately owned and only accessible to people who have health insurance. Twenty three percent (23%) are state owned and services 82% of the population. Most patients do not have health insurance and are dependent on state PCI facilities which are limited in number [21]

In an additional study Stassen reported the presence of barriers to coronary care networks in South Africa .He attributed this to multiple delays in the system, from transport to hospital, to diagnosis and administration of thrombolytics . Many of these delays due to geographical location (rural areas) and poor socioeconomic class as well as lack of public awareness on ACS. The paucity of data prevents changes being made to current policies and referral networks.[22]

Currently The RIC Africa trial is being conducted to determine if remote ischemic conditioning can reduce the complications of heart failure and death in patients with STEMI, who are thrombolysed but do not have access to PCI.[23]

Aim of the Study

The study aims to evaluate the outcomes of patients admitted with acute coronary syndrome (ACS) at 30 days, 6 months, and 12 months respectively. This knowledge will serve to improve patient care and ensure the best outcomes for patients admitted with acute coronary syndromes. The study will inform clinical training and create awareness, as well as assist with resource allocation. Finally, this study will contribute to the evidence base of ACS management for the Sub-Saharan continent.

Objectives

Primary endpoint: Mortality at

- 30 days
- 6 months
- 12 months

Secondary endpoints: Major adverse clinical outcomes

- Composite of total death
- Re-infarction
- Arrythmias
- Heart failure
- Rehospitalisation
- Stroke

Methods

Study design and setting

We conducted a retrospective observational cohort study on outcomes of patients admitted with ACS to Victoria Hospital from 1st September 2020 - 30 November 2020. Victoria Hospital (VHW) is a district hospital that serves a catchment population of 600,000 people across the southern suburbs of the Cape Metropole.

Patients admitted with ACS in South African state hospitals are managed according to a hub and spoke model, and PCI and CABG are only accessible through tertiary institutions. When a patient with a STEMI presents at VHW, they only have access to thrombolytics. Patients who are high-risk, unstable, or have failed thrombolysis are discussed with cardiologists at Groote Schuur Hospital (a tertiary hospital). These patients are prioritised for transfer for rescue PCI or for intensive cardiac care. Groote Schuur Hospital has a dedicated 6-bed cardiac intensive care unit that services a large drainage area and therefore, beds are often limited. This results in primary PCI and

pharmacoinvasive therapy (a procedure by which thrombolytic therapy is combined with PCI within the first 24 hours after thrombolysis) [21] often being unavailable to those who need it. The European Society of Cardiology highly recommends pharmacoinvasive treatment when primary PCI is not available specifically in LMIC. [21] In our setting, this still remains a challenge. [21]

Study population and patient eligibility

Patients were classified according to their admission diagnosis of STEMI/NSTEMI/UAP as per ESC guidelines. [24]

1. *ST elevation myocardial infarction*- ischemic chest pain and new ST-segment elevations in 2 contiguous leads or new bundle branch blocks with ischemic repolarisation patterns.
2. *Non ST elevation myocardial infarction* -Ischemic chest pain, no ST elevation on ECG, and positive biomarkers (highly sensitive trop T).

   Unstable angina was defined -Ischemic chest pain with negative biomarkers

Inclusion criteria

- >18 years of age
- Admitted to Victoria Hospital with a diagnosis of acute coronary syndrome (STEMI, NSTEMI/UAP)
- Admitted from 1 September 2020 to 30 November 2020.

Exclusion Criteria

- < 18yrs of age
- Alternate cardiovascular disease

Primary and secondary endpoints

Primary endpoint: Mortality at 30 days, 6 months, and 12 months

Secondary endpoint: Major adverse clinical outcomes

Data Collection and Management

Data were extracted from the VIMRI registry which captures patients admitted to VHW with cardiovascular disease. Information was collected from records of patients with a confirmed diagnosis of ACS. Additional patient data were extracted from further electronic databases such as Electronic continuity of care records (ECCR), Single patient viewer (SPV), National health laboratory service, (NHLS) and patient folders. This process was conducted by two experienced doctors who were familiar with the objectives of the study. Data were anonymised and captured on a data extraction sheet. The variables included patient demographics such as age and gender, disease classification (STEMI, NSTEMI/UAP), comorbidities (hypertension, diabetes, HIV, previous ischemia, dyslipidemia), admission data (treatment received, complications, thrombolysis, transfer to cardiology), discharge medication (ACE inhibitors, B-blockers, Clopidogrel, ASA, statins), outcomes at 1 month, 6 months, and 12 months such as death, major adverse clinical outcomes (congestive cardiac failure, arrythmias, recurrent ischemia, stroke, gastro intestinal bleeds) and, rehospitalisation;.

Conservative management was defined as no use of thrombolytics ,PCI or CABG , coronary intervention referred to use of PCI/CABG/thrombolytics, and coronary revascularisation was defined as PCI or CABG.

Data was transferred into Microsoft Excel in preparation for statistical analysis. All ethical protocols pertaining to confidentiality were adhered to including password protection with limited personnel being authorised to access the electronic data and folders of patients.

Data analysis

Data were analysed with Stata 15.1. A Shapiro-Wilk test was used to check normality of data. Mean and standard deviation were used to describe normally-distributed continuous variables. Frequency and proportions were used to describe categorical variables. Chi-square and Fisher exact tests were used to evaluate the association between the two groups. Mortality data were calculated as cumulative figures, and a p-value of <0.05 was considered statistically significant.

Ethics considerations

Permission was obtained from HREC (HREC 640/2022) on 28 October 2022 and VIMRI registry R043/202. The study was conducted in accordance with the Declaration of Helsinki.[25]

Results

Risk factors

Patient demographics and cardiovascular risk factors are provided in Table 1. In summary, 88 patients were admitted with ACS to VHW from Sep to Nov 2020, with a mean age 60 years (SD ± 12 years), males (61.4%) . Patients diagnosed with NSTEMI/UAP (n = 52, 59%) compared to STEMI (n = 36, 41%). The major cardiovascular risk factors identified were hypertension, smoking, dyslipidaemia, diabetes, and prior cardiac ischaemic events. These risk factors were more prevalent in the NSTEMI/UAP group in who hypertension was found to be statistically significant (p = 0.01). Recreational drug use was more common in the STEMI cohort (although not statistically significant).

T*able 1-Baseline characteristics of patients admitted with ACS.*

Variable	Overall,88	NSTEMI/UAP, 52 (59.09%)	STEMI, 36 (40.91%)	P-Value
Age, mean (sd)	60.01 (12.55)	60.48 (10.95)	59.33 (14.70)	0.68
Age group, n (%) 20 – 40 years 41 – 60 years 61 – 80 years > 80 years	 4 (4.55) 42 (47.73) 38 (43.18) 4 (4.55)	 0 (0.00) 27 (51.92) 23 (44.23) 2 (3.85)	 4 (11.11) 15 (41.67) 15 (41.67) 2 (5.56)	0.09
Gender, n (%) Female Male	 34 (38.64) 54 (61.36)	 24 (46.15) 28 (53.85)	 10 (27.78) 26 (72.22)	0.08
Smoking	68 (77.27)	41 (78.85)	27 (75.00)	0.07
Hypertension	64 (72.73)	43 (82.69)	21 (58.33)	0.01
Diabetes mellitus	38 (43.18)	26 (50.00)	12 (33.33)	0.12
Dyslipidemia	50 (56.82)	34 (65.38)	16 (44.44)	0.05
HIV	4 (4.55)	1 (1.92)	3 (8.33)	0.45
Polysubstance use	11 (12.50)	4 (7.69)	7 (19.44)	0.12
Previous Ischemia	37 (42.05)	26 (50.00)	11 (30.56)	0.07

NSTEMI/UAP, Non-ST-elevation myocardial infarction/unstable angina; STEMI, ST-elevation myocardial infarction; n=number

Mortality and major adverse outcomes

During the study period, 17 (19%) patients died which consisted of ten STEMI and seven NSTEMI. No patients with UAP demised during the study . The overall mortality rate was high, reaching 4% at 1 month, 17% at 6 months, and 19% at 12 months. There was a minor difference between the STEMI and NSTEMI/UAP groups at 30 days (6% vs. 4%), 6 months (19% vs.15%) and 12 months (19% vs.19%) as seen in the supplementary table. The most frequent complications at 12 months were heart failure 42 (47%), arrhythmias 11 (12%), and recurrent cardiac ischemia 3 (3%), and these were similar in both STEMI and NSTEMI/UAP groups. A larger proportion of NSTEMI/UAP patients required rehospitalisation (46%) compared to STEMI (28%) patients (p = 0.09). One patient experienced an acute gastrointestinal bleed and no strokes were reported during the study. Detailed outcomes are presented in table 2 below.

Table 2-Cumulative outcomes at 30 days ,6 months, and 12 months.

	Cumulative Outcomes 0 to 30 days		Cumulative Outcomes 0 to 6 months		Cumulative Outcomes 0 to 12 Months		Overall	
	NSTEMI/ UAP n=52	STEMI n=36	NSTEMI/ UAP n=52	STEMI n=36	NSTEMI/ UAP n=52	STEMI n=36	P value	ACS n=88
Death	2 (4%)	2 (6%)	8 (15%)	7 (19%)	10 (19%)	7 (19%)	1	17 (19%)
Heart Failure	24 (46%)	16 (44%)	24 (46%)	17 (47%)	24 (46%)	18 (50%)	0.71	42 (47%)
Arrhythmia	5 (10%)	5 (14%)	6 (12%)	5 (14%)	6 (12%)	5 (14%)	0.78	11 (12%)
Recurent cardiac Ischemia	0	1 (3%)	1 (2%)	1 (3%)	2 (4%)	1 (3%)	0.80	3 (3%)
Rehospitalisation	18 (35%)	9 (25%)	21 (40%)	10 (28%)	24 (46%)	10 (28%)	0.09	34 (38%)
GIT Bleeding	1 (2%)	0	1 (2%)	0	1 (2%)	0	0.39	1 (1%)
Stroke	0	0	0	0	0	0	0	0

NSTEMI/UAP, Non-ST-elevation myocardial infarction/unstable angina; STEMI, ST-elevation myocardial infarction; n=number; ACS, Acute coronary syndrome

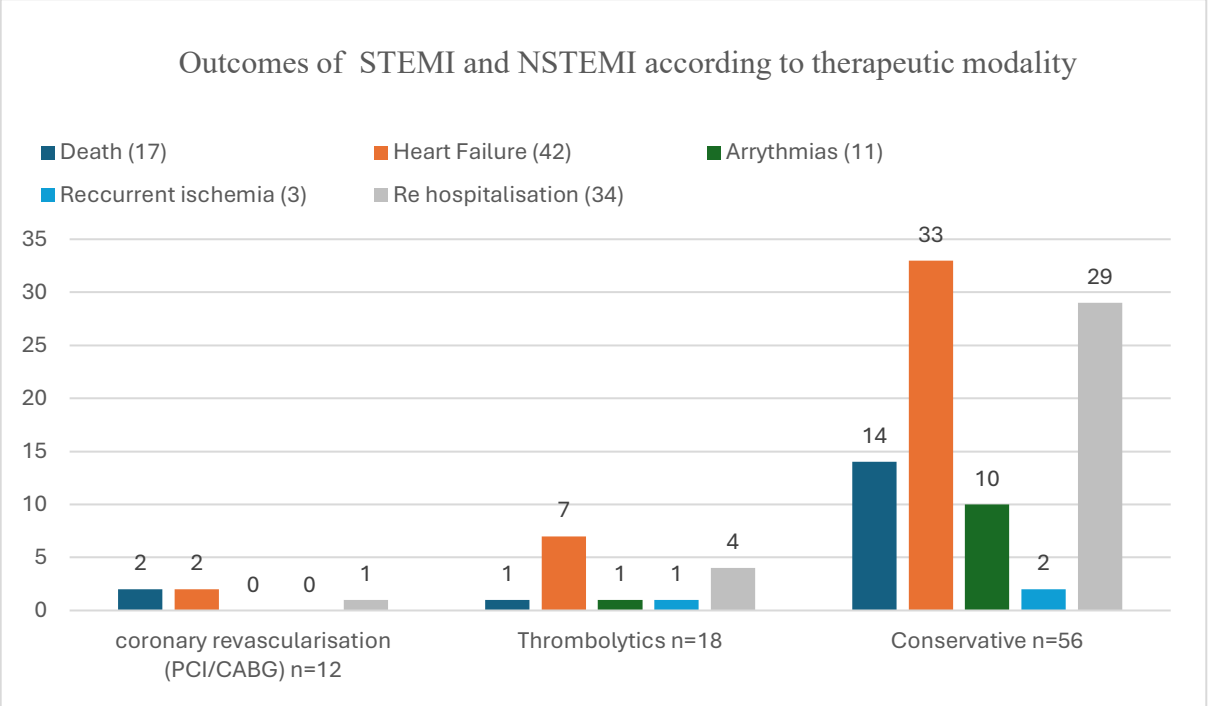
Therapeutic Interventions

Two(5%) patients received pharmacoinvasive therapy and eighteen patients (50%) with STEMI received thrombolytics. All patients requiring coronary revascularisation was appropriately referred to a tertiary facility (GSH). Thirty-two patients (36%) received angiography, 8 (9%) underwent percutaneous coronary intervention (PCI), and 4 (4%) coronary artery bypass grafting (CABG), see table 3. Nearly half of the STEMI 17 (47%) and NSTEMI 39 (46%) patients were managed conservatively and had worse clinical outcomes. All deaths occurred in the STEMI and NSTEMI cohorts .Fourteen of the seventeen deaths occurred in patients that did not receive coronary intervention (PCI/CABG and thrombolytics). More than fifty percent of the individuals in the conservative cohort developed congestive heart failure and required rehospitalisation. See figure 2.

Table 3 – Therapeutic interventions

Variable	Variable class	NSTEMI/UAP (n=52, 59.09%)	STEMI (n=36, 40.91%)
Thrombolysed	No	52 (100.00)	18 (50.00)
	Yes	0 (0.00)	18 (50.00)
Angiogram	No	27 (51.92)	29 (80.56)
	Yes	25 (48.09)	7 (19.44)
PCI	No	46(88.46)	34 (94.44)
	Yes	6 (11.54)	2 (5.56)
CABG	No	49 (94.23)	35 (97.22)
	Yes	3 (5.77)	1 (2.78)

NSTEMI/UAP, Non-ST-elevation myocardial infarction / unstable angina; STEMI, ST-elevation myocardial infarction; n = number; PCI, per cutaneous intervention; CABG, coronary artery bypass graft

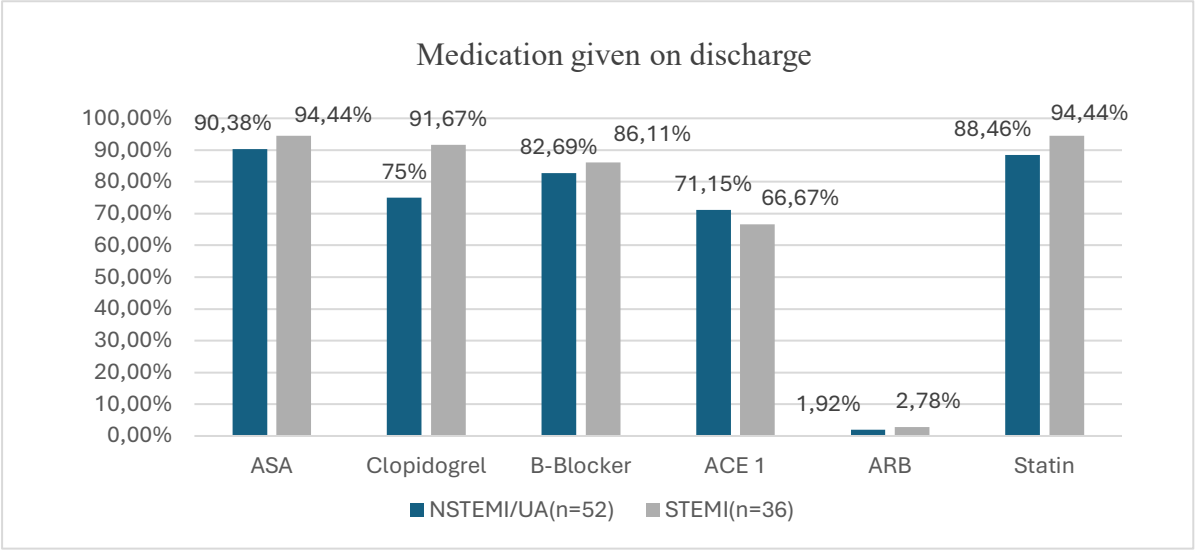


Coronary revascularisation - PCI /CABG ; Conservative management – no PCI /CABG /thrombolytics ; n= number ; STEMI-ST elevation myocardial infarction; NSTEMI -Non ST elevation myocardial infarction

Figure 1– Outcomes of STEMI and NSTEMI patients according to therapeutic modality

Discharge medication

On discharge, most patients were managed appropriately within guideline-directed medical therapies, although a slightly lower proportion of patients received ACE inhibitors and Clopidogrel. A small proportion of patients were allergic to ACE inhibitors and required ARBs. See figure 2 below.



NSTEMI/UAP, Non-ST-elevation myocardial infarction / unstable angina; STEMI, ST-elevation myocardial infarction; ARB, Angiotensin receptor blocker; n = number

Figure 2- Discharge medications.

Discussion

The primary aim of our study was to assess the outcomes of patients admitted with acute coronary syndrome (ACS) to a district-level state hospital in Cape Town, South Africa. Eighty eight patients with a diagnosis of ACS were admitted .The major cardiac risk factors identified were Hypertension and smoking. In this study, the overall mortality rate (19%) was markedly higher than those reported in studies from more developed countries (10%) and tertiary private hospitals in South Africa (5%). [26], [27] Notably, patients who received coronary intervention (PCI/CABG and thrombolytics) demonstrated superior outcomes to those managed conservatively. While this result is not surprising, it reflects the major impact of limited resources in a district-level hospital. Unfortunately, the scarcity of comparative data from similar settings in South Africa makes broader comparisons challenging.

The majority of our patients were managed in a resource-constrained setting without access to high-care monitoring or primary PCI, a situation further exacerbated by the COVID-19 pandemic. Only half of the patients with STEMI received thrombolytics, and this may have contributed to the higher twelve-month mortality rate of 19%. The mortality rate in this study is comparable to those observed in low-and middle-income countries (LMIC) facing similar challenges. [28], [29] We found only one comparable study in South Africa, which reported a lower mortality rate of 6%. [26] However, this study was conducted in private tertiary hospitals and do not reflect the tremendous challenges faced at district hospitals in South Africa.

Our findings indicate that conservative management was the predominant approach for most STEMI and NSTEMI patients, with only a limited subset receiving PCI/CABG at the tertiary care facility. Only half of the patients with STEMI in our study received thrombolytics. The low utilisation of thrombolytics can possibly be attributed to delayed hospital presentations, a problem further exacerbated by the COVID-19 pandemic. The same period showed a similar delay in patient presentation to hospitals in Hong Kong. This

was due to fears of contracting Covid 19 [30] Suboptimal thrombolysis is not unique to our setting and similar patterns have been reported in other South African state hospitals and across sub-Saharan Africa, often stemming from delays in door to needle time. [31], [32], [33], [34], [35]) However, a study from KwaZulu-Natal revealed promising improvements in door-to-needle times when specialist family physicians were involved in managing these patients upon arrival [36], [37], suggesting a potential avenue for enhancing care delivery.

In this study, 32 patients (36%) were transferred to Groote Schuur Hospital for coronary angiography. In total 12 of the 32 patients (38%) received (PCI/CABG). The COVID-19 pandemic profoundly impacted staff availability and resources, further delaying surgeries. This could possibly explain the limited number of coronary artery bypass grafts (CABG) (n=4) performed during our study period While a study by the General Surgery department at Groote Schuur Hospital reported a 77% backlog for elective surgeries[38], Little is known about the pandemic's specific impact on cardiothoracic surgeries at the hospital, warranting further investigation. Previous studies in South Africa reported much higher PCI/CABG rates, exceeding 90%. [[26], [39] However, these studies were primarily conducted in specialised care settings with better access to advanced cardiac interventions and on-site cardiologists, painting an overly optimistic picture of cardiac intervention accessibility in the public health sector. A study by Stassen and colleagues has reported fragmented coronary care networks in South Africa and poor access to PCI. [21], He attributed this, to lack of public awareness, poverty and patients being in rural locations .He also reported that coronary care is not adquately prioritised in South Africa despite the increase in mortality [22],

Our secondary outcome analysis suggests that STEMI/NSTEMI patients managed solely with conservative therapy were more prone to complications. Heart failure was noted to be a common complication in the conservative group , affecting 33 (59%) patients, followed by arrhythmias 10 (18%) and recurrent ischemia 2 (3%), Twenty nine (52%) patients in this cohort required rehospitalisation. Fewer complications were noted in those that received coronary intervention. Seven patients (39%) that received thrombolytics developed heart failure and 4 (22%) required rehospitalisation. The least number of complications were

noted in patients that received PCI/CABG. Two (16%) developed heart failure and one (8%) required rehospitalisation. No other complications were reported in this cohort.

Findings from our study are consistent with research in low-and middle-income countries, which also established heart failure as a frequent complication after a myocardial infarction and a strong predictor of mortality. [28], [40], [41] A publication in the SA Heart journal reported that an invasive treatment approach rather than conservative management conferred long-term benefits in terms of composite endpoints encompassing death, major adverse cardiac events, and rehospitalisation. Notably, patients presenting with high-risk NSTEMI appear to benefit from prompt revascularisation. [42]

Our study cohort exhibited an exceptionally high prevalence of cardiovascular risk factors. Specifically, 72% of patients were smokers, 77% had hypertension, 56% had dyslipidemia, and 43% had diabetes,. These risk factors were notably more prevalent in the NSTEMI/UAP cohort. Previous data from Victoria Hospital and data from multiple studies from South Africa and Sub-Saharan Africa have reported similar risk factor profiles [(43),(44), (45),(46)], further emphasising the current epidemiological transition in the region. [14], [45], [46] Smoking remains a major health concern in South Africa, with patients continuing to engage in this behaviour despite the implementation of strict tobacco policies.' In contrast, some low- and middle-income countries, such as India, have reported lower smoking rates when more stringent tobacco policies are implemented. [47]

Our analysis revealed that most patients were discharged with guideline-directed therapy. Over 90% received aspirin, while 80% were prescribed statins and beta-blockers. However, we observed lower utilisation of ACE inhibitors in both groups and reduced use of Clopidogrel in the NSTEMI group. Notably, Clopidogrel were prescribed in accordance with the drug and therapeutics committee guidelines. Patients with STEMI without a stent received 1 month of treatment. Patients with NSTEMI without stents received 3 months, and stented patients were prescribed 6-12 months of therapy. A study conducted in Cape Town emphasised that secondary prevention and long-term outcome management are equally

essential as thrombolysis in acute coronary syndrome management. [32] This aligns with findings from the ACCESS registry and studies from low-and middle-income countries which found that guideline-directed medical management reduced the composite of death and major adverse cardiovascular events. [26], [32], [48])

The average age of patients in this study was approximately 60 years, younger than European cohorts but similar to local cohorts. [13, 29), [26), [49), [27)] We observed a male predominance consistent with both local and international studies. [8), [26), [49), [27), [39) ,[32)]

Recommendations

Our research is among a few studies conducted at a district-level public hospital in South Africa that evaluate the impact of cardiovascular disease, specifically acute coronary syndromes. Victoria Hospital faces compelling challenges, such as limited access to PCI and CABG . Due to the shortage of monitored high-care beds, most patients are treated in general medical wards. Our study findings emphasise the urgent need for enhanced access to coronary revascularisation, which includes pharmacoinvasive therapy for STEMI and PCI/CABG treatments for moderate- to high-risk NSTEMI patients. Considering that this retrospective study took place during the COVID-19 pandemic, we advocate for a follow-up prospective study in the post-COVID era to yield additional insights and compare outcomes.

Limitations

Our study has some limitations that should be noted. It was a retrospective, single-centre study with a small sample size (n = 88), therefore the generalisability of our results is constrained. The study's timeline coincided with the COVID-19 pandemic, which affected patient transfer and management strategies. The retrospective design meant that not all data could be obtained, and incomplete medical records resulted in the exclusion of some patients. Telephonic updates and follow up plans were given to patients during the pandemic . This was not documented in patients files/records therefore making it difficult to obtain information that was discussed telephonically. Many patients did not receive outpatient clinic appointments at tertiary hospitals. Clinics were non-operational during the Covid 19 pandemic. This could have had an impact on the outcomes. However further studies need to be done.

Conclusion

This study emphasises the major obstacles encountered in resource-limited settings, where access to coronary revascularisation in the management of ACS is restricted. The high mortality rates observed, especially in the long term, indicate a pressing need to address lack of access to PCI/CABG. The insufficient use of evidence-based interventions and the considerable presence of modifiable risk factors in our cohort point to more extensive, widespread issues within our population. Our results stress the critical importance of policies that guarantee patients receive optimal evidence-based treatment. Given the concerning increase in mortality rates due to resource limitations, it is essential to prioritise cardiac care in similar settings. Future research should aim to devise and implement strategies that overcome these challenges and enhance outcomes for patients experiencing acute coronary syndromes in resource-limited settings.

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Appendices

Data tool

AGE		STEMI	
GENDER		NSTEMI	
		UNSTABLE ANGINA	
Risk Factor			
Hypertension		Smoking	
Diabetes		Family Hx of premature CAD	
Dyslipidaemia		Previous MI	
CKD		HIV	
In patient morbidity and mortality			
Cardiogenic shock		Bleeding	
Arrythmias		Stroke	
Killip ii-iii		Renal failure	
Reinfarction		Death	
Reduced EF			
Secondary prevention			
Ace Inhibitor		Simvastatin	
Enalapril		ASA	
Clopidogrel		CCB	
Outcome at 30 days			
Rehospitalisation		Arrythmias	
Cardiac failure		Death	
Stroke		PCI/CABG	
Re infarction		GIT Bleed	
Outcome at 6 months			
Rehospitalisation		Arrythmias	
Cardiac failure		Death	
Stroke		PCI/CABG	
Re infarction		GIT Bleed	
Outcome at 12 months			
Rehospitalisation		Arrythmias	
Cardiac failure		Death	
Stroke		PCI/CABG	
Re infarction		GIT Bleed	

Ethics approval letter

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room 45 E-53-E-Floor- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-submissions@uct.ac.za
Website: https://health.uct.ac.za/home/human-research-ethics

25 October 2022

HREC REF: 640/2022

Dr N Van Der Schyff
Department of Medicine
Victoria Hospital -Wynberg
Email: nasief.vanderschyff@uct.ac.za
Student: kamini.govender73@gmail.com

Dear Dr Van Der Schyff

PROJECT TITLE: OUTCOMES OF PATIENTS ADMITTED WITH ACUTE CORONARY SYNDROME TO A DISTRICT LEVEL HOSPITAL IN A LOWER TO MIDDLE INCOME COUNTRY. OBSERVATIONAL STUDY-
9MASTERS CANDIDATE-DR KAMINI GOVENDER)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 October 2023.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: Dr Kamini Govender will also be involved in this study.

Please quote the HREC REF 640/2022 in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the FHREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

PROFESSOR M FREEDSHAN
CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637. Institutional Review Board (IRB) number: IRB00001938 NHREC-registration number: REC-210208-007
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2020), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

Ethics renewal letter

UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

FHS017: Annual Progress Report / Renewal

Record Reviews/Audits/Collection of Biological Specimens/Repositories/Databases/Registries

HREC office use only (FWA00001637; IRB00001938)			
This serves as notification of annual approval, including any documentation described below.			
☑ Approved	Annual progress report	Approved until/next renewal date	30.10.2024
☐ Not approved	See attached comments		
Signature Chairperson of the HREC/ Designee		Date Signed	15/11/23

Note: Please note that incomplete submissions cannot be reviewed.
Please email this form and supporting documents (if applicable) in a combined pdf file to hrec-enquiries@uct.ac.za

Please clarify your plan for research-related activities during COVID-19 lockdown

HUMAN RESEARCH ETHICS COMMITTEE
15 NOV 2023
HEALTH SCIENCES FACULTY UNIVERSITY OF CAPE TOWN

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	8/11/23		
HREC REF Number	640/2022	Current Ethics Approval was granted until	30/10/23
Protocol title	Outcomes of patients admitted with Acute coronary syndrome to a district level hospital in a lower to middle income country		
Principal Investigator	Dr Nasief Van Der Schyff		
Department / Office Internal Mail Address	Nasief vanderschyff@uct.za		
1.1 Does this protocol receive US Federal funding?		☐ Yes	☑ No

2. Protocol status (tick ✓)

☐	Research-related activities are ongoing
☑	Data collection is complete, data analysis only

Please indicate (in the block below) the titles and HREC reference numbers of any projects currently making use of the Database/registry/repository

3. Protocol summary

Total number of records or specimens collected, reviewed or stored since the original approval		88
Total number of records or specimens collected, reviewed or stored since last progress report		68
Have any research-related outputs (e.g. publications, abstracts, conference presentations) resulted from this research? If yes, please list and attach with this report.	☐ Yes	☑ No

4. Signature

Signature of PI	Date	14/11/2023

Supplementary table

Table 4-Outcomes at 30 days , 6months, and 12months

Outcome	Yes/No	Outcomes to 1 month				Outcomes 1 to month 6				Outcomes 6 to month 12			
		NSTEMI/UAP (n start=52)		STEMI (n start=36)		NSTEMI/UAP (n start=50)		STEMI (n start=34)		NSTEMI/UAP (n start=44)		STEMI (n start=29)	
		Count	% of n	Count	% of n	Count	% of n	Count	% of n	Count	% of n	Count	% of n
Death Status	No	50	96%	34	94%	44	88%	29	85%	42	95%	29	100 %
	Yes	2	4%	2	6%	6	12%	5	15%	2	5%	0	0%
Heart Failure	No	28	54%	20	56%	50	100 %	33	97%	42	95%	28	97%
	Yes	24	46%	16	44%	0	0%	1	3%	2	5%	1	3%
Arrhythmia	No	47	90%	29	81%	49	98%	34	100 %	44	100%	29	100 %
	Yes	5	10%	5	14%	1	2%	0	0%	0	0%	0	0%
Recurrent Ischemia	No	52	100 %	35	97%	49	98%	34	100 %	43	98%	29	100 %
	Yes	0	0%	1	3%	1	2%	0	0%	1	2%	0	0%
GIT Bleeding	No	51	98%	36	100 %	50	100 %	34	100 %	44	100%	29	100 %
	Yes	1	2%	0	0%	0	0%	0	0%	0	0%	0	0%
Stroke	No	52	100 %	36	100 %	50	100 %	34	100 %	44	100%	29	100 %
	Yes	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Rehospitalisation	No	34	65%	27	75%	47	94%	33	97%	41	93%	29	100 %
	Yes	18	35%	9	25%	3	6%	1	3%	3	7%	0	0%

NSTEMI/UAP, Non-ST-elevation myocardial infarction / unstable angina; STEMI, ST-elevation myocardial infarction; n = number; ACS, Acute coronary syndrome

This table describes the outcome of patients admitted with ACS during a specific period of the study. The Data obtained are not cumulative but shows data at that point in time.

In this study it was noted that the highest number of deaths occurred at 6 months and occurred more frequently in the STEMI cohort .

The lowest number of deaths was at 30 days. The highest rate of heart failure developed at 30 days and was predominant in the NSTEMI group. Highest rate of arrythmias and GIT bleeding also occurred at 30 days. Frequent rehospitalisation occurred during the first 30 days.

This data reflects that the most crucial time post MI is within the first 30 days and 6months as most complications develop during this time .Therefore it is important to be more proactive during this period of time