ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCES, SCHOOL OF MEDICINE, DEPARTMENT OF EMERGENCY AND CRITICAL CARE MEDICINE

A SINGLE CENTER RETROSPECTIVE COHORT STUDY ON CLINICAL PROFILE AND SHORT TERM OUTCOME OF RHEUMATIC HEART DISEASE PATIENTS PRESENTING WITH ACUTE HEART FAILURE AT TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA, ETHIOPIA.

A Research thesis submitted to Addis Ababa University College of Health Sciences, School of Medicine, Department of Emergency and Critical Care, presented in partial fulfillment of the requirement for a specialty certificate in Emergency and Critical Care Medicine.

Principal Investigator: Dr.Amarech Dage , MD

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Addis Ababa,

Ethiopia

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A Retrospective cohort study on Clinical Profile and short term Outcome of Rheumatic Heart Disease patients presenting with Acute Heart failure at Tikur Anbessa Specialized Hospital

Addis Ababa, Ethiopia.

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December, 2025

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Declaration

I, the principal investigator and the undersigned, declare that this is my original work. All sources used in this investigation are fully acknowledged in the manuscript.

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This thesis has been submitted with my approval as a university advisor.

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Acronyms

AAU - Addis Ababa University

AHF - Acute Heart Failure

AF - Atrial Fibrillation

ASMR - Age-Standardized Mortality Rate

BP – Blood pressure

CHS - College of Health Sciences

CXR - Chest Radiography

DALY - Disability Adjusted Life year

ECG - Electrocardiogram

Echo – Echocardiography

HAI – Hospital Acquired Infection

IHM - In-Hospital Mortality

IQR – Inter Quartile Range

JMC - Jimma Medical College

LOS - Length of Stay

LMICs - Low and Middle Income Countries

MS – Mitral Stenosis

MR - Mitral Regurgitation

AR - Aortic Regurgitation

TR - Tricuspid Regurgitation

NYHA - New York Heart Association

RHD - Rheumatic Heart Disease

SDI - Socio-Demographic Index

TASH – Tikur Anbessa Specialized Hospital

WHF -World Heart Federation

WHO – World Health Organization

Abstract

Background:

The burden of Rheumatic Heart Disease(RHD) in low- and middle-income countries, including Ethiopia, remains significant. Despite this, there are limited retrospective data on the clinical features and outcomes of patients with RHD presenting with AHF in Ethiopia, particularly at tertiary centers such as Tikur Anbessa Specialized Hospital(TASH).

Objectives: To assess the clinical profile and short-term outcomes of RHD patients presenting with AHF at TASH.

Methods: This hospital-based retrospective cohort study was conducted at TASH, Addis Ababa. Patients diagnosed with RHD and AHF between October 1, 2024 to September 30, 2025 were randomly selected for enrollment. Data collection included demographic characteristics, clinical features at admission, laboratory and echocardiographic findings, treatment, and outcomes (e.g., length of stay, in-hospital mortality, and 30-day readmission or death). The New York Heart Association classification was used to categorize the functional status of the patients.

Results: The median age of the cohorts was 31 years (IQR 20-39), 57% were female, and 50.4% were married. 83.7% of patients covered their healthcare costs out of pocket.

The median duration of symptoms before hospital presentation was 7 days (IQR 5-14). Dyspnea was the most common presenting symptom; 47.4% of patients presented in NYHA Class IV and The most common precipitating factor identified was pneumonia (27.1%); Mitral valve involvement was 97%,

Nearly all patients (99.3%) received diuretics.

In-hospital complications occurred in 52.8% of patients, with electrolyte abnormalities being the most common complication,

The median length of stay was 21 days (IQR 11-31), 76.3% of patients were discharged, and 23.7% died.

Conclusion:

This study shows that RHD remains a major cause of AHF in young adults, often presenting late and experiencing high complication rates and mortality.

Keyword: Rheumatic heart disease , Outcome

1. Introduction

11.1 Background

The World Heart Federation (WHF) defines RHD as chronic and permanent valve damage caused by rheumatic fever, an autoimmune inflammatory reaction triggered by a preceding streptococcal infection. It has remained a major yet preventable public health concern. [1], [2]

While new case occurrence and overall disease impact have been decreasing in developed nations since the beginning of the 20th century, it remain the major cause of morbidity and mortality in LMICs, affecting the young, especially in sub-Saharan countries. It affects an estimated 40 million people worldwide and results in more than 300,000 deaths per year. [1], [2], [3]

A complete and thorough assessment of patients through history and physical examination is important for the diagnosis of RHD in patients presenting with AHF. Initial presenting Symptoms depend on the severity of valve damage and may include dyspnea, chest pain and edema. [4], [5]

ECG and CXR can be used in the initial evaluation of patients, but Echo remains standard for screening and diagnosis. [1], [4]

RHD can be prevented by combating poverty and upgrading overall living standards including housing and treating streptococcal infection. [2]

Treatment depends on the severity of valve involvement and may include surgery to replace a damaged valve. [5]

1.2 Statement of the problem

Although improved standards of living and antibiotic utilization have reduced the incidence of RHD in developed nations, it continues to be a leading cause of morbidity among adolescents and young adults in developing nations like Ethiopia.

