



School of Nursing

Magnitude and Associated Factors of Atrial Fibrillation, and its Complications among Adult Rheumatic Heart Diseases Patients in Governmental Hospital in Bahir Dar Town, Northwest Ethiopia 2024

By: Diress Abebe

A Research Thesis Report Submitted to Department of Medical-Surgical Nursing, School of Nursing, St. Paul's Hospital Millennium Medical College for Partial Fulfillment of the Requirement for the Degree of Masters in Cardiovascular Nursing

August 2024

Addis Ababa, Ethiopia

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Abstract

Introduction: Atrial fibrillation (AF), is characterized by high-frequency stimulation of the atrium, causes dyssynchronous atrial contraction and irregular ventricular excitation. Hospital-based studies in Africa have reported AF prevalence rates between 0.7% and 55.7%. In Ethiopia, the prevalence of AF among rheumatic heart disease was 46.8%. Studies conducted in Ethiopia, and other studies does not addressed comorbidity related factors associated with atrial fibrillation like ischemic heart disease, hyperthyroidism, and dyslipidemia by adding this variables I was conducted a research in the area of interest.

Objective: To assess the magnitude and associated factors of atrial fibrillation, and its complications among adult rheumatic heart diseases patients in governmental hospital in Bahir Dar town, Northwest Ethiopia 2024.

Methods: An institutional-based cross-sectional retrospective chart review study design was used, with in the study period from May 10, 2024 to June 9, 2024. With a sample size of 421. A simple random sampling technique was used to select the patient charts. Data was entered, cleaned, and coded and then analyzed using SPSS version 26 software. A bivariable and multivariable logistic regression model was used, and a P-value < 0.05 was considered statistically significant.

Result: In this study a total of 402 rheumatic heart disease patients were included. The response rate was 95%. Majority of them were female (56%). Out of 402 patients 51.2% was developed atrial fibrillation. Age >50 years old (AOR= 7.20(2.03-25.46)), left atrium size (AOR=1.23(1.14-1.33)), sever tricuspid regurgitation 4.50(1.18-17.20)), and left ventricular ejection fraction % (AOR=0.94(0.89-0.99)) was associated with AF. The present study showed that complication related to atrial fibrillation was HF (72.8%), ischemic stroke (34.4%), systemic thromboembolism (12.1%). **Conclusion and recommendation:** More than half of the study participants were found to have atrial fibrillation in patients with RHD. In this study, atrial fibrillation was a fivefold increased risk of ischemic stroke and two fold increased risk of systemic thromboembolism. Advancing screening strategies, such as Holter monitoring, focuses on all RHD patients to detect AF early and reduce its complications, should be recommended.

Key word: atrial fibrillation, rheumatic heart disease, stroke, Ethiopia

Acknowledgment

I would like to extend my gratitude to St. Paul's hospital millennium medical college for the opportunity to give me to learn the degree of masters in cardiovascular nursing.

Finally, I would like to forward my heartfelt thanks and extraordinary gratitude to Helina Bogale (PHD Fellow) and Tekalign Markos (Msc CVNP) for their unreserved guidance and frequent support to develop this thesis. I also thank you the data collectors and study area cardiac clinic followed up staff for their cooperativeness. Finally, I would like to extend my acknowledgement to my family.

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List of Acronyms and Abbreviations

