ORIGINAL RESEARCH

Predictors of early mortality following cardiac surgery for rheumatic heart disease at a national referral hospital in Dar es Salaam, Tanzania: A retrospective study

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Abstract

Background
Rheumatic heart disease (RHD) is endemic in Tanzania and is ranked third among the most common causes of heart failure after hypertensive heart disease and cardiomyopathy. This study aimed to determine the predictors of early operative mortality for RHD at Muhimbili National Hospital, Tanzania.

Methods
In this retrospective cross-sectional study, 212 patients operated on due to RHD from May 2008 to December 2012 were included. The patients' demographic and clinical data at admission and within 30 days of their respective index elective cardiac procedures were recorded in a predefined clinical record form. The chi-square test and Fisher's exact test were used to compare categorical variables. Variables with a *P* value <0.2 in the bivariable analysis were included in a multivariable modified Poisson regression model.

Results
Of the 212 patients, 140 (66%) were females. The median age was 21 years (interquartile range, 15-32 years). One hundred forty-five patients (68.4%) underwent valve replacement, of which 113 (77.9%) were single (mitral), 17 (11.7%) aortic, and 15 (10.4%) double (aortic and mitral) valve replacements. Valve repair was performed on 42 patients (19.8%), 41 of whom had mitral repairs and 1 of whom had an aortic repair. Surgical mitral commissurotomy was performed on 25 patients (11.8%). Thirty patients (14.1%) died in hospital. In multivariable analysis, mortality was >5 times higher among patients who underwent double than single valve replacement (adjusted prevalence ratio, 5.65; 95% confidence interval, 2.46-12.99; *P*<0.001). Patient age, disease duration, ejection fraction, surgical modality, pulmonary hypertension, and intensive care unit stay were not predictors of mortality.

Conclusions
The in-hospital mortality observed in this study was higher than those reported in previous studies. In patients with RHD, double valve replacement is associated with increased early mortality, which may require greater technical expertise and careful postoperative management. Our findings need to be confirmed in prospective studies.

Keywords: predictors, early mortality, rheumatic heart disease, cardiac surgery, intensive care unit, Tanzania

Introduction

Rheumatic heart disease (RHD) is a significant cause of cardiac morbidity and mortality among children and young adults, affecting an estimated 15.6 million people yearly and responsible for up to 300 000 deaths each year worldwide.[1] The disease is prevalent in developing countries, including sub-Saharan Africa, where the prevalence is as high as 1 to 3 for every 100 school children.[2],[3] The most common clinical presentations are heart failure, pulmonary hypertension (PHT), atrial fibrillation, stroke, and infective endocarditis, all of which signify late presentation of patients to health facilities and/or delayed management.[4],[5] Some patients present too late to be candidates for valvular interventions.[6]-[8] In studies conducted in Uganda, about 50% of newly diagnosed RHD patients presented with complications.[9],[10]

Guidelines for the management of valvular heart diseases recommend valve surgery for clinically significant valve lesions.[11],[12] However, in developing countries, most patients are likely to be managed conservatively. Zhang et al.[13] reported that of 551 patients evaluated from the Uganda RHD Registry, 398 (72.3%) required invasive intervention, with 332 (60.3%) needing surgery. Yet, only 153 patients (27.7%) were managed medically. In contrast, 498 patients (90.4%) were on medical treatment. Of the 60.3% requiring surgery, only 44 (8.0%) underwent valvular surgery. Given that the treatment for advanced forms of RHD is cardiac surgery, policymakers need to improve access to cardiac surgery and ensure the simultaneous availability, affordability, and accessibility of medications for treating RHD complications, such as heart failure.[14]-[18]

Several factors are known to affect the outcome of cardiac surgery for RHD.[8],[19]-[24] The preoperative cardiac status of the patient, such as advanced age, New York Heart Association (NYHA) class III to IV, PHT, left ventricular ejection fraction (LVEF) <50%, and a large left atrium, have been found to be predictors of mortality.[22],[25],[26] Intraoperative predictors of early mortality include the duration of the aortic cross-clamp, total surgical time, and cardiopulmonary bypass.[19],[22]-[24],[26] Double valve replacement (DVR), although technically difficult, offers excellent symptomatic relief and better late survival, similar to that of single valve replacement (SVR).[22],[23] This is important to recognize because, in regions with a high prevalence of RHD, approximately 50% of patients have multivalvular involvement.[27],[28] Postoperatively, low cardiac output syndrome, bleeding, thromboembolism, sepsis, and prosthesis-related complications are among the predictors of mortality.[19],[21],[24],[29] Although the decision to repair or replace a rheumatic mitral valve is controversial,[30] recent[31[,[32] and earlier[8],[33],[34] publications have demonstrated that repair is superior to replacement in terms of mortality and valve-associated complications. A recent review reported that mitral valve repair may only outperform replacement in carefully selected patients, as progressive valve deterioration and calcification may result in valves that are not optimally repairable.[35]