The Global Burden of Disease (GBD) Study reported in 2015 that RHD affected 33.4 million people globally and is responsible for 319,400 deaths annually, and the age-standardized mortality decreased by 47.8% from 1990 to 2015. [6]

Despite being a preventable condition with high morbidity and mortality, it receives limited attention from both medical and scientific communities. [7]

Since the 1960s, the WHO has proposed and advocated for the establishment of national programs and standardized use of secondary prophylaxis for controlling rheumatic fever and RHD; however, it has been neglected due to the decline in disease burden in high SDI countries. The WHF, as part of the RHD Resolution and global advocacy efforts, established a target of achieving a 25% reduction in mortality from RHD and ARF among individuals aged < 25 years by 2025. [8] However, political commitment to achieve this goal remains limited.

1.3 Significance of the study

Research conducted in different parts of the world shows a high burden of the disease in countries with low and middle SDI because of poverty, overcrowding, malnutrition, and inadequate health resources.

The RHD impact remains high in sub-Saharan Africa, South Asia, and the Pacific Islands.

There is a lack of data on the burden of RHD in Ethiopia, particularly at TASH.

The findings of this study will help clinicians recognize high-risk patients early and optimize management. Furthermore, it will assist hospital administrators in improving resource allocation.

2. Literature Review

A systematic review was done from 1990 to 2015 on the global, regional, and national burden of RHD, and the study estimated that the prevalence was 33.4 million, with a disability-adjusted life year (DALY) of 10.5 million and 319,400 deaths reported. Although Global ASMR has declined by 47.8% from 1990 to 2015,

substantial regional variations were observed. In 2015, the highest ASMR and prevalence were recorded in Oceania, South Asia, and Central Sub-Saharan Africa. [9]

In Africa, an analysis of 22 population-based studies on the prevalence and pattern of RHD found a pooled magnitude of 18.41/1000, with definite cases of RHD accounting for 8.91/1000. Overall, the combined prevalence of RHD did not differ between males and females. The most affected valve the Mitral valve accounting for roughly 73%. [10]

A study conducted in six teaching/referral Hospitals in Ethiopia , result showed the median age of patients was 33; females comprised 58.5% of the patients, while 61% were urban residents. Valvular heart disease was the most common diagnosis (40.5%); among these, 86% were cases of RHD. [11]

A study conducted in Northern India on 2,005 RHD patients reported a mean age of 40.3 ± 14.3 years, with a predominantly female population (72.3%) and 92% residing in rural areas. Valve involvement was 83.3% and multivalvular involvement was 43.2%; the mitral valve was most commonly affected valve (83.3%).The most common adverse cardiovascular event recorded was advanced heart failure (15.6%); followed by peripheral embolism (4.1%) and stroke (3.9%).Advanced age, severe mitral stenosis, pulmonary artery hypertension, and AF were identified as independent predictors of major adverse events. Although use of oral anticoagulant therapy was documented in 77.7% of high-risk patients, secondary prophylaxis use was only reported in 28.5% of the study population. [12]

Out of 120 patients enrolled in a study in South India, the reported mean age was 45.7±12.2 years and 79 were females. 51.7% had single-valve disease; among them, 93.5% had mitral valve involvement, with mitral stenosis being the commonest lesion. [13]

A study was conducted in 12 hospitals across 9 Sub-Saharan African countries on RHD -AHF patients which shows, female predominance with younger age. The cohort had a higher prevalence of AF with lower rates of hypertension, hyperlipidemia, and diabetes. They also exhibited lower BP, higher pulse rate, better kidney function, and higher ejection fraction. In addition, they had higher mean LOS (10.5 vs. 8.8 days) and significantly higher initial hospitalization mortality (9.1% vs. 3.4%). [13]

In a hospital based cross-sectional study involving 39 children with RHD done at Hiwot Fana Comprehensive Specialized Hospital, 71.8% were female. Shortness of breath (53.9%) and cough (38.5%) were the most common presenting symptoms. AHF was prevalent in 89.7%, with MR (94.9%) and AR (66.7%) being the most frequent valve lesions. Left atrial enlargement was observed in 86.1%. Laboratory findings included a mean hemoglobin level of 10.29 g/dL and a mean ESR of 45 mm/hr. [14]

To assess the progression of RHD disease severity in indigenous residents diagnosed with RHD(between ages of 5 and 24 years), a study was conducted on 591 patients across Australia. Out of 96 (16.2%) patients with severe RHD the study found that 50% had undergone surgery within 2 years, and 10% died within 6 years. Patients with moderate RHD exhibited similar long-term probabilities of disease regression or progression. Those patients with mild RHD demonstrated the most stable course; after 10 years, 64% remained mild, while 11.4% progressed to severe RHD, and half of these required surgery. [15]

A Ugandan cohort study of 449 patients (median age 30, 66.8% female) with established RHD found that among those with follow-up (73.7%), 35% developed AHF and 63.7% developed AF. AHF was linked to poor penicillin adherence and left ventricular end-diastolic diameter > 55 mm. Atrial fibrillation was associated with a left atrial diameter >40 mm (OR = 7.5, CI 2.4–9.8, p = 0.001). 1-year mortality was 17.8%, concentrated in the first three months of presentation. Mortality was 3.81 times higher in patients with poor vs. better penicillin adherence .[16]