AF- Atrial Fibrillation

AOR- Adjusted Odds Ratio

AR- Aortic Regurgitation

AV- Atrioventricular

CAD- Coronary Artery Disease

CI- Confidence Interval

CKD – Chronic Kidney Disease

COPD – Chronic Obstructive Pulmonary Disease

CRP – C-Reactive Protein

COR- Crude Odds Ratio

DALY- Daily Adjusted Life Year

DCMP- Dilated Cardiomyopathy

DM- Diabetes Mellitus

ECG- Electrocardiography

ESR- Erythrocyte Sedimentation Rate

HIC- High Income Country

HP-RF/RHD- Himachal Pradesh Rheumatic Fever/Rheumatic Heart Disease

HTN- Hypertension

IHD- Ischemic Heart Disease

IQR- Interquartile Range

INR- International Normalized Ratio

IS- Ischemic Stroke

LA- Left Atrium

LMIC- Low and Middle Income Country

LOAF- Late Onset Atrial Fibrillation

LVEF- Left ventricular ejection fraction

MR- Mitral Regurgitation

MS- Mitral Stenosis

MV- Mitral Valve

MVA- Mitral Valve Area

NOA - Novel Oral Anticoagulated

NYHA- New York Heart Disease

OR- Odds Ratio

PI- Principal Investigator

PTMC- Percutaneous Transvenous Mitral Commissurotomy

RHD- Rheumatic Heart Disease

RVHD- Rheumatic Valvular Heart Disease

SSA- Sub-Saharan Africa

TR- Tricuspid Regurgitation

VHD- Valvular Heart Disease

VKA- Vitamin K Antagonist

1. Introduction

1.1. Background

One of the most prevalent and avoidable types of acquired heart disease is rheumatic heart disease, brought on by repeated severe or numerous acute rheumatic fever episodes that damage the heart valves over time (1). Valvular damage due to rheumatic heart disease results from an abnormal autoimmune reaction after recurrent infection with group A streptococcal (GAS) bacteria (2). Estimates suggest that there were 10.5 million disability-adjusted life years and 33.4 million cases of rheumatic heart disease globally in 2015. In low- and middle-income countries (LMICs), rheumatic heart disease (RHD) is a major cause of atrial fibrillation (AF); in high-income countries (HICs), hypertension and coronary artery disease are the most prevalent causes of AF (3, 4).

According to research done showed the prevalence of AF in RHD is 32.8% worldwide, with significant variation (4.3%–79.9%) depending on the degree of development in each nation (5). Rheumatic heart disease (RHD) is a common risk factor for AF in sub-Saharan Africa (SSA), with a prevalence ranging from 4.6% to 46.8% (6-9).

Atrial fibrillation (AF) is one of the most common cardiac arrhythmias, resulting from high-frequency stimulation of the atrium and causing dyssynchronous atrial contraction and irregular ventricular excitation (10). AF is a supraventricular tachyarrhythmia with uncoordinated atrial activation and ineffective atrial contraction. Electrocardiographic characteristics include irregular R-R intervals (when atrioventricular conduction is present), absence of distinct P waves, and irregular atrial activity also known as fibrillatory waves(11).

This rhythm disturbance is due to increased atrial pressure, chronic inflammation, fibrosis, and left atrial enlargement (12, 13). In clinical practice, atrial fibrillation is the most prevalent persistent cardiac arrhythmia, and its prevalence is rising (14-17).

The most common type of AF in industrialized countries is paroxysmal; however, permanent AF is more common in Africans. This is due to low rates of rhythm strategy and a low detection probability of paroxysmal AF, leading it to quickly become permanent (18). Atrial fibrillation in rheumatic heart disease is prevalent in many countries around the world. It primarily affects young people, causing severe morbidity and mortality (3). According to a 2020 evaluation in Africa, hospital-based studies had a

prevalence of AF was 0.7% to 55.7%, and community-based studies had a prevalence of 0.03% to 1.25% (19). In Ethiopia, 4.3% of people over 40, 5.1% of people between 40 and 49, and 6.9% of people over 80 years old (20).

1.2. Statement of the Problem

According to the worldwide burden of cardiovascular disease, the number of deaths from atrial fibrillation in 2021 was 366,000, and the disability-adjusted life year was 8,200,000 (21). Globally, atrial fibrillation affects 37,574 million people (0.51% of the global population), and its prevalence has risen by 33% in the past 20 years. Future estimates suggest that the absolute burden of atrial fibrillation could rise by more than 60% by 2050 (22).