This study aimed to report the predictors of early mortality in a relatively large sample of 212 RHD patients who underwent cardiac surgery at Muhimbili National Hospital (MNH) over a period of 4 years.

Methods

Study design, subjects, and setting

This was a retrospective, cross-sectional study of 212 patients admitted to MNH, between May 2008 and June 2012, for cardiac surgery due to RHD. MNH is a tertiary referral and teaching hospital located in Dar es Salaam, the largest commercial city in Tanzania, with a population of nearly 5 million in 2012.[36] The MNH cardiac unit used to receive referred cardiac patients from all regions of Tanzania. Open-heart surgery started at MNH in May 2008. Patients referred for assessment and listing for open-heart surgery were initially admitted to medical wards and were cared for in the hospital's intensive care unit (ICU) and cardiac wards perioperatively. Since 2018, cardiac surgery has been performed at the Jakaya Kikwete Cardiac Institute.

Data collection procedures

Data were collected from medical ward admission books, operation books, and patient files from the hospital's medical records. Information obtained was recorded on a predefined clinical record form comprising social demographics (age, sex, level of education, marital status, residential area, and employment); history and physical findings (symptoms and signs, duration of symptoms, comorbidities, and a diagnosis made); and investigations (chest X-ray, echocardiogram, electrocardiogram, and laboratory tests). Certified cardiologists performed echocardiograms on all recruited patients. Before surgery, the valve team held a clinical meeting to discuss each patient and reach a consensus for the operation. The hospital operates on RHD patients following guidelines for the management of valvular heart disease.[11],[12] Patients with RHD who underwent cardiac surgery for other cardiac conditions were omitted. We also excluded patients with missing pulmonary arterial pressure records.

Operative technique

Local cardiac surgeons performed all procedures on an elective basis. The general approach to surgery was median sternotomy with aortocaval (mitral/double valve procedures) or aortic and 2-stage cavoatrial cannulation (isolated aortic valve surgery) for cardiopulmonary bypass; cooling to 30°C to 32°C; antegrade (mitral valve operations); and coronary ostial (multiple/aortic valve procedures) St. Thomas' Hospital solution cardioplegia administration every 20 to 25 minutes. The Sondergaard groove was used to approach the mitral valve, and a J incision into the noncoronary cusp was made for aortic valve operations. An interrupted suture technique was used to secure the prosthetic valves. Mechanical heart valves were used for patients who underwent valve replacement.

Bilateral commissurotomy with chord-papillary muscle preservation was the manoeuvre for open mitral valvotomy. Mitral valve repair was accomplished by the application of an

annuloplasty ring, posterior mitral leaflet augmentation, and chordal splitting. For closed mitral valvotomy, the left atrial appendage was approached through the left anterolateral thoracotomy at the fourth intercostal space. The appendage was opened, and the index finger was introduced through the opening onto the stenotic mitral valve for dilatation.

Follow-up

We recorded the type and number of valve procedures performed, the duration of stay in the ICU, postoperative echocardiography, postoperative complications (surgical site infection, thromboembolism, endocarditis, anticoagulant-related bleeding), the duration of in-hospital stay, and mortality at 30 days.

Definitions

In this study, PHT from echocardiography measurements was defined as right ventricular systolic pressure >35 mmHg as determined by the peak systolic gradient across the tricuspid valve regurgitation.[37] PHT was classified as mild (35-50 mmHg), moderate (50-70 mmHg), and severe (>70 mmHg). Early (operative) mortality was defined as death (in-hospital) within 30 days after the index elective cardiac surgery, as recommended by the guidelines for reporting morbidity and mortality after cardiac valvular operations of the American Heart Association for thoracic and cardiovascular surgery.[38] SVR was defined as the replacement of the mitral valve alone, while DVR was the combined replacement of the mitral and aortic valves.

Data management and analysis

The collected data were checked for quality, and coding was done before entry. Two different individuals entered the data twice, and checks were performed to ensure no double entry or incorrect entry occurred. The analysis was conducted using the SPSS Statistics for Windows, version 24.0 (IBM Corp., Armonk, NY, USA) and Stata 13 (StataCorp, College Station, TX, USA). The factors analysed as predictors of mortality included the duration of disease, age, sex, employment, LVEF, type of valvular lesion, PHT, the modality of surgery, the number of replaced valves, and the duration of ICU stay. Continuous data were presented as mean with standard deviation when distributed normally and as median with interquartile range (IQR) when skewed. Discrete data were expressed as counts and percentages. The chi-square test and Fisher's exact test were used to compare categorical variables. Variables with a *P* value <0.2 in univariable modified Poisson regression were included in the multivariable modified Poisson regression model. The factors analysed in the multivariable regression model included the duration of disease, age of the patient, LVEF, PHT, the modality of surgery, the number of replaced valves, and the duration of ICU stay. For each analysis, a *P* value <0.05 was considered statistically significant.

Ethical considerations

Ethical clearance to conduct the study was obtained from the research and publications committee of Muhimbili University of Health and Allied Sciences (Ref. No. MU/PGS/SAEC/Vol.VI). Permission to conduct the study at MNH was granted by the hospital.

Results

During the 4-year period from May 2008 to June 2012, a total of 285 RHD patients were admitted and assessed for eligibility for cardiac surgery at MNH. Of these, 240 (84.2%) had their pulmonary pressures recorded, with 212 (74.4%) being operated on. Twenty-eight patients were not operated on because they did not fulfil the criteria for surgery adhered to by the hospital.[11] Data on pulmonary arterial pressure was missing for 45 patients (15.8%), as shown in Figure 1.

The median age of the patients at the time of operation was 21 years (IQR, 15-32 years). Approximately half of the patients were under the age of 20 years. There were 140 females and 72 males, giving a female-to-male ratio of 2:1. The majority of patients (n=176, 83%) were unemployed, and 157 (74.1%) had attained primary education. About two-thirds of the patients resided outside of Dar es Salaam. The socio-demographic characteristics of the study population are presented in Table 1.

Regarding valvular lesions, 79 patients (37.3%) had pure mitral regurgitation, and 45 (21.2%) had mitral stenosis, respectively. Twenty-five patients (11.8%) had combined mitral regurgitation and mitral stenosis, while 27 (12.7%) had combined mitral and aortic valve regurgitation, as expressed in Figure 2.

The median duration of symptoms was 36 months (IQR, 12-72 months). Over 95% of the patients had normal white blood cell counts and haemoglobin levels. PHT was detected in 178 patients (84%). Most patients (n=182, 85.8%) had a normal LVEF. Valve replacement was performed on 145 patients (68.4%), of which 113 (77.9%) were mitral, 17 (11.7%) aortic, and 15 (10.4%) double (aortic and mitral) valve replacements. Valve repair was conducted on 42 patients (19.8%), with 41 mitral and 1 aortic. Surgical mitral commissurotomy was performed on 25 patients (11.8%), of which 5 were open and 20 were closed commissurotomies. De Vega

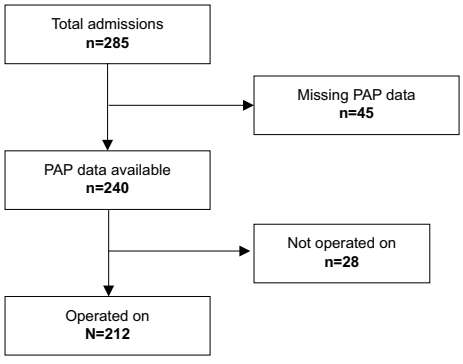

Figure 1. Participant inclusion flow diagram of patients with rheumatic heart dsease admitted to the cardiac unit at Muhimbili National Hospital in Dar es Salaam, Tanzania, between May 2008 and June 2012

PAP, pulmonary arterial pressure

Table 1. Sociodemographic characteristics of patients who underwent surgery for rheumatic heart disease at Muhimbili National Hospital in Dar es Salaam, Tanzania, between May 2008 and June 2012 (N=212)

Variable	Quantity
Age, median (IQR), years	21 (15-32)
Age group, years, n (%)	
<20	105 (49.5)
21-40	83 (39.2)
≥41+	24 (11.3)
Sex, n (%)	
Female	140 (66.0)
Male	72 (34.0)
Highest education level, n (%)	
None/informal	23 (10.8)
Primary	157 (74.1)
Secondary	32 (15.1)
Employment status, n (%)	
Employed	36 (17.0)
Not employed	176 (83.0)
Residence, n (%)	
Dar es Salaam	76 (35.8)
Other	136 (64.2)

IQR, interquartile range

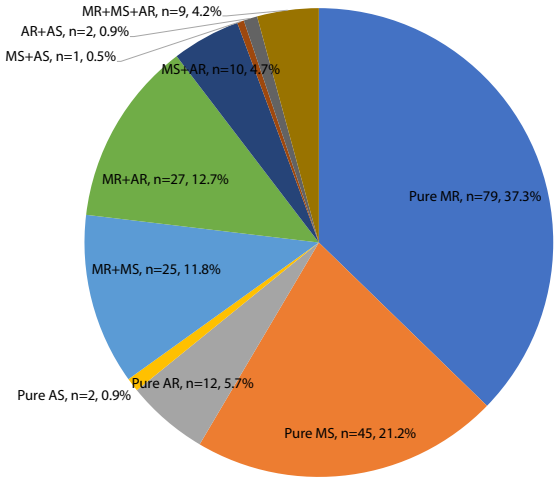

Figure 2. Categories of primary valvular lesions among patient with treated surgically for rheumatic heart disease at the cardiac unit of Muhimbili National Hospital in Dar es Salaam, Tanzania, between May 2008 and June 2012

AR, aortic regurgitation; AS, aortic stenosis; MR, mitral regurgitation; MS, mitral stenosis

tricuspid valve annuloplasty was performed on 56 patients (26.4%) and tricuspid ring annuloplasty on 26 (12.3%). Nearly one-third of the patients (n=62, 29.2%) stayed in the ICU for >5 days. The clinical characteristics of the patients are summarized in Table 2.

The in-hospital mortality rate was 14.1%, with 30 patients deceased, of which 22 deaths (73.3%) occurred in the ICU. Regarding demographic characteristics (Table 3), mortality was comparable between males and females (prevalence ratio [PR], 1.30; 95% confidence interval [CI], 0.66-2.54), between individuals with a longer duration (≥24 months) of symptoms (n=19, 16.4%) and those with a shorter duration (n=11, 11.5%) (*P*=0.241), between younger patients (<20 years of age, n=10, 9.3%) and those ≥20 years (n=20, 19.0%) (*P*=0.65), and between unemployed and employed patients (PR, 1.33; 95% CI, 0.49-3.59).

Patients with mitral regurgitation had comparable mortality to those without mitral regurgitation (PR, 1.13; 95% CI, 0.46-2.76) and patients with mitral stenosis compared to those without mitral stenosis (PR, 0.84; 95% CI, 0.43-1.64). Mortality was comparable between patients with and without PHT (PR, 2.67; 95% CI, 0.67-10.74). In terms of PHT severity, there were 14 deaths (22.6%) among patients with mild PHT, 8 (11%) among those with moderate PHT, and 6 (14%) among patients with severe PHT (*P*=0.122). Mortality was comparable between individuals with an LVEF ≥50% and those with LVEF <50% (PR, 0.21; 95% CI, 0.03-1.49). Patients who underwent valve repair had a higher mortality rate (n=10, 23.8%) than those who underwent valve replacement (n=19, 13.1%) or valvotomy (n=1, 4%) (*P*=0.080). Mortality was higher among patients who underwent DVR than SVR (PR, 4.39; 95% CI, 2.00-9.64) and among patients with a longer ICU stay (PR, 2.42; 95% CI, 1.26-4.65; *P*=0.007). There was no significant difference in mortality between patients with atrial fibrillation (n=7 deaths, 15.6%) and those without (n=10 deaths, 16.9%); neither was there a significant difference in this regard between those with a dilated left atrium (n=23 deaths, 14.0%) and those without (n=2 deaths, 10.5%). The only independent predictor of early mortality was having undergone double (compared to single) valve replacement, with an adjusted PR of 5.65 (95% CI, 2.46-12.99; *P*<0.001). The clinical characteristics predicting early mortality are shown in Table 3.

Discussion

This study revealed an in-hospital mortality rate of 14.1% (30/212). This finding is similar to that reported by Mishra et al.,[24] with a mortality rate of 11.3%, and lower than that reported by Nyawawa et al.[19] at 24%. However, other studies have reported lower mortalities, such as 2.5% by Pillai et al.,[39] 3.8% by Akhtar et al.,[23] 4% by Panda et al.,[22] and Sharma et al.,[40] 4.4% by Debel et al.,[21]

Table 2. Clinical characteristics of patients who underwent surgery for rheumatic heart disease at Muhimbili National Hospital in Dar es Salaam, Tanzania, between May 2008 and June 2012 (N=212)

Characteristic	Quantity
Symptom duration, median (IQR), months	36 (12-72)
Symptom duration categories, months, n (%)	
<24	96 (45.3)
24-60	46 (21.7)
≥60	70 (33.0)
White blood cell count, mean, ×10³/μL	7.02 (±2.60)
Abnormal WBC count, n (%)	11 (5.2)
Haemoglobin level, mean ± SD, g/dL	12.7±2.2
Anaemia, n (%)	10 (4.7)
Pulmonary pressure, mean ± SD, mmHg	50.0±16.6
Pulmonary hypertension, n (%)	178 (84)
Pulmonary arterial pressure grade, n (%)	
Normal	34 (16)
Mild	62 (29.2)
Moderate	73 (34.4)
Severe	43 (20.3)
LVEF, mean ± SD, %	54.9±6.8
Reduced LVEF, n (%)	30 (14.2)
Valve operation, n (%)	
Mitral valvotomy	25 (11.8)
Mitral/aortic valve replacement	145 (68.4)
Mitral/aortic valve repair	42 (19.8)
Number of replaced valves	
1	128 (88.3)
2	17 (11.7)
ICU stay duration, meant ± SD, days	5.2 (±3.1)
ICU stay ≥5 days, n (%)	62 (29.2)

ICU, intensive care unit; IQR, interquartile range; LVEF, left-ventricular ejection fraction; SD, standard deviation; WBC, white blood cell

8% by Gupta et al.,[26] and 9.2% by John et al.[29] The observed differences in mortality from these studies could be attributed to variations in the study population: DVR alone[22],[24]-[26],[29],[39]; DVR, aortic valve replacement, and SVR[19],[21],[23],[40]; and valve repair.[8],[9],[21] The experience of the operating surgeon[19],[21],[26] and technical issues may also account for the differences in mortality rates.[21],[26],[29] The mortality rate of 24% reported in the first year of RHD procedures after the initiation of cardiac surgery at MNH decreased over the subsequent 4 years.[19]

Our study showed that in RHD patients, DVR imposes a significantly higher early mortality than SVR. Similarly, Akhtar et al.[23] observed higher in-hospital mortality in the DVR group (4.2%) compared to the SVR group (3.5%), while Panda et al.[22] reported a mortality rate of 4%. In contrast, Sharma et al.[40] did not report any 30-day mortality from the DVR group, and Pillai et al.[39] reported it at a lower rate of 2.5%. The hospital mortality rate for DVR ranges from 5% to 15%.[22],[23] The notably higher mortality of 42% observed in our DVR group could be explained by several factors. First, our patients had a longer duration of symptoms, which could indicate more advanced disease, as was previously reported in a study done at the same institution where 80% of the patients presented in NYHA class III and IV at initial presentation.[19] Second, cardiac procedures were newly established at the hospital, suggesting that the skills and expertise of the operating team might have been developing. Third, our sample size was smaller compared to those of the cited studies. Lastly, there were differences in the study populations, with some studies including only DVR[22],[24]-[26],[29],[39]; others involved DVR, aortic valve replacement, and SVR[19],[21],[23],[40]; and valve repair.[8],[19],[21] DVR, although technically challenging, has been advocated as a standard surgical option for patients requiring surgery for combined rheumatic mitral and aortic valve disease.[22],[23] This is crucial to recognize because, in regions with a high prevalence of RHD, approximately 50% of patients have multivalvular involvement.[27],[28] Furthermore, these patients are young and present with severe disease at the time of surgery, making DVR a preferred surgical modality.

This study revealed higher mortality rates among patients younger than 20 years old compared to those older than 20 years of age. Contrarily, advanced age has been reported in several studies to predict mortality following cardiac surgery.[22],[25],[26] The increased mortality observed in younger individuals in our study could be attributed to the fact that RHD in developing countries often presents at an early age with already advanced disease.[4],[5]

Our patients had a median symptom duration of 36 months (IQR, 12-72 months). Mortality was higher among those with a longer duration of symptoms, which could suggest more advanced disease, as previously reported in a study at MNH where 80% of patients presented in NYHA class III and IV at presentation.[19] It can be postulated that the longer the disease duration, the higher the likelihood of myocardial tissue remodelling.