A prospective cross-sectional study was conducted at JMC on 115 participants; out of this 74.8% were female and 25.2% were male. The mean age of the patients was 32.31 years. Mitral valve involvement was universal (98.26%), aortic valve involvement was documented in 49.5%, and tricuspid valve was involved in 21.7% of the cases. MR + MS + AR (15.7%) were the most frequent combination of valve involvement, followed by MR + AR + TR (8.7%). Compared to males occurrence of MR+MS+AR) was higher in women (17.4% vs. 10.3%) and they had severely reduced

ejection fraction (84.8% vs. 15.2%). RHD-related complications were observed in 63.5%; pulmonary hypertension (26.1%) and atrial fibrillation (19.1%) were the two most reported complications. [17]

In a survey done in April 2005 at the Dabat Health Center, North Gondar Zone in Ethiopia, the mortality rate was 125.3/1000 person-years and the mean age at death was 22 years. [18]

3. Objective

3.1 General Objective

To assess the clinical profile and Short-term outcome of RHD patients presenting with acute heart failure at TASH.

3.2 Specific objective

To describe the clinical profile of patients with RHD who present with acute heart failure.

To identify factors associated with in-hospital mortality and prolonged length of stay.

4 Research Methodology and Materials

4.1 Study Area

The study was conducted at TASH, which is located in Addis Ababa, which is the largest tertiary hospital in Ethiopia.

It was established in 1964 and serves as a major teaching hospital affiliated with Addis Ababa University School of Medicine and Health Sciences.

It provides 51 specialty services, including cardiac services. The cardiac service comprised nine cardiologists and five cardiology fellows.

The hospital has a capacity of approximately 700 inpatient beds and treats over 500,000 outpatients and more than 21,000 inpatients annually.

4.1.1 Study unit

The study was conducted at the emergency medicine center, which is one of the busiest units in the hospital, with an average of 52 new patients triaged every day. The department has 10 EMCC senior consultants, 46 residents, and 63 nurses.

4.2 Study Design and Method

An institutional-based retrospective cohort study was conducted at TASH, Addis Ababa, from October 1, 2024, to September 30, 2025.

4.3 Sampling technique

A retrospective review of medical records was conducted. From a total of 183 eligible patients from October 1, 2024, to September 30, 2025, 135 records were selected using simple random sampling. A sampling frame was prepared from the triage registry in the Electronic Medical Record (EMR), and study participants were selected using computer-generated random numbers.

Records with incomplete outcome data were excluded and replaced using the same random sampling procedure.

4.4 Population

4.4.1 Target Population

All patients with RHD presented with acute heart failure in Ethiopia.

4.4.2 Source Population

All patients with RHD presented at the TASH emergency department between October 1, 2024, and September 30, 2025.

4.4.3 Study population

RHD patients with acute heart failure presented to the TASH emergency department from October 1, 2024, to September 30, 2025.

4.5 Eligibility Criteria

4.5.1 Inclusion Criteria

All RHD patients greater than 14 years old who presented with acute heart failure

4.5.2 Exclusion criteria

All patients aged less than 14 years.

Patients with missing or incomplete medical records were excluded.

4.6 Sample Size and Sampling Procedure

A single population proportion formula was used to determine the sample size. We used a prevalence of 40.5 % from a retrospective cohort study conducted in Ethiopia at six main referral hospitals in 2015.

$$n = \frac{(Z\alpha/2)^2 * P * (1 - P)}{d^2}$$

Where: n = sample size

Zα/2 = the standard normal deviate (set at 1.96 for a 95% level of precision)

P = the expected prevalence (set at 40.5% for this example)

d = the acceptable margin of error (set at 5% for this example)

Therefore, the sample size would be: n = (1.96^2 * 0.405 * (1 - 0.405)) / 0.05^2 = 370.29

Rounded up to the nearest whole number, the estimated sample size would be 370.

We used correction for finite population; after analyzing EMR records in the previous 1 year, the maximum number of patients over 1 year was 183, so using the formula sample size = n*N/n+N=122.

N =our corrected sample size,

n = the total sample before correction (370).

Considering the 10% nonresponse rate, the adjusted sample size was

$$n_{adjusted} = \frac{n}{1\text{-nonresponse rate}} = \frac{122}{1\text{-}0.10} = \frac{122}{0.9} \approx = 135$$

4.7 Study Variables

4.7.1 Dependent Variable

- Magnitude of in-hospital mortality.
- Length of hospital stay.

4.7.2 Independent Variable

- Socio-demographic characteristics
- Clinical characteristics
- Echocardiographic finding and laboratory test results
- In-hospital complication and ICU admission
- Clinical outcome at discharge and readmission

4.8 Operational Definition.

- **Clinical Presentation:**

Includes initial signs and symptoms recorded at admission, such as shortness of breath, chest pain, fatigue and palpitation.