According to the Global Burden of Disease Study 2017, the age-standardized incidence and prevalence rates of AF were 38.2 and 481.5 per 100,000 individuals, respectively. In 2017, atrial fibrillation was a contributing factor in 287,241 deaths worldwide (23). AF has an impact on up to 3% of Western populations aged 20 or older at the moment, and by 2030, there will be about 13 million impacted people in the European Union (EU), up from roughly 7 million (24-26). According to a study conducted in Netherlands and the European Union for projections on the number of individuals with atrial fibrillation in the European Union from 2000 to 2060, estimates indicate that 6–12 million individuals globally will have this illness in the United State by 2050 and 17.9 million people in Europe by 2060 (27).

A 2019 study found that among people with rheumatic heart disease (RHD), the estimated prevalence of AF in Sub-Saharan Africa ranged from 9.5% to 46.8% (28). African individuals with AF are more likely to be younger and have a higher frequency of rheumatic valvular heart disease than those from other regions (29). There are high death rates in Africa, mostly because of insufficient medical care and restricted access to facilities(18). Atrial fibrillation (AF), the most prevalent cardiac arrhythmia in adults, doubles the risk of stroke fivefold and is associated with an increasing public health burden (30). In developed nations with primary underlying causes of AF is hypertensive heart disease, hypertension, cardiomyopathy, alcohol drinking, and cigarette smoking whereas rheumatic valvular heart disease showed that is the main contributors of AF in Africa(11).

One of the complications of AF is stroke. Globally, 6.9 million reported cases of ischemic stroke linked to AF were reported in 2019. Among them, 0.7 million (0.05 to 0.9) had a new diagnosis during the year, representing a 35% increase over 2009. Similarly, between 2009 and 2019, the global total fatalities and disability-adjusted life

years (DALY) from ischemic stroke related to AF climbed by 22% and 21%, respectively (31, 32).

The average yearly risk of stroke is elevated by 2.3% (lethality 30%) in atrial fibrillation (33). The economic burden of AF is related to its symptoms, their effects, therapy, and complications. Direct costs include hospitalization, outpatient and home visits, medications, diagnostic tests, and long-term care. Indirect expenses associated with lost productivity from missed work are also considered in the economic impact (34). A study was carried out in a single center in Sub-Saharan Africa. Atrial fibrillation (82.1%), dilated cardiomyopathy (12.8%), and rheumatic mitral stenosis (5.1%) were the three primary causes of cardioembolic stroke (35).

A study at Tikur Anbessa specialized hospital found that the prevalence of AF among patients with rheumatic heart disease was 46.8% and cardioembolic stroke was 9.2% (9). Currently cardiovascular disease is the leading cause of death in Ethiopia, each day about 170 Ethiopians are dying of cardiovascular diseases, particularly in the woredas and regions where political authorities are not sufficiently informed about the magnitude of the problem and its risk factors (36). Studies conducted in Ethiopia, and other studies does not addressed comorbidity related factors associated with atrial fibrillation like ischemic heart disease, hyperthyroidism, and dyslipidemia by adding this variables I was conducted a research in the area of interest. As far as my knowledge there is no prior studies on the magnitude and, associated factors of atrial fibrillation and its complications among patients with rheumatic heart diseases in a governmental hospital in Bahir Dar town, a study was conducted at a government hospital in Bahir Dar, northwest Ethiopia.

1.3. Significance of the Study

This study aims to assess the magnitude and associated factors atrial fibrillation and its complications among patients with rheumatic heart diseases. While few studies have been done in Ethiopia, there are several predictors that remain to be diagnosed, making this research a valuable addition to the existing body of knowledge. This study will serve to enhance or improve patients' quality of life and reduced complications and mortality associated with atrial fibrillation.

This study will serve to enhance the understanding of health care professionals regarding the risk factors of atrial fibrillation in the study area, offering insight at the country level. Additionally, the findings of this study will be used as contribute for further investigation by the institution to improve the diagnosis and management of AF. The identification of gaps will guide policymakers to give emphasis to this emerging issue and contribute to the development of programs crucial for the prevention and control of atrial fibrillation.

2. Literature Review

2.1. Magnitude of Atrial Fibrillation among Patients with Rheumatic Heart Disease

A study conducted in South Korea among 293 patients with rheumatic mitral valve disease 20.9% were developed atrial fibrillation (37). Moreover, observational cross-sectional study conducted in Nepal reported that 36.3% were develop AF among 330 rheumatic heart disease patients(38). Another study conducted in Iran among rheumatic heart disease patients with mitral valve stenosis the prevalence of atrial fibrillation was reported 33% (39). A study conducted in India on 1918 consecutive patient's showed that the prevalence of atrial fibrillation among those with rheumatic heart disease was 23.9% (40).

An institutional -based cross-sectional study conducted at Jakaya Kikwete Cardiac Institution, Tanzania among 390 consecutive rheumatic heart disease patients the prevalence of atrial fibrillation was 57%(41). In Ethiopia, a single-centered institutional-based retrospective cross- sectional study conducted among 500 consecutively selected patients with rheumatic heart disease reported that the prevalence of atrial fibrillation was 46.8%(9).

2.2. Associated factors of atrial fibrillation among rheumatic heart disease

2.2.1. Sociodemographic factor of Atrial Fibrillation

Studies conducted in Australia and Spain show older age and male sex was significantly associated with atrial fibrillation (42-45). A study was conducted in India and Pakistan showed that age and being female was significantly associated with atrial fibrillation (40, 46). A retrospective study on the prevalence and predictors of atrial fibrillation in patients with rheumatic heart disease conducted at the Tikur Anbessa Specialized Hospital showed that among those in males (44.6%) and females (47.5%). The age group ≥ 50 was associated with the development of AF (65.6%)(9).

2.2.2. Behavioral related factors of Atrial Fibrillation

Studies conducted in Japan, Australia, and Israel found that smoking and alcohol drinking were the predicative factors for the development of atrial fibrillation (47-49).

2.2.3. Clinical Related Factors of Atrial Fibrillation among Patients with Rheumatic Heart Disease

Studies conducted in Turkey, Age and high-CRP levels are independent predictors of AF, and on the other hand, 19.1% of patients receiving warfarin therapy showed a labile INR (50, 51). Rheumatic mitral valve disease in 293 sinus rhythm individuals studied in South Korea. Large left atrium (LA) dimensions ($>47\text{mm}$) and severe mitral stenosis ($\leq 1.5\text{ cm}^2$) were independent predictors of AF development (37). Another study conducted in Korea incidence and risk factors of atrial fibrillation heart failure was significantly associated with AF (52).

Another study conducted in China, high triglyceride levels and ESR were positively associated with atrial fibrillation (53, 54). There were 603 Iran mitral stenosis patients in the study. Left atrial enlargement, and ejection fraction, the factors that were independently associated with atrial fibrillation (39). An observational study that looked at the clinical assessment and investigations of atrial fibrillation in rheumatic mitral valve disease was carried out in Western India. Out of 40 patients, thirteen (32.5%) patients received metoprolol, 75% of them was good response while thirty (75%) patients received diltiazem, and 90% of patients was good response. In 15% and 7.5% of patients, digoxin and amiodarone were utilized, respectively (55).

A study was conducted on 1918 patients in India Himachal Pradesh-Rheumatic Fever (HP-RF). The mitral valve was the most frequently affected valve (89.3%), and multivalvular involvement was present in 94.3% of the patients. MS, TR, and NYHA classes (41%, 36%, 34.9%, and 46.8%), respectively, and LA size were the independent and significant associated factors with AF (40). Studies conducted in Saudi Arabia show DM were significantly associated with AF (56).

A study conducted in Tanzania found that the prevalence, of arrhythmias among patients with rheumatic heart disease (NYHA III & IV) and severe LA enlargement was an independently associated factor with AF (41). In Ethiopia a study conducted at Tikur Anbessa specialized showed that left atrial size $\geq 45\text{mm}$, mitral stenosis (51.9%), and tricuspid regurgitation (54.4%) were significant predictors of AF (9).

2.3. Complications of Atrial Fibrillation among Patients with Rheumatic Heart Disease

Rheumatic mitral valve disease in 293 sinus rhythm individuals studied in South Korea. In 21 patients (7.2%) had an outcome of systemic embolism and death rate of 2.1% (37). In a study conducted in Denmark one year following the diagnosis of AF, anticoagulated patients with isolated aortic stenosis had a 2.6% risk of thrombosis and a 3.7–5.7% risk of bleeding complications. Patients with isolated aortic stenosis treated with a VKA had a 1-year mortality risk of 19.1% (57). Studies conducted in Nepal showed that reduced ejection fraction (67.5%), pulmonary arterial hypertension (52.5%), left atrial clot (9.1%), stroke (8.3%), and peripheral embolism (2.5%) were among the complications seen by AF in RHD patients (38).

Studies conducted in a tertiary care hospital in Western India examined the clinical evaluation and investigations of atrial fibrillation in rheumatic mitral valve disease 67.5% of patients had LA sizes >40 mm, and complications of atrial fibrillation included heart failure (85%), cardioembolic stroke (12.5%), infective endocarditis (2.5%), and cardiogenic shock (10%) (55).

Study in India the registry database of RHD patients AF with RHD experienced complications such as heart failure (15.9%), reduced left ventricular systolic function (9.3%), stroke (4.5%), peripheral embolism (3.7%), infective endocarditis in a tiny number of cases (0.3%), and seven (0.36%) patient deaths (40).

2.4. Conceptual framework

Conceptual framework adapted by reviewing various literature about soci-demographic, behavioral factors, investigation, and comorbidity related factors (9, 38, 40, 45) (see figure 1)

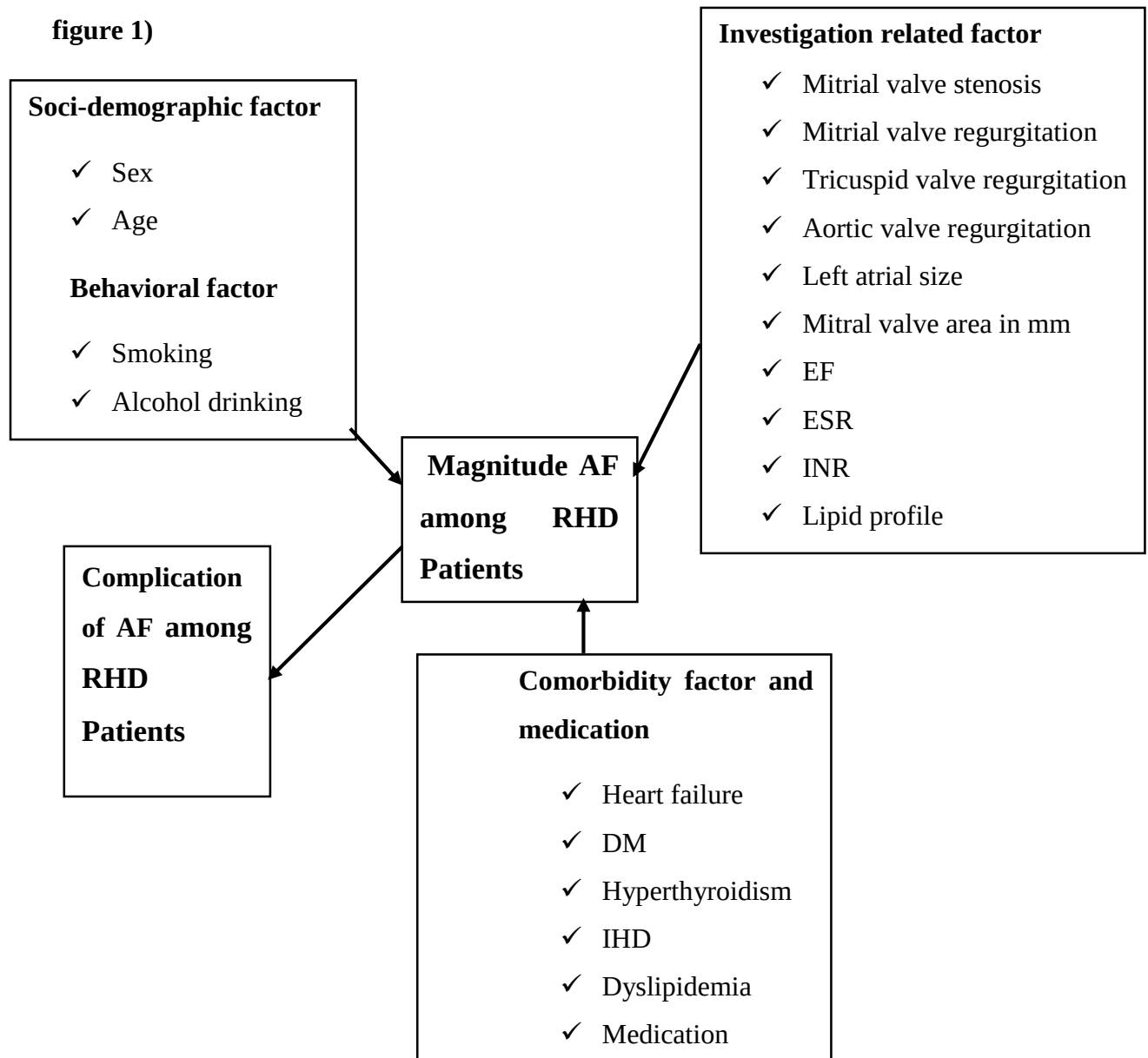


Figure 1. Conceptual Frame Work magnitude and Associated Factors of atrial fibrillation, and Its Complications among Adult Rheumatic Heart Disease Patient's at Governmental Hospital in Bahir Dar, Ethiopia 2024

3. Objective

3.1. General objective

1. To assess the magnitude and associated factors of atrial fibrillation, and its complications among adult rheumatic heart disease patients in government hospitals in Bahir Dar town, Northwest Ethiopia, 2024.

3.2. Specific objective

1. To determine the magnitude of atrial fibrillation among adult rheumatic heart diseases patients in a government hospitals in Bahir Dar town, northwest Ethiopia 2024.
2. To identify the associated factors of atrial fibrillation among adult rheumatic heart diseases patients in a government hospitals in Bahir Dar town, northwest Ethiopia 2024.
3. To describe the complications of atrial fibrillation among adult rheumatic heart diseases patients in a government hospitals in Bahir Dar town, northwest Ethiopia 2024.

4. Methods and Materials

4.1. Study Area

The study was conducted at Tibebe Ghion Specialized Hospital (TGSH) and Felege Hiwot Comprehensive Specialized Hospital (FHCSH), two specialized referral public hospitals in Bahir Dar City, Northwestern Ethiopia. Bahir Dar City is located 587 km northwest of Addis Ababa, the capital city of Ethiopia. Tibebe-Ghion Comprehensive Specialized Hospital is a teaching hospital under the College of Medicine and Health Sciences of Bahir Dar University, located in Bahir Dar, Ethiopia. The hospital provides a tertiary-level healthcare service that is administered by Bahir Dar University. Felege Hiwot Comprehensive Referral Hospital is a referral hospital located in Bahir Dar. Both hospitals serve more than 5 million people each, with more than 500 beds, and provide health-care services with, medical, surgical, gynecological, and intensive care units, orthopedic wards, as well as emergency and outpatient departments(58). The annual number of patient visits in TGSH and FHCSH was more than 180,546 and 197,883 respectively. From these services, TGSH provided follow-up services for 4476 cardiac patients with 430 rheumatic heart disease patients and FHCSH provided follow-up services for 5654 cardiac patients with 375 rheumatic heart disease patients, having follow-up in the outpatient cardiac clinic unit of each hospital per year.

4.2. Study Design and Period

An institutional based cross-sectional retrospective chart review study design was conducted from May 10, 2024 to June 9, 2024.

4.3. Population

4.3.1. Source Population

The medical charts of all adult age 18 and older with rheumatic heart disease in follow-up cardiac clinics at Tibebe Ghion Specialized Hospital and FelegHiwot Compressive Specialized Hospital.

4.3.2. Study Population

The complete medical records of all adult patients age 18 and older diagnosed with rheumatic heart disease in follow-up cardiac clinics at Tibebe Ghion Specialized Hospital and FelegHiwot Compressive Specialized Hospital from Januray1, 2021 to December 30, 2023.

4.3.3. Study unit

The study unit was selected medical records of patient's diagnosis of rheumatic heart disease in follow-up cardiac clinics at two specialized governmental hospitals in Bahir Dar from January 1, 2021 to December 30, 2023.

4.4. Eligibility Criteria

4.4.1. Inclusion Criteria

All medical records of patient's diagnosed with adult rheumatic heart disease in two specialized governmental hospitals in Bahir Dar.

4.4.2 Exclusion Criteria

Rheumatic heart disease patients' with replaced valve.

Rheumatic heart disease patients with post percutaneous transvenous mitral commissurotomy (PTMC).

Patients' with rheumatic heart disease whose medical records are incomplete (absent investigation like ECG, echocardiography).

4.5 Sample Size Determination

The sample size was determined using a single population proportion formula. By taking the prevalence of AF 46.8% studied in Tikur Anbessa Specialized Hospital (9), 5% marginal error, 95% confidence interval, and 10% non-response rate was added.

$$n = (Z_{\alpha/2})^2 P (1-p)/d^2$$

n = the minimum required sample size.

$Z_{\alpha/2}$ = normal standard distribution value corresponding to the 95% confidence interval.

P = single population proportion =46.8 %

D = the margin of error (precision) =0.05

$$n = \frac{(1.96)^2 0.468(1-0.468)}{(0.05)^2} = 383$$

by adding a 10% non-response rate, the total sample size was 421.

The sample size for the factors of atrial fibrillation was calculated using a (2x2) table by taking significant factors from previous studies using Epi Info Version 7 statcalc and considering 85% power, a 95% CI, and a 10% non-response rate (see table 1).

Table 1: Sample size calculation by factors of atrial fibrillation obtained from the previous study (9) using Epi Info Version 7, Bahir dar, Ethiopia, 2024.

Variables	95% CI	Power	Ratio	Proportion among unexposed	Proportion among exposed	Odds ratio	Non-response rate	Sample size
Mitral stenosis	95	85	1:1	28.4	51.9	4.664	10%	84
TR	95	85	1:1	35.8	54.4	1.913	10%	414
Left atrial size	95	85	1:1	13.6	43	3.559	10%	165
Age	95	85	1:1	38.6	65.8	3.985	10%	101

After calculating the sample size using factors and a single population proportion, the largest sample size was taken. Therefore, the final sample size for this study was 421.

4.6. Sampling Technique

Considering the follow-up rate of adult rheumatic heart disease patients at the cardiac clinics of purposive selected hospitals at Bahir dar such as Felege Hiwot Comprehensive Referral Hospital and Tibebe Ghion Specialized Teaching Hospital. To account for patient flows in the past three consecutive years at both hospitals, a proportion-to-size allocation method was implemented to determine the number of rheumatic heart disease cases to be included from each hospital. The study samples was selected by taking all index rheumatic heart disease patients' chart numbers who were followed up in the selected hospitals from January 1, 2021, to December 30, 2023, from the registry book. Simple random sampling technique was used to select the charts of the patients with the help of a computer-generated number. The number of patients with rheumatic heart disease included in each hospital is calculated as; (Number of rheumatic heart disease patients in each hospital $\times$ sample size) / total population from all hospitals (see figure 2).

$$\text{TGSH} = 823 \times 421 / 1589 = 218$$

$$\text{FHCSH} = 766 \times 421 / 1589 = 203$$

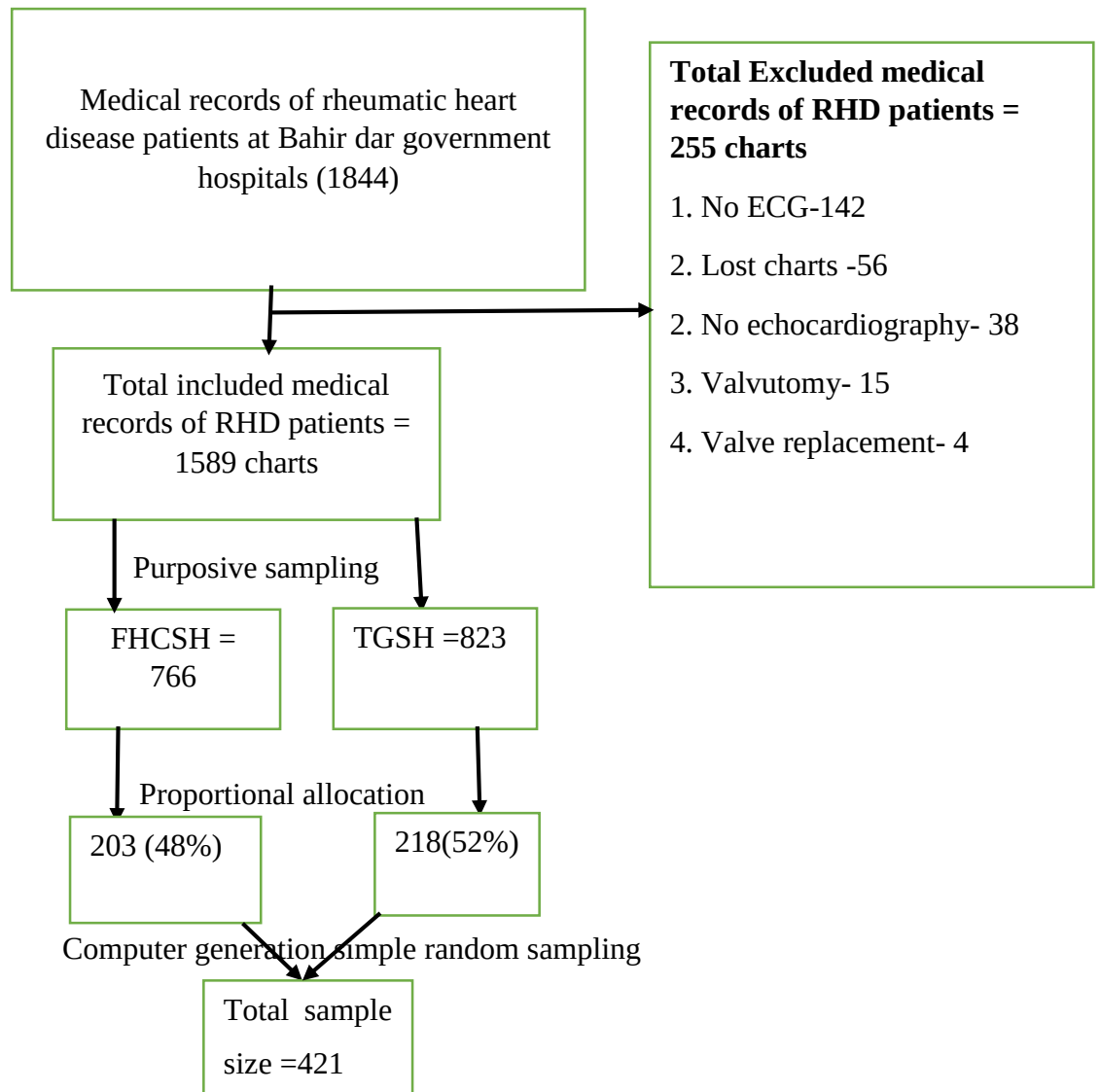


Figure 2. Sampling Procedure for Selecting Medical Records of Rheumatic Heart Disease Patients Follow Up at Cardiac Clinic of Bahir Dar Town Government Hospitals in Bahir Dar, Northwest Ethiopia, 2024.

4.7 Operational Definition

Atrial Fibrillation: The evaluation is made by reviewing the attached 12 lead ECG strips, if available, or if an ECG reading report with an index of AF was found in the case records.

Rheumatic heart disease (RHