GLOBAL HEART

Types and Outcomes of Arrhythmias in a Cardiac Care Unit in Western Kenya: A Prospective Study

ORIGINAL RESEARCH

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ABSTRACT

Background: Sustained arrhythmias are frequently encountered in cardiac care units (CCU), but their types and outcomes in Africa are unknown. Studies from high-income countries suggest arrhythmias are associated with worse outcomes.

Objectives: To determine the types and proportion of cardiac arrhythmias among patients admitted to the CCU at Moi Teaching and Referral Hospital (MTRH), and to compare 30-day outcomes between patients with and without arrhythmias at the time of CCU admission.

Methods: We conducted a prospective study of a cohort of all patients admitted to MTRH-CCU between March and December 2021. They were stratified on the presence or absence of arrhythmia at the time of CCU admission, irrespective of whether it was the primary indication for CCU care or not. Clinical characteristics were collected using a structured questionnaire. Participants were followed up for 30 days. The primary outcome of interest was 30-day all-cause mortality. Secondary outcomes were 30-day all-cause readmission and length of hospital stay. The 30-day outcomes were compared between the patients with and without arrhythmia, with a p value < 0.05 being considered statistically significant.

Results: We enrolled 160 participants. The median age was 46 years (IQR 31, 68), and 95 (59.4%) were female. Seventy (43.8%) had a diagnosis of arrhythmia at admission, of whom 62 (88.6%) had supraventricular tachyarrhythmias, five (7.1%) had ventricular tachyarrhythmias, and three (4.3%) had bradyarrhythmia. Atrial fibrillation was the most common supraventricular tachyarrhythmia (82.3%). There was no statistically significant difference in the primary outcome of 30-day mortality between those who had arrhythmia at admission versus those without: 32.9% versus 30.0%, respectively ($p = 0.64$).

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Conclusion: Supraventricular tachyarrhythmias were common in critically hospitalized cardiac patients in Western Kenya, with atrial fibrillation being the most common. Thirty-day all-cause mortality did not differ significantly between the group admitted with a diagnosis of arrhythmia and those without.

INTRODUCTION

Arrhythmias are common among critically ill cardiac patients and are associated with increased morbidity and mortality [1–3].Click or tap here to enter text. They may be the primary reason for admission or may occur among admitted critically ill patients [4]. Click or tap here to enter text. In patients with structural heart disease, arrhythmias are not only a marker but also a predictor of both severity and adverse outcomes [5]. Click or tap here to enter text. However, most available data are from high-income countries (HIC).

Data on arrhythmias in Africa are limited [6–8], Click or tap here to enter text. however, the few available studies in outpatient settings show a wide discrepancy in the diagnosis and care of arrhythmias in comparison with HICs, which contributes to differences in both the types and outcomes of arrythmias that may be seen in this setting [9, 10]. Click or tap here to enter text. Atrial fibrillation (AF) is the most common type of arrhythmia worldwide among both the general population and the critically ill [11–13]. Click or tap here to enter text. Notably, data from outpatient settings in Africa reveal inadequate care of patients with AF in comparison to the other continents [14–16]. Click or tap here to enter text. Pacing, which is important for survival among patients with brady-arrhythmias is not widely available [17–19]. Click or tap here to enter text. Further, in centers where pacing is available, the pacing devices are costly, and this is compounded by a scarcity of human resources [20]. Click or tap here to enter text. In addition, there is poor response and inadequate reporting on sudden cardiac death (SCD) that is thought to occur after a ventricular arrhythmia [21–24]. Click or tap here to enter text. There is, however, a need for data on the burden of other arrythmias in the inpatient setting and their impact on clinical outcomes in our African setting.

Whereas previous studies done in Africa focused on specific arrhythmias in an outpatient set up [16, 25, 26], Click or tap here to enter text. this prospective study looked at all the types of arrhythmias and the 30-day outcomes in a cardiac care unit.

METHODS

STUDY POPULATION AND DESIGN

This was a prospective observational cohort study that was conducted in the CCU at MTRH, which is the only tertiary hospital in Western Kenya and the second largest referral Hospital in Kenya. After enrollment, the participants were followed up for 30 days or until death, whichever occurred first.

STUDY PROCEDURE

After receiving approval from the Institutional Research and Ethics Committee of Moi University School of Medicine and MTRH (approval no: 0003766), all adult patients admitted to the CCU during the study period and having provided written informed consent, were consecutively recruited until a target sample size of 160 participants was achieved. We excluded patients who were unable/declined to consent, those who had undergone cardiopulmonary resuscitation within the prior 24 hours and those who were admitted for elective procedures. Each participant's admission 12-lead ECG tracing was interpreted by the admitting cardiology fellow and confirmed by an attending cardiologist (CA, WS and FB). The participants were then stratified on the presence or absence of sustained arrhythmia irrespective of whether it was the primary indication for CCU care or not. Sinus tachycardia or asymptomatic sinus bradycardia of more than 40 beats/minute, premature supraventricular and ventricular contractions were excluded from arrhythmia diagnosis. Other variables that were collected included: demographics, clinical characteristics, admission diagnosis as per primary clinician, cardiac structure and function based on echocardiography results, clinical management, and laboratory findings.

The arrhythmias were classified broadly into ventricular tachyarrhythmias, supraventricular tachyarrhythmias, and bradyarrhythmia. Hemodynamic stability was dichotomized at admission. Arrhythmias were managed as per established guidelines or at the discretion of the attending cardiologist. The primary outcome was 30-day all-cause mortality, and the secondary outcomes were length of hospital stay and all cause readmission within 30 days after enrollment.

Participants were reviewed daily while in the hospital and a follow-up phone call was made at least weekly after discharge until death or up to 30 days after the recruitment, whichever occurred first. The length of hospital stay was defined as the entire hospital stay, and therefore included any time spent in the general medical wards. An ECG was obtained on discharge to establish if there was resolution of the arrhythmia. In case of a readmission within 30 days, a copy of the discharge summary was obtained and the reason for readmission was documented. For any reported mortality, a copy of the death certificate was obtained; if not possible, we sought confirmation of death from the area chief or sub-chief.

DATA ANALYSIS

Data was entered into a Red Cap database and analyzed using STATA version 15 and RGUI version 4.1.1. Descriptive statistics such as frequencies and proportions were used for categorical variables while means and medians and associated standard deviation and interquartile range were used for continuous variables. Cross-tabulation tables were used to describe patients' profiles and outcomes by arrhythmia status at admission. Survival analysis was used to model mortality and presented using Kaplan-Meier curves. We also conducted multivariate analysis to assess factors associated with 30-day mortality.

RESULTS

A total of 227 patients admitted to MTRH-CCU between March and December 2021 were screened, and 160 patients were enrolled consecutively into the study. A total of 70 (43.7%) had a diagnosis of arrhythmia at admission. All patients were followed up for 30 days (Figure 1).

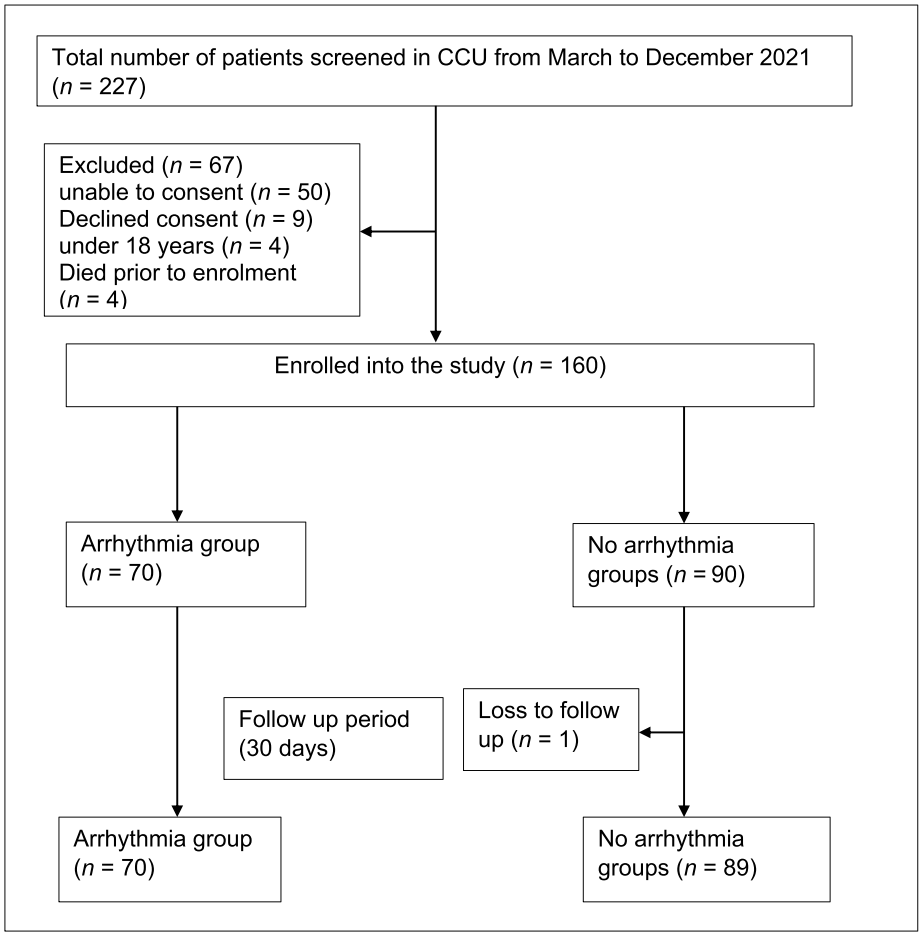

Figure 1 Flow diagram showing study recruitment schema.

The median age of the patients was 46 (IQR = 31, 68). Most of the participants were female (59.4%), with a lower proportion of males in the arrhythmia group (31.4%) compared to the no arrhythmia group (47.8%) (p value = 0.04). A significantly high proportion of patients with arrhythmia had a history of known rheumatic heart disease (RHD) compared to those without arrhythmia [34.3% versus 3.3%, p value < 0.001]. The patients' characteristics are presented in Table 1. At admission, RHD was the most common underlying structural heart disease in the arrhythmia arm (50%) while cor pulmonale and uncharacterized dilated cardiomyopathy were frequent in the no arrhythmia arm (Table 2).

Table 1 Patients' characteristics.

PARTICIPANTS' BASELINE CHARACTERISTICS	ALL	ARRHYTHMIA		*P* VALUE
	N = 160	YES (*N* = 70)	NO (*N* = 90)	
Median age in years (IQR)	46 (31, 68)	46 (29, 70)	46 (31, 63)	0.873
Female gender—*n* (%)	95 (59.4)	48 (68.6)	47 (52.2)	0.037
Heart failure at admission—*n* (%)	137 (85.6)	62 (88.6)	75 (83.3)	0.349
NYHA Class				0.195
I	12 (8.8)	3 (4.8)	9 (12.0)	
II	34 (24.8)	13 (21.0)	21 (28.0)	
III	73 (53.3)	35 (56.5)	38 (50.7)	
IV	18 (13.1)	11 (17.7)	7 (9.3)	
Medical history—*n* (%)				
Heart failure	80 (50)	41 (58.6)	39 (43.3)	0.056
Hypertension	28 (17.5)	11 (15.7)	17 (18.9)	0.6
Rheumatic heart disease	27 (16.9)	24 (34.3)	3 (3.3)	<0.001
Arrhythmia	18 (11.2)	18 (25.7)	0 (0.0)	<0.001
Diabetes mellitus	8 (5)	2 (2.9)	6 (6.7)	0.273
Stroke	2 (1.2)	1 (1.4)	1 (1.1)	0.858
Ischemic heart disease	1 (0.6)	1 (1.4)	0 (0.0)	0.255
Kidney disease	1 (0.6)	1 (1.4)	0 (0.0)	0.255
Thyroid disease	1 (0.6)	0 (0.0)	1 (1.1)	0.376
On oral anticoagulation	21 (13.1)	13 (34.2)	6 (15.8)	0.064
Implantable cardioverter defibrillator	0	0	0	0
Family and social history—*n* (%)				
Smoking history	18 (11.2)	8 (11.4)	10 (11.1)	0.95
Alcohol use	43 (26.6)	13 (18.6)	30 (33.3)	0.037
Indoor air pollution	73 (45.6)	37 (52.9)	36 (40.0)	0.105
Family history of sudden cardiac death	1 (0.6)	1 (1.4)	0 (0.0)	0.255
Nutrition status—*n* (%)				0.247
Underweight	35 (23.3)	20 (31.2)	15 (17.4)	
Normal	76 (50.7)	30 (46.9)	46 (53.5)	
Overweight	29 (19.3)	10 (15.6)	19 (22.1)	
Obese	10 (6.7)	4 (6.2)	6 (7.0)	
Vital signs at admission—median (IQR)				
SBP	110 (90, 120)	100 (90, 120)	110 (92, 130)	0.127
DBP	69.5 (60, 80)	60 (60, 80)	70 (60, 80)	0.071
Heart rate	102 (85, 121)	113 (89.7, 138.2)	95.5 (84, 110.7)	0.002
Temperature	36.3 (36, 36.5)	36.2 (36, 36.6)	36.3 (36.1, 36.5)	0.791

(Contd.)

PARTICIPANTS' BASELINE CHARACTERISTICS	ALL	ARRHYTHMIA		*P* VALUE
	N = 160	YES (*N* = 70)	NO (*N* = 90)	
Respiratory rate	23 (20, 28)	24 (20, 28.7)	22 (20, 27)	0.293
SPO2	94 (91, 96)	95 (91, 97.2)	93 (92, 96)	0.083
Baseline lab parameters—mean (*SD*)				
Serum creatinine—umol/L	128 (100.7)	133 (100)	124 (101.6)	0.574
Urea—mmol/L	11.6 (9.74)	12.7 (10.9)	10.7 (8.7)	0.209
WBC—$10^{9/L}$	9.9 (14.97)	11.7 (22.1)	8.5 (4.9)	0.199
Hemoglobin—g/dL	13.3 (10.63)	14.5 (15.9)	12.4 (2.5)	0.222
Platelets—$10^{9/L}$	228 (100.3)	217 (104.1)	236 (97.1)	0.249
Potassium—mmol/L	4.7 (1.07)	4.7 (1.1)	4.6 (1)	0.534
Sodium—mmol/L	131 (11.7)	131 (9.2)	131 (13.4)	0.843
Albumin (g/L)	32 (6.6)	33 (6.7)	31.7 (6.5)	0.178
RBS—mmol/L	6.6 (3.42)	6.7 (3.7)	6.6 (3.2)	0.912
TSH—uMU	3.7 (4.88)	4.6 (6.5)	3.2 (3.6)	0.328
COVID-19 Positive—*n* (%)	16 (10)	3 (4.3)	13 (14.4)	0.1
Requiring vasoactive medicine at admission—*n* (%)	50 (31.2)	27 (38.6)	23 (25.6)	0.078
Norepinephrine	30 (18.8)	22 (31.4)	9 (10.0)	
Dobutamine	19 (11.9)	17 (24.2)	21 (23.3)	
Milrinone	1 (0.6)	0 (0)	1 (0.01)	
Left ventricular ejection function—*n* (%)				
≥50%	80 (50)	34 (48.6)	46 (51.1)	0.153
>40–<50%	29 (19.0)	17 (24.3)	12 (13.3)	
≤40%	44 (28.8)	18 (25.7)	26 (28.9)	
Not available (NA)	7 (4.4)	1 (1.4)	6 (6.7)	
Diastolic dysfunction—*n* (%)	27 (17.8)	7 (10.3)	20 (23.8)	0.03
Right ventricular function				
Normal	73 (47.7)	27 (39.1)	46 (54.8)	0.13
Mildly reduced	12 (7.8)	6 (8.7)	6 (7.1)	
Moderately reduced	22 (14.4)	9 (13.0)	13 (15.5)	
Severely reduced	46 (30.1)	27 (39.1)	19 (22.6)	

ADMISSION DIAGNOSIS—*N* (%)	ARRHYTHMIA	
	YES (*N* = 70)	NO (*N* = 90)
Rheumatic heart disease (RHD)	35 (50)	11 (12.2)
Ischemic cardiomyopathy (IHD)	2 (2.9)	10 (11.1)
Cor pulmonale	3 (4.3)	12 (13.3)
Other cardiomyopathy	9 (12.9)	4 (4.4)
Pericardial disease	1 (1.4)	6 (6.7)
Congenital heart disease	3 (4.3)	1 (1.1)
Uncharacterized dilated cardiomyopathy	6 (8.6)	12 (13.3)
Hypertensive heart disease	6 (8.6)	10 (11.1)
Alcoholic dilated cardiomyopathy	1 (1.4)	7 (7.8)
Peripartum cardiomyopathy	1 (1.4)	6 (6.7)
Pulmonary embolism	0	5 (5.6)

Table 2 Admission diagnosis.

Among the patients with arrhythmia, 12 (17.1%) were hemodynamically unstable. The most common arrhythmia subtype was supraventricular tachycardia in 62 (88.6%) of the patients, mainly AF (82.3%). Five (7.1%) had ventricular tachyarrhythmias, and three (4.3%) had bradyarrhythmia. The different subtypes of arrhythmia identified are summarized in Figure 2. Of the patients with arrhythmias, 22 (31%) underwent electrical cardioversion/defibrillation and 35 (50%) of the patients receiving pharmacological therapy were managed with digoxin. At discharge, 13 (18.6%) of patients admitted with an arrhythmia were in sinus rhythm. During follow-up, new onset arrhythmia (supraventricular arrhythmia) developed among three patients in the no arrhythmia group (Table 3).

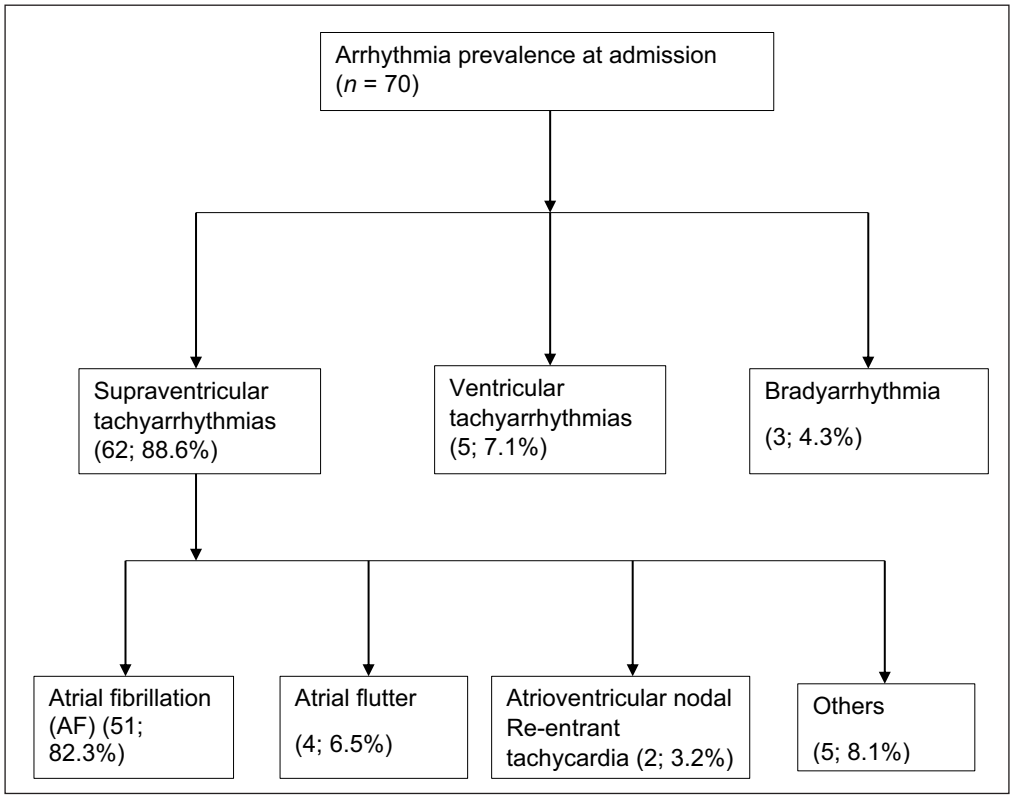

Figure 2 Types and proportion of cardiac arrhythmias.

PATIENT MANAGEMENT	FREQUENCY (%)
Electrical (synchronized/defibrillation)—*n* (%)	**22 (31)**
Medical therapy—*n* (%)	
Digoxin	35 (50)
Amiodarone	13 (18.6)
Metoprolol	4 (5.7)
Pacing—*n* (%)	**1 (1.4)**
Resolution of arrhythmias at discharge—*n* (%)	**13 (18.6)**
New onset arrhythmia in CCU—*n* (%)	
Supraventricular tachyarrhythmias	3 (0.03)
Bradyarrhythmia	0 (0)
Ventricular tachyarrhythmias	0 (0)

Table 3 Management among patients with arrhythmias and incidence of arrhythmias in CCU.

There was no significant difference in 30-day mortality among those with arrhythmia (23; 32.9%) compared to those without arrhythmia (27; 30.0%). The median length of hospital stay was higher in those without arrhythmia compared to those with arrhythmia [median = 9 (IQR = 6,14) vs median = 8 (IQR = 4,12), *p* value = 0.044]. The 30-day all-cause readmission was four (8.2%) in the arrhythmia group and one (1.5%) in the no arrhythmia group (*p* value = 0.087) (Table 4).

OUTCOME	ARRHYTHMIA (*N* = 70)	NO ARRHYTHMIA (*N* = 90)	*P* VALUE
Survival to 30 days—*n* (%)			0.638
Alive	47 (67.1)	62 (68.9)	
Dead	23 (32.9)	27 (30.0)	
Unknown	0	1 (1.1)	
Survival to discharge—*n* (%)			0.821
Alive	51 (72.7)	67 (74.4)	
Dead	19 (27.1)	23 (25.6)	
Length of stay—median (IQR)	8 (4,12)	9 (6,14)	0.044
30-day all-cause readmission—*n* (%)	4 (8.2)	1 (1.5)	0.087

Table 4 30-day outcomes among the patients.

The difference in 30 days mortality, and readmission between the arrhythmia group and the no arrhythmia group, was also not significant after stratification by gender. There was higher proportion of deaths among male patients with arrhythmias (Table 5). Overall mortality did not significantly differ between the two groups and most deaths occurred within 10 days (Figure 3). On multivariate analysis, the risk of mortality among those with LVEF 40%–50% was less compared to those with LVEF of >50% (HR = 0.36, 95% CI 0.13, 0.99: *p* value = 0.049). In addition, the mortality risk among those on vasoactive meds was greater than that of patients not on vasoactive meds (HR = 2.9, 95% CI 1.5, 5.8), *p* value = 0.002 (Table 6).

Table 5 30-day outcome stratified by gender among the participants.

VARIABLE	MALE			FEMALE		
	ARRHYTHMIA	NO ARRHYTHMIA	*P* VALUE	ARRHYTHMIA	NO ARRHYTHMIA	*P* VALUE
	N = 22	*N* = 43		*N* = 48	*N* = 47	
Survival to discharge—*n*(%)			0.232			0.609
Alive	15 (68.2)	36 (83.7)		35 (72.9)	32 (68.1)	
Dead	7 (31.8)	7 (16.3)		13 (27.1)	15 (31. 9)	
Survival to 30 days—*n* (%)						0.474
Alive	15 (68.2)	34 (79.1)		32 (66.7)	28 (59.6)	
Dead	7 (31.8)	8 (18.6)		16 (33.3)	19 (40.4)	
Unknown	0 (0)	1 (2.3)		0 (0)	0 (0)	
Length of stay—median (IQR)			0.819			0.04
	8.5 (7.25, 16.75)	11 (5.3, 17.5)		7 (4, 10)	9 (6.1, 13.25)	
30-day all-cause readmission—*n* (%)			0.123			0.365
Yes	1 (6.7)	0 (0)		3 (8.8)	1 (3.3)	

DISCUSSION

In a public sector CCU in Western Kenya, we detected a relatively high prevalence of arrhythmia upon admission to the CCU. Supraventricular tachyarrhythmias were the most common, with AF constituting the majority. In contrast to our a priori hypothesis, the primary outcome of all-cause mortality was similar between the patients who were admitted with a diagnosis of arrhythmia and those without. However, despite being relatively young, both groups had a high 30-day mortality rate of 30% or more. To the best of our knowledge, this is the first study looking at a population of CCU patients in Africa with a fairly large sample size and good follow-up.

The high prevalence of arrhythmia reflects the structurally distinct cardiac pathologies in SSA, where RHD is still an enormous burden, being more prevalent in younger and female patients [14, 16, 27, 28]. Click or tap here to enter text. In contrast, studies from HICs report a lower

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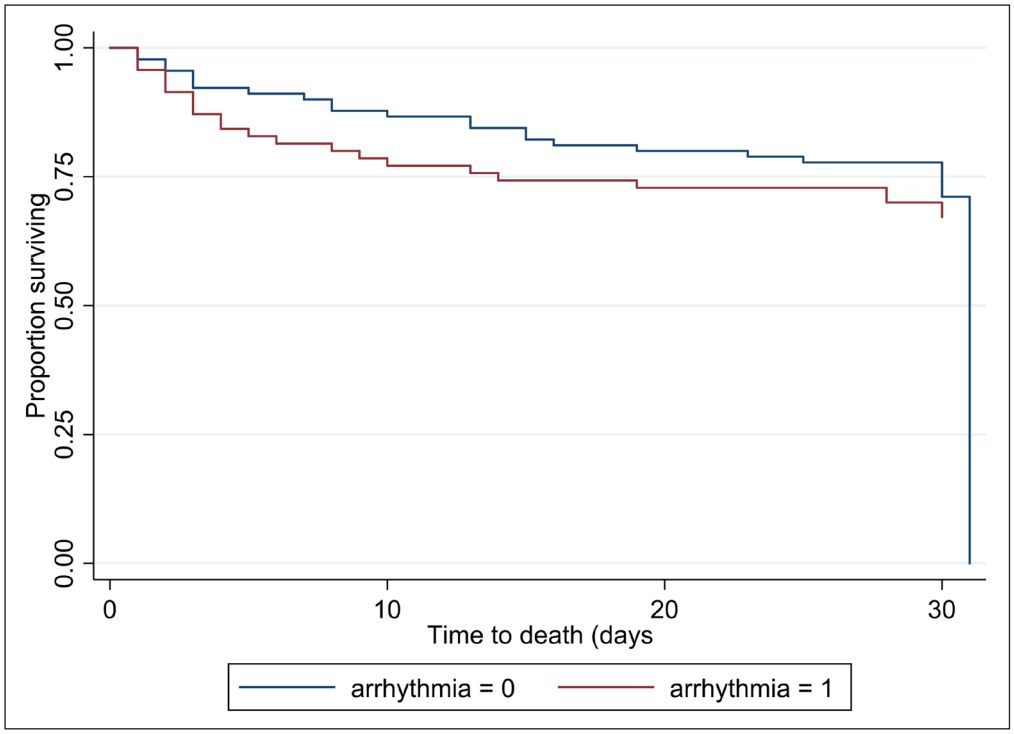

Figure 3 Kaplan-Meier curve showing overall 30 days survival by arrhythmia status at admission.

Table 6 Multivariate analysis of factors associated with 30-day mortality.

VARIABLE	HAZARD RATIO	*P* VALUE	LOWER LIMIT [95% CONF.	UPPER LIMIT INTERVAL]
Arrhythmia (yes vs no)	1.096	0.813	0.513	2.344
Age	1.001	0.883	0.984	1.019
Gender (female vs male)	1.496	0.294	0.705	3.176
Heart failure present (yes vs no)	0.775	0.688	0.223	2.69
NYHA (3,4 vs 1,2)	1.844	0.174	0.763	4.455
RHD present (yes vs no)	1.118	0.843	0.371	3.368
HTN present (yes vs no)	0.568	0.31	0.191	1.692
History of arrhythmia (yes vs no)	0.844	0.741	0.308	2.308
LVEF >40–<50% vs >50%	0.358	**0.049**	0.129	0.997
LVEF ≤40% vs >50%	0.463	0.137	0.168	1.277
LVEF NA vs >50%	0.864	0.826	0.236	3.169
Valvular (NA vs mild/normal)	1.550	0.346	0.622	3.860
Valvular (moderate/severe vs mild/ normal)	1.548	0.314	0.661	3.627
Vasoactive meds (yes vs no)	2.924	**0.002**	1.486	5.754
RV function (moderate/severe vs mild/ normal)	1.431	0.352	0.672	3.046
Creatinine (abnormal vs normal)	1.472	0.314	0.694	3.123
Urea (abnormal vs normal)	1.943	0.085	0.912	4.138
Sodium (abnormal vs normal)	0.865	0.693	0.42	1.781
Albumin (abnormal vs normal)	0.59	0.123	0.301	1.153

prevalence of arrhythmia. For example, in two multicenter studies, the prevalence was 10% in the Tokyo CCU registry and 17.1% in the North American study [4, 29]. Click or tap here to enter text.A recent systematic review reported a rising prevalence of arrhythmia in SSA [30]. This may reflect either a true rising prevalence or improved diagnostic capacity. For example, the Pan African Society of Cardiology (PASCAR) initiatives have led to improved training of personnel and pacing activities in SSA [17]. Click or tap here to enter text. Nevertheless, our findings indicate the need for screening for arrhythmias in patients with a critical illness.

Supraventricular tachyarrhythmias were the most common (88.6%) among patients with arrhythmia, with AF representing the majority at 82.3%. Similar to our cohort, a multicenter study of patients with AF in Africa and the Middle East showed it mainly affected young females [31]. Click or tap here to enter text. In THESUS-HF study, the prevalence of AF among hospitalized heart failure patients was lower and varied from 7.7% to 18.3% [32]. Click or tap here to enter text.However, their population was older and gender-balanced compared to this study. None of the studies in the African region were conducted in cohorts of critically ill patients. Compared with HICs whose population is older, our study revealed a high burden of AF [2, 4].Click or tap here to enter text. Various reasons might account for the higher prevalence of AF in SSA. First, the majority of our study cohort with AF had RHD, which is still quite prevalent in Western Kenya [14, 16]. Click or tap here to enter text. Second, there is high prevalence of permanent AF in SSA, which is likely related to not only the tendency of clinicians to opt for rate control strategies even in cases of new onset AF [25, 26, 33], Click or tap here to enter text. but also the lack of access to catheter ablation. Only 18.6% of all patients with arrhythmias were discharged in sinus rhythm. Additionally, paroxysmal AF has been shown to progress to permanent AF [45–47], and it is likely that underdiagnosis and/or inadequate management in SSA can lead to higher rate of progression to permanent AF. Finally, aging and urbanization are associated with rising cases of comorbidities associated with AF [34]. Click or tap here to enter text. While there is reported higher prevalence of supraventricular tachyarrhythmias in HICs, data in SSA are lacking [30]. Click or tap here to enter text.

Ventricular tachyarrhythmias comprised 7.1% of those who had a diagnosis of arrhythmia. We found a lower prevalence of ventricular tachyarrhythmias than the studies from HICs; among those who had arrhythmia, the prevalence of ventricular tachyarrhythmias was 25% in the Tokyo registry and 16.9% in Puerto Rico [1, 3, 4]. Click or tap here to enter text. In SSA, we found no studies reporting the prevalence of ventricular arrhythmias; however, few studies have reported the incidence of SCD which can occur after ventricular arrhythmia [24, 35, 36]. Click or tap here to enter text. A population-based survey of SCD in Cameroon found an incidence rate of 24.2/100,000 person year [37]. Click or tap here to enter text. Hence, the lower prevalence in SSA may be due to underdiagnosis leading to sudden deaths in the community, which are likely underreported and under investigated, or a lower burden of ischemic heart disease [20, 35].Click or tap here to enter text. illustrative of this, none of our patients had an implanted ICD prior or during their hospital stay.

Bradyarrhythmia was the least common of all arrhythmia, constituting only 4.3% which was mostly due to AV block and was lower than 27% prevalence in the Tokyo registry [4]. Click or tap here to enter text. Although the prevalence of bradyarrhythmia in Africa is unknown [6], Click or tap here to enter text. previous studies have found that AV block is the most common indication for pacing in SSA [15, 19, 38]. Click or tap here to enter text. Cardiac conduction abnormalities can cause heart failure and SCD resulting from extreme bradycardia [7]. Click or tap here to enter text. The PASCAR survey established inadequate diagnostic and treatment services for arrhythmias in SSA [23]. Click or tap here to enter text. Hence, underdiagnosis and SCD prior to pacing may explain the lower prevalence in this study.

The presence of an arrhythmia at admission had no significant impact on the primary outcome of 30-day all-cause mortality, in contrast to those from HICs, which have reported higher mortality among patients with arrhythmias [3, 39–41]. Click or tap here to enter text. Our findings may reflect prompt diagnosis and better management for patients with arrhythmias given that it is an academic center with a highly trained dedicated staff establishment. We also postulate that differences in the common underlying heart disease between the two groups may be in play. Cor pulmonale and cardiomyopathies were more common in the no arrhythmia group. Cor pulmonale tends to be more common in the elderly, while cardiomyopathies are associated with poorer outcomes [32, 42]. Click or tap here to enter text. Further, there were more males in the no arrhythmia group who on subgroup analysis appeared to do worse in terms of outcomes. In addition, the study was also conducted during the COVID-19 pandemic, a period that saw patients delay presentation to the hospital which might have increased their overall mortality risk. On multivariate analysis, the use of vasoactive agents was significantly associated with increased 30-day mortality, similar to prior studies [29, 39]. Click or tap here to enter text.

Although the 30-day duration of follow-up was short, many similar studies have used a similar period [3, 39, 43], Click or tap here to enter text. thus our results may be best comparable to these studies. Sub-analysis of the outcomes based on arrhythmia subtypes was not feasible given the small number of the ventricular arrhythmias and bradyarrhythmia. We also had a very low incidence of tachyarrhythmias in our study. Hence, despite the above observations on overall mortality, the short duration of follow-up and the small sample size preclude firm conclusions but build a foundation for our future studies.

Of the secondary outcomes, we found a significant yet marginal increase in the length of stay among patients without arrhythmia of one day. This finding contrasted a systematic review that identified arrhythmia as one of the factors associated with increased length of stay in the ICU [44]. Click or tap here to enter text. Notably, in addition to having a higher proportion of cor pulmonale and cardiomyopathies as mentioned earlier, more patients in the no arrhythmia group were diagnosed with COVID-19, which may have impacted their length of stay.

STUDY LIMITATIONS

We acknowledge that our study is not without limitations. First, this study was done in a specialized cardiac care unit in a tertiary referral center which limits its generalizability to other settings. Second, this being an observational study, we cannot fully control confounders and patients were not matched at enrollment. Third, the mortality in our study in the no arrhythmia group was higher than the hypothesized value, which might have lowered the power to detect the mortality difference between the two groups. Fourth, arrhythmias were not classified as new or preexisting or analyzed by the subtypes due to the small numbers, which may have led to different conclusions. Fifth, paroxysmal arrhythmias may have been misclassified since history of arrhythmia was not factored in the patient assignments. Finally, the high prevalence of AF in our population limits the extrapolation of our findings to populations with different arrhythmia prevalence.

CONCLUSIONS

Supraventricular tachyarrhythmias were common in critically hospitalized cardiac patients in Western Kenya, with AF constituting the majority. Thirty-day all-cause mortality was moderately high and did not differ between the group admitted with a diagnosis of arrhythmia and those without. Future multicenter studies with larger sample sizes, baseline matching and longer follow-up are required in Africa to further characterize the impact of arrhythmia in critically ill patients with cardiac disease.

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COMPETING INTERESTS

The authors have no competing interests to declare.

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Conceptualization: JK, FB, CA, WS, RV

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