- Clinical Outcome:
  Assessed at discharge Categorized as:

➤ Improved: Clinically stable with reduced symptoms and better NYHA class

➤ Unchanged: No significant improvement or deterioration

➤ Worsened: Progression of symptoms or new complications

- Mortality: In-hospital or 30-day death related to heart failure or its complications
- Length of Hospital Stay:
  Total number of days from admission to discharge as recorded in hospital records.
- Re-admission:
  Any unplanned hospital admission within 30 days of discharge due to worsening heart failure symptoms or related complications.
- Complications:
  Defined as new-onset arrhythmias, thromboembolic events (e.g., stroke), or renal dysfunction occurring during hospitalization, confirmed by clinical and diagnostic tests.
- Adult - age greater than 14 years

4.9 Data collection tool and procedure

- This study aims to assess the clinical presentation and outcome of RHD patients who presented with acute heart failure at TASH, Addis Ababa, and data was collected by using a structured questionnaire on Google Forms. This method allowed for efficient and accurate data collection and reduces error and increases overall reliability of the collected data.
- Data were collected by a single data collector using a personal computer and a predesigned structured questionnaire.

Data quality control

- The checklist was pretested on 18 (5% of the participants)

in randomly selected patient charts to maintain data quality before starting the actual data collection .

Data Processing and Analysis

- All data collected from patient EMR was entered into a pre-designed data collection tool using Google Forms for analysis, and double entry was done to minimize errors. After entry, the data was exported to **SPSS version 31.0.1.0** for cleaning and analysis. Any outliers or inconsistencies identified during data cleaning were cross-checked with the original source documents and corrected accordingly. Descriptive statistics such as count, proportion, median, and IQR were used to summarize the demographic and clinical characteristics of the study participants.
- To identify associations and outcomes Pearson Chi-square test was used to assess associations between categorical variables (for example gender vs. in-hospital mortality). The Mann-Whitney U test was used to compare continuous variables between two groups.
- Due to small number of deaths relative to number of predictor variables Firth's penalized-likelihood logistic regression was used to reduce small sample size ,Negative binomial regression was conducted to assess predictors of hospital stay and Kaplan-Meier was used for survival analysis.
- A p-value < 0.05 was considered statistically significant.

Ethical Consideration

- This study was conducted after obtaining ethical clearance from the Institutional Review Board (IRB). An official letter of permission was obtained from Addis Ababa University prior to data collection. As this was a retrospective study based on review of existing medical records, the requirement for informed consent was waived by the IRB.
- Patient confidentiality was strictly maintained throughout the study. No personal identifiers such as names, medical record numbers, or contact information were collected. Data were used solely for research purposes and were stored securely with access limited to the research team only.

Dissemination of Results

The findings of this study will be disseminated to a broad range of stakeholders to ensure the results contribute to clinical practice, policy formulation, and further research. The primary audience will include healthcare professionals, hospital administrators, academic institutions, policymakers, and researchers involved in cardiovascular and public health. Some of the key ways to dissemination includes

1. Conference and presentation
2. Publication in peer-review journals
3. Hospital meeting and morning presentation
4. Social media

5 Result

5.1 Socio-demographic characteristics

The median age of patients in this study was 31 years (IQR 20-39), 57% were females and 50.4% of the populations were married. 83.7% of patients paid out-of pocket for healthcare provision, only 16.3% had community based health insurance coverage.

5.2 Past Medical History

Out of 135 patients 130 (96.3%) had a prior diagnosis of RHD, Only 93 (68.9%) had documentation of regular secondary prophylaxis use.

71.1% had admission for AHF in the past 1 year compared to 28.9% with no admission.
More than half (56.3%) had history of AF. Comorbidities were found in 15 patients (11.1%), Stroke was the most prevalent affecting 7 patients (5.2%) followed by Chronic Hepatitis B in 3 patients (2.2%).

Socio-demographic characteristics	Count	Percent	95% CI for percent	
			lower bound	upper bound

Age	Median	31 years		28.56	32.17
	IQR	20-39			
Gender	Female	77	57.0%	48.9	64.4
	Male	58	43.0%	35.6	51.1
Health Insurance Status	Out of Pocket	113	83.7%	77.0	89.6
	CBHI	22	16.3%	10.4	23.0
Marital status	Married	68	50.4%	43.0	58.5
	Single	60	44.4%	36.3	52.6
	Divorced	6	4.4%	1.5	8.1
	Widowed	1	0.7%	0.0	2.2
Previous Diagnosis of RHD	Yes	130	96.3%	93.3	99.3
	No	5	3.7%	0.7	6.7
Regular use of secondary prophylaxis	Yes	93	68.9%	61.5	77.0
	No	42	31.1%	23.0	38.5
Previous Hospital admission for Heart failure	Yes	96	71.1%	63.7	78.5
	No	39	28.9%	21.5	36.3
Comorbidity	No	120	88.9%	83.0	94.1
	Yes	15	11.1%	5.9	17.0
Comorbidity	Chronic HBV	3	2.2%	0.0	5.2
	Chronic Kidney disease	1	0.7%	0.0	2.2
	Epilepsy	1	0.7%	0.0	2.2
	Hypertension	1	0.7%	0.0	2.2
	Hypothyroidism	1	0.7%	0.0	2.2
	Major	1	0.7%	0.0	2.2

	Depressive Disorder				
	Stroke	7	5.2%	2.2	8.9
History of Atrial fibrillation or other arrhythmia	Yes	76	56.3%	47.4	64.4
	No	59	43.7%	35.6	52.6

Table 1: Socio-Demographic characteristics and Past medical History

5.3 Presenting Compliant and clinical feature

The median duration from symptom onset to hospital presentation was 7 days (IQR 5-14).

Dyspnea was the most frequent presenting symptom affecting 91.9% of patients followed by Edema (57.8%), and cough (57%).

Functional classification showed 47.4% in NYHA Class IV, 36.3% in Class III and 16.3% in Class II.

Pneumonia (28.1%) was the commonest identified precipitating factor, followed by AF (21.5%), and drug discontinuation (19.3%). In 8.1% of patients there was no documentation of identified precipitating factor.

		Count	Percent of cases (%)	95% CI for percent	
				Lower bound	Upper bound
Presenting symptoms	Dyspnea	124	91.9%		
	Edema	78	57.8%		
	Cough	77	57.0%		
	Orthopnea	57	42.2%		
	Easy Fatigability	48	35.6%		
	Palpitation	32	23.7%		
	PND	22	16.3%		
	Chest pain	5	3.7%		
NYHA functional class	IV	64	47.4%	39.3	55.6
	III	49	36.3%	28.9	44.4
	II	22	16.3%	10.4	22.9
Precipitating factors	Pneumonia	38	28.1%	20.7	36.3
	Atrial fibrillation	29	21.5%	14.8.	28.1
	Drug discontinuation	25	18.5%	11.9	25.9
	Not Documented	11	8.1%		

	Infective endocarditis	8	5.9%	2.2	10.4
	Hospital acquired infection	8	5.9%	2.2	10.4
	Suboptimal dose	8	5.9%	2.2	10.4
	Disease Progression	4	3.0%	0	5.9
	Pregnancy	3	2.2%	0	5.2
	Stuck valve	1	0.7%	0	2.2

Table 3: Clinical Feature and Compliant

5.4 Vital sign at Triage

Recorded median values include a heart rate of 108(IQR 93-132) beats/min, a respiratory rate of 22 (IQR 20-24) breaths/min, an SBP of 103 (IQR 93-112) mmHg, diastolic BP of 68 (IQR 60-78) mmHg and oxygen saturation of 93(IQR 90-96) %.
No temperature measurement was documented.

Vital sign	Median	IQR	95% CI for Median	
			Lower Bound	Upper Bound
Heart rate (bpm)	108	93 - 132	104	115
Respiratory rate (breath/min)	22	20 - 24	20	24
Systolic blood pressure (mmHg)	103	93 - 112	100	106
Diastolic blood pressure (mmHg)	68	60 - 78	65	70
Spo2 (%)	93	90 - 96	92	94

Table 4: Vital sign at Triage

5.5 Echocardiography and Laboratory finding

97% had Mitral valve involvement and, Multi-valvular involvement was 90.4%. Among the 109 patients with mitral stenosis 81.65% had severe, 11.01% moderate and 7.34% mild MS.

The median LVEF was 60% (IQR 55-60%). Severe pulmonary

hypertension was documented in 76.3% while pericardial effusion was found in 5.9%. Among 29 patients for whom chamber dilatation status was recorded, 25 (89.7%) exhibited chamber dilatation while 10.3% did not. Isolated left atrium dilatation was the most frequently documented (48%) followed by combined left atria and right chamber (32%). Bi-atrial dilatation was reported in 4% and 16% had all chamber dilatation.

Upon admission, patients' laboratory finding revealed median hemoglobin of 12.3 g/dl(IQR 10.8-13.6), WBC count of 8.2 (IQR 5.95-12.25) $\times 10^3$ mm3and platelet count of 232 (IQR 175-308) $\times 10^3$. renal function test showed median creatinine of 0.8 mg/dl (IQR 0.6-1.1) and urea of 33 mg/dl. Analysis of electrolytes revealed mild hyponatremia (133.5 mEq/L) and normal potassium levels (4.1 mEq/L).

Compared to admission the discharge or death laboratory values showed deterioration, hemoglobin dropped to 11.3 g/dl, renal function worsened, with creatinine rising to 0.9 mg/dl and urea to 36.5 mg/dl, Serum electrolytes also shifted: potassium decreased to 3.74 mEq/L and sodium to 133 mEq/L.WBC and platelet counts remained relatively stable.

Echocardiography Findings		Count	Percent
Mitral Valve involvement	Yes	131	97.0%
	No	4	3.0%
Mitral Stenosis	No	26	19.3%
	Yes	109	80.7%
Multivalve involvement	Yes	122	90.4%
	No	13	9.6%
Pericardial effusion	No	127	94.1%
	Yes	8	5.9%
Chamber Dilatation	No	109	80.7%
	Yes	26	19.3%
Pulmonary Hypertension	Yes	126	93.3%
	No	9	6.7%

MS Severity	Mild	8	7.34%
	Moderate	12	11.01%
	Severe	89	81.65%
Severity of Pulmonary hypertension	Mild	8	6.35%
	Moderate	15	11.9%
	Severe	103	81.7%

Table 5: Echocardiographic Finding

At Admission	Median	IQR	95% CI for Median	
			Lower bound	Upper bound
Hemoglobin (g/dl)	12.3	10.8 - 12.3	11.9	12.9
WBC Count (x10³mm3)	8.2	5.95 - 12.25	7.05	9.5
Platelet (x10³mm3)	232	175 – 308	211	251
Serum-creatinine (mg/dl)	0.8	0.6 - 1.1	0.7	0.9
Urea (mg/dl)	33	23 – 64	30.0	38.0
Potassium	4.1	3.67 - 4.79	3.92	4.28
Sodium	133.5	128 – 137	132	134
INR	2.59	1.36 - 4.22	1.36	4.22
At Discharge or death	Median	IQR	95% CI for Median	
			Lower bound	Upper bound
Hemoglobin (g/dl)	11.3	9.85 - 13.5	10.7	12.2
WBC Count (x10³mm3)	8.0	5.49 - 12.5	7.0	9.2
Platelet (x10³mm3)	224.0	171 - 322.5	202	242
Serum creatinine(mg/dl)	0.9	0.6 - 1.6	0.7	1.0
Urea (mg/dl)	36.5	26 - 74.5	32	46
Potassium	3.74	3.44 - 4.3	3.63	3.978
Sodium	133	126 – 137	130.5	134.9
INR	2.05	1.6 - 4.95	1.63	4.95

Table 6: Laboratory Results

5.6 Management

Diuretics were used in 99.3% of patients, with Furosemide prescribed in all patients who required diuretics. Intravenous

antibiotic was administered in 77 patients (57%). Rate-control therapy was required in 42 patients (31.1%) with Digoxin being the most used rate controller utilized in 32(23.7 %,) overall.
Oxygen therapy was required in 68.9%, while vasopressor or inotropes were required in 25.9%, with noradrenaline used in 23.7% of patients.

		Count	Percent
Duiretics	Yes	134	99.3
	No	1	0.7
Antibiotics	Yes	77	57.0
	No	58	43.0
Rate controller	No	93	68.9
	Yes	42	31.1
Digoxin	No	103	76.3
	Yes	32	23.7
Oxygen therapy	Yes	93	68.9
	No	42	31.1
Vasopressor or inotrope use	No	100	74.1
	Yes	35	25.9
Nor-adrenaline	No	103	76.3
	Yes	32	23.7

Table 7: Medication Given

5.7 Outcome

In-hospital complications occurred in 71 (52.8%) patients. Electrolyte abnormalities were the most frequent which occurred in 51 patients (37.8%) followed by shock (22.2%0 and hospital-acquired infection in 18.5%.

The median length of stay was 15.5 days (IQR 3.5-19.5). ICU admission was required in 25(18.5%), with a median ICU stay of 5 days (IQR 2-7).
103 patients were discharged (76.3%) alive and 32 died (23.7%) during hospitalization. Out of 103 discharged patients 22 patients (21.36%) were readmitted within 1 month.
Most deaths occurred in general ward (14) followed by ICU (12), 6 patients died in the emergency. Out of 32 deaths in 28.1% the cause of death was not documented and Refractory shock was the leading identified immediate cause of death in 25% followed by

sudden cardiac arrest documented in 18.75% of deaths.

In-Hospital complication	Responses		Percent of Cases
	Count	Percent	
Electrolyte abnormality	51	37.8%	71.8%
Shock	30	22.2%	42.3%
HAI	25	18.5%	35.2%
AKI	21	15.6%	29.6%
Arrhythmia	8	5.9%	11.3%

Table 8 In-Hospital complication

Length of stay	Median	IQR	95% CI for Median	
			Lower	Upper
Length of Hospital Stay	15.5 days	3.5 – 19.5	6.0	19.0
Length of ICU admission	5 days	2 - 7	3.0	5.0

Table 9 Length of stay

		Count	Percent
ICU Admission	No	110	81.5
	Yes	25	18.5
In-hospital Complication	Yes	71	52.6
	No	64	47.4
Outcome of Hospitalization	Discharge	103	76.3
	Death	32	23.7
Place of death	Ward	14	10.4
	ICU	12	8.9
	Emergency	6	4.4
Condition at Discharge	Improved	92	68.1
	Same	9	6.7
	LAMA	2	1.5
Readmission within 1 Month	No	81	78.64
	Yes	22	21.36

Table 10: Outcome

5.8 Determinants of Length of stay and Outcome

The use of vasopressor or inotrope showed a marked difference between groups, 84% (27out of 32) of patients who died received vasopressor or inotrope compared to only 7.8% (8 out of 102) of survivors.

Given the strong association observed Firth penalized multivariable binary logistic regression model was used and it showed, the use of vasopressor or inotrope use was strongly associated with mortality (AOR=70.85, 95% CI=20.43-337.66, P-value =1.44).

While point estimates suggested potential associations, specifically a protective trend for age (AOR=0.95, 95%CI =0.88-1.01, p-value 0.07); increased odds for female gender (AOR= 2.54, 95%CI=0.74-9.64, p-value=0.14) and creatinine with higher odds (AOR=1.31, 95% CI=0.83-1.75, p-value=0.15) none of them showed statistical significance.

The negative binomial regression model assessing predictors of hospital length of stay showed Oxygen requirement (IRR=2.65 , 95% CI=1.84-3.81, p-value=1.39) and ICU admission(AOR=1.71,95% CI= 1.13-2.60, p-value=0.01) were associated with longer hospital stay; on the other hand higher heart rate(IRR=0.99, 95% CI=0.987-0.998, p-value=0.004) and vasopressor or inotrope use(IRR=0.57, 95% CI=0.37-0.88, p-value=0.01) was associated with shorter length of stay reflecting the higher mortality in patients requiring vasopressor or inotrope,.

Kaplan-Meier survival analysis with death considered as primary event identified male sex and ICU admission as independent factor associated with accelerated in-hospital mortality. Male patients had a median survival of 19 days (95% CI=8.49-29.51), while ICU patients had median survival of 21days (95% CI=18.26-23.7).

Firth Penalized logistic regression				
Predictor	OR	95% CI		p-value
		Lower	Upper	
(Intercept)	0.13	0.02	1.07	0.06
Age	0.95	0.88	1.01	0.07

Gender, Male	2.54	0.74	9.64	0.14
creatine1	1.31	0.83	1.75	0.15
Vasopressor, Yes	70.85	20.43	337.66	1.44

Negative Binomial logistic regression				
	IRR	95% CI		p-value
		Lower	Upper	
(Intercept)	11.67	2.79	48.92	0.0008
Age	0.999	0.98	1.02	0.89
Gender, Male	0.99	0.72	1.36	0.96
NYHAIII	1.21	0.799	1.822	0.37
NYHAIV	1.18	0.81	1.71	0.40
Duration	1.09	0.99	1.02	0.25
Heart-rate	0.99	0.987	0.998	0.004
Respiratory rate	1.08	0.98	1.03	0.57
Oxygen, Yes	2.65	1.84	3.81	1.39
Vasopressor, Yes	0.57	0.37	0.88	0.01
ICU, Yes	1.71	1.13	2.60	0.01

Kaplan-Meier survival analysis								
Gender	Mean	95% CI		Median	25%	75%	95% CI	
		Lower	Upper				Lower	Upper
Female	42.45	33.73	51.16	-	-	25.0	-	-
Male	21.99	16.47	27.51	19.0	35.0	9.0	8.49	29.51

Log Rank(Mantel-Cox)		
Chi-Square	Df	Sig.
9.198	1	0.002

ICU admission	Median	95% CI		Log Rank(Mantel-Cox)		
		Lower	Upper	Chi-Square	df	Sig.
No	37.000	35.231	38.769	29.389	1	0.000
Yes	21.000	18.259	23.741			

6. Discussion

In this study, among 135 patients the socio-demographic profile of the study population demonstrated median age of 30.36

years which is consistent with the REMEDY study in which 3343 patients were enrolled with a median age of 28 years and a prospective study done in JMC with a mean age of 32.31 (SD± 12.16) years. Females accounted for 57% which is lower compared to REMEDY (66.2%), and the study done in JMC(74.5%) showing higher toll of RHD among young and middle-aged women. Most patients presented with advanced symptoms, highlighting the persistent problem of delayed care-seeking and limited access to routine cardiac follow-up in low-resource settings. The majority had tachycardia, tachypnea, reduced oxygen saturation, and varying degrees of hypotension at presentation, indicating significant hemodynamic compromise.

Laboratory evaluation commonly showed borderline low hemoglobin levels and variable elevations in white blood cell count, suggestive of chronic inflammation or possible acute infection, both of which are known contributors to heart failure exacerbation in RHD.

In-hospital outcomes demonstrated that a considerable proportion of patients developed complications, including arrhythmias, cardiogenic shock, and electrolyte abnormalities. The rate of ICU admission, although not very high, reflected the severity of heart failure in a subset of patients requiring advanced monitoring.

The median lengths of hospital stay which was 15.5 days (IQR 3.5 – 19.5) was longer than previous study done on AHF patients at Yekatit 12 medical college, Ethiopia in which the median LOS was 9 days(IQR 6-14). [19] Despite intensive management 23.7% of patients succumbed to their illness, this percent is higher than the in hospital mortality rate of AHF patients reported at Yekatit 12 hospital (MR=8.6%) but consistent with the mortality rate reported at ICU in the same study; despite high mortality, the majority were stabilized and discharged; underscoring that timely hospital care can significantly alter the trajectory of acute decompensation. When predictors of length of hospital stay were examined using negative binomial regression, oxygen requirement and ICU admission were identified as significant predictors of prolonged hospitalization, while vasopressor use and higher heart rate were associated with shorter stays. Patients requiring supplemental oxygen stays more than 2.5 xs longer than those not requiring oxygen and ICU admitted patients have 71% longer expected hospital stays than non-ICU patients. Patients requiring vasopressors or inotrope have 43%

shorter expected hospital stay this is consistent with the Firth's penalized logistic regression result which showed strong association of vasopressor or inotrope use with mortality (AOR=70.85). The extreme OR for vasopressor or inotrope use, while statistically valid, poses challenges in clinical interpretation due to its magnitude, second we cannot determine whether vasopressor and inotropes contribute to mortality or simply identified the sickest patients.

Age, gender, NYHA class, Duration of symptom and respiratory rate showed no significant independent association with length of stay.

Strengthening early detection of RHD, improving patient adherence to secondary prophylaxis, and expanding access to timely surgical interventions may reduce the incidence and severity of such acute presentations. Future prospective studies with larger sample sizes and more detailed echocardiographic and treatment variables will be essential to better identify predictors of adverse outcomes and guide targeted interventions.

7. Limitation

The study focused on in-hospital outcomes only. Long-term survival and progression of valvular disease were not assessed.

This study cannot be generalized to all RHD patients because most patients treated at this hospital have advanced disease with multiple and severe valvular involvement and complications including pulmonary hypertension and chamber dilatation. Studies conducted in general and other teaching hospitals are needed to obtain more comprehensive conclusions.

8. Conclusion

This study shows that rheumatic heart disease remains a major cause of acute heart failure in young adults, with patients often presenting late and experiencing high rates of complications and mortality. Most had severe valvular disease, pneumonia or atrial fibrillation as precipitating factors, and required intensive medical therapy. More than half developed in-hospital complications, and nearly one-quarter died despite treatment. These findings highlight the need for earlier diagnosis, improved secondary prophylaxis, and strengthened acute heart failure care to reduce preventable

morbidity and mortality in this population.

9. Recommendation

Based on the findings and limitations of this study, the following recommendations are proposed:

For Clinical Practice

- Strengthen Early Detection and Follow-Up of RHD
- Improve Documentation Quality Standardized clinical documentation, particularly for Echo findings and treatment details, is essential to guide clinical decision-making and facilitate future research.

For Health Systems and Policy

- Strengthen RHD Prevention Programs Expanding primary and secondary prophylaxis programs, especially in endemic region.
- Increase Access to Cardiac Surgery Many patients with advanced RHD require timely surgical intervention. Expansion of cardiac surgical services would improve long-term outcomes.

For Future Research

- Conduct Prospective Multi-center Studies Larger, multi center prospective studies should be conducted to improve generalization and allow for more robust modeling of predictors.

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Annex (English Version Questionnaire)

Section A: Socio-demographic Information

1. Age
2. Sex _Male _Female
3. Marital Status _Single _Married _Divorced _Widowed
4. Health Insurance Status _Yes _No

Section B: Past Medical History

1. Previous Diagnosis of Rheumatic Heart Disease(RHD) _Yes _No
2. Regular use of Secondary Prophylaxis _Yes _No
3. Previous Hospital Admission for Heart Failure
   _Yes _No
4. History of Atrial Fibrillation or other arrhythmias _Yes _No
5. Comorbidities
   _Hypertension _Diabetes Mellitus
   _Chronic Kidney Disease _Stroke
   _HIV _Other(Specify)_

Section C: Presenting Compliant and Clinical Feature

1. Duration of current symptoms _Days
2. Symptom at presentation(Check all that apply)
   _Dyspnea _Chest pain
   _Orthopnea _Palpitation
   _Paroxysmal Nocturnal Dyspnea
   _Edema _Fatigue
   _Syncope
   _Other(Specify)
3. NYHA Functional class
   _I _II _III _IV
4. Vital sign at admission
   BP _ mmHg
   HR _ bpm
   RR_ /min
   Temp_
   O2 Sat _%

Section D: Echocardiographic Findings

1. Valve Involvement
   _Mitral Stenosis
   _Mitral Regurgitation
   _Aortic Stenosis
   _Aortic Regurgitation
   Severity _Mild _Moderate _Severe
2. Left Ventricular ejection Fraction(LVEF) _ %
3. Severity of Pulmonary Hypertension

_Mild _Moderate _ Severe
4. Presence of Pericardial Effusion _Yes _No
5. Chamber Dilatation _Yes _No If Yes , Specify _

Section E: Laboratory Findings

1. Hemoglobin _g/dl
2. WBC Count _mm3
3. Serum creatinine _ mg/dl
4. BUN _ mg/dl
5. Electrolyte Na_ K_
6. INR(If on Warfarin) _

Section F: Treatment and Management

1. Medication Given on Admission _Duiretics _ACE Inhibitors/ARBs _Beta Blockers _Digoxin _Anticoagulants _Antibiotics _Other ,Specify
2. Oxygen Therapy _Yes _No
3. Vasopressor or Inotropes use _Yes _No If yes ,Type
4. ICU Admission _Yes _No 5. If Yes length of ICU Stay _

Section G: Outcomes

1. Length of Hospital stay _ Days
2. In-Hospital complications _Stroke _Renal Failure _Arrhythmia _Sepsis _Cardiogenic Shock
3. Discharge Status _Improved and Discharged _Referred

_Died _Left against Medical advice
4. Follow up appointment scheduled _Yes _No