Our study reported a comparable mortality rate between patients with PHT and those without (15.7% vs 5.9%; *P*=0.176). Debel et al.[21] found that 3 out of 5 deaths in their cohort had severe PHT. Likewise, in the current study, mortality was comparable between patients with mild PHT and those with moderate and severe PHT. Other studies have reported a significant association between PHT and mortality after surgery for RHD.[22],[25],[26] However, most of these studies focused on the association of PHT with long-term mortality.

Table 3. Predictors of early operative mortality associated with rheumatic heart disease managed at Muhimbili National Hospital in Dar es Salaam, Tanzania, between May 2008 and June 2012 (N=212)

Variable	Total	Mortality, n (%)	Bivariable analysis		Multivariable analysis	
			PR (95% CI)	*P* value	Adjusted PR (95% CI)	*P* value
Sex						
Female	140	18 (12.9)	Reference			
Male	72	12 (16.7)	1.30 (0.66-2.54)	0.451		
Symptoms, months						
<24	96	11 (11.5)	Reference		Reference	
24-60	46	10 (21.7)	1.89 (0.87-4.15)	0.109	1.03 (0.33-3.27)	0.956
≥61	70	9 (12.9)	1.12 (0.49-2.57)	0.785	2.04 (0.65-6.39)	0.220
Age, years						
<20	105	20 (19.0)	Reference		Reference	
21-40	83	6 (7.2)	0.38 (0.16-0.90)	0.029	0.44 (0.15-1.29)	0.135
≥41	24	4 (16.7)	0.88 (0.33-2.33)	0.789	0.94 (0.28-3.15)	0.926
Employment						
Employed	36	4 (11.1)	Reference			
Not employed	176	26 (14.8)	1.33 (0.49-3.59)	0.574		
Mitral regurgitation						
No	72	7 (9.7)	Reference			
Yes	140	23 (16.4)	1.13 (0.46-2.76)	0.794		
Mitral stenosis						
No	122	20 (16.4)	Reference			
Yes	90	10 (11.1)	0.84 (0.43-1.64)	0.614		
Pulmonary hypertension						
No	34	2 (5.9)	Reference			
Yes	178	28 (15.7)	2.67 (0.67-10.74)	0.165		
LVEF <50%						
No	182	29 (15.9)	Reference		Reference	
Yes	30	1 (3.3)	0.21 (0.03-1.49)	0.118	0.20 (0.03-1.17)	0.075
Valve operation						
Mitral valvotomy	25	1 (4.0)	Reference			
Mitral valve/aortic valve replacement	145	19 (13.1)	3.28 (0.46-23.49)	0.238		
Mitral valve/aortic valve repair	42	10 (23.8)	5.95 (0.81-43.98)	0.080		
Number of replaced valves						
1	128	12 (9.4)	Reference		Reference	
2	17	7 (41.2)	4.39 (2.00-9.64)	<0.001	5.65 (2.46 12.99)	<0.001
ICU stay ≥5 days						
No	150	15	Reference		Reference	
Yes	62	15	2.42 (1.26-4.65)	0.007	1.36 (0.55 -3.38)	0.510

CI, confidence interval; ICU, intensive care unit; LVEF, left ventricular ejection fraction; PR, prevalence ratio

In our study, LVEF was not a predictor of early mortality, aligning with findings reported by Nyawawa et al.,[19] who concluded that suboptimal ventricular dysfunction alone should not contraindicate cardiac surgery. Nevertheless, our findings should be interpreted with caution due to the small number of patients with a low LVEF. This contrasts with other studies,[22],[25],[26] where an LVEF <50% was a predictor of mortality following cardiac surgery for RHD.

This study determined a mortality of 23.8% among patients who underwent valve repair compared to 13.1% for valve replacement and 4% for valvotomy. Nyawawa et al.[19] also reported that mitral valve repair accounted for 64.3% of all deaths, suggesting that it requires special consideration, especially in newly established cardiac surgery programmes where skills and expertise are still being developed. On the other hand, Debel et al.[21] found no deaths among patients who underwent mitral valve repair, attributing this to their cautious approach to valvular calcifications and the challenges of valve repair durability in resource-limited settings. Mitral valve repair has established benefits, offering better early and late survival and is particularly advantageous for patients who do not require oral anticoagulants.[33],[41] In sub-Saharan Africa, the management of patients with mechanical valves poses significant challenges due to the difficulties with anticoagulants and monitoring the International Normalized Ratio.[8],[42] However, the less-durable nature of valve repair and the challenge of revision operations in resource-constrained settings make its advocacy debatable. Recent reviews recommend that mitral valve repair for RHD should be considered in low- and middle-income countries, with several strategies proposed to increase exposure and training in rheumatic valve surgery, such as international collaboration, visits by cardiovascular surgeons, simulation teaching methods, and professional organization courses.[35]

Mortality was higher among patients with a longer duration of ICU stay, aligning with findings from previous studies where longer ICU stays were associated with higher mortality.[19] These studies suggested that a longer ICU stay was influenced by total surgical time and aortic cross-clamp duration. Other studies have also noted a significant association between mortality and surgical time, aortic cross-clamp duration, and cardiopulmonary bypass time.[22]-[24],[26] No differences were observed in terms of mean age, mean duration of symptoms, female sex, lower LVEF, PHT, or modality of surgery among patients with varying lengths of ICU stay, indicating that the duration of ICU stay may be influenced by intraoperative factors.[19]

Despite cardiovascular disease being the leading cause of morbidity and mortality worldwide, 6 million people lack access to timely, safe, and affordable cardiac surgery services when needed.[43] Recent publications have highlighted the necessity of improving access to cardiac care for RHD in sub-Saharan Africa.[16]-[18] Increasing the coverage of interventions targeting the RHD/acute rheumatic fever spectrum, including primary, secondary, and tertiary prevention, could prevent about 74 000 deaths from RHD and acute rheumatic fever from 2021 to 2030 in the African Union.[16] Economically, scaling up secondary and tertiary care interventions for RHD could result in a net benefit of US $2.8 billion for the African Union by 2030.[16] Okello and Beaton[17] commented on the study by Coates et al.[16] that scaling up tertiary intervention measures in the African Union is achievable with multisectoral involvement. Strengthening local health systems by investing in domestic services for heart surgery, rather than referring patients abroad, could save governments of low- and middle-income countries millions of dollars annually.[44] However, this requires political will and commitment, an improved understanding, and the availability of funds.[18]

In developing countries, patient selection and the choice of valvular surgery are critical considerations due to late presentation with severe disease. Currently, there are no local guidelines that adequately address the presentation and treatment outcomes of our patient population. In Tanzania, since 2018, cardiac surgery has been exclusively performed at the Jakaya Kikwete Cardiac Institute. Anecdotal data suggests that the annual mortality following cardiac surgery for RHD at this institute is <4%. Our study findings represent progress from the establishment of a cardiac centre towards achieving excellence in providing state-of-the-art cardiac services.

Limitations and strengths

This study had all the inherent limitations of a retrospective study. First, there was missing or incomplete information, such as comorbidity variables. For heart failure and NYHA functional class, LVEF was used as a surrogate measure. Patients with missing or incomplete data might have had predictive factors for early mortality. Additionally, other comorbidities were reported in small numbers and did not allow for detailed analysis. Second, we could not analyse intraoperative variables such as total operation time, cardiopulmonary bypass time, and aortic cross-clamp time, nor could we assess postoperative complications like congestive cardiac failure, arrhythmias, wound infection, and acute respiratory distress syndrome. However, the influence of these variables on patient outcomes was previously analysed at the same institution,[19] albeit with a smaller sample size. Third, our multivariable model is potentially overadjusted because we included ICU stay (an outcome) as a predictor.

The strengths of our study include a relatively larger sample size and the contribution to the body of knowledge from the study previously done at the same institution. Although most of the variables known to influence early mortality after cardiac surgery were not statistically significant, we believe they have clinical significance and should be considered when selecting candidates for valvular interventions.

Conclusions and recommendations

The in-hospital mortality rate observed in this study is higher compared to those reported in previous studies. In patients with RHD, DVR is associated with increased early mortality, suggesting the need for greater technical expertise and careful postoperative management. Prospective studies with larger sample sizes are required to confirm these findings and to further investigate the determinants of early and late mortality in this patient population. Additionally, there is a pressing need for local guidelines to manage these patients effectively.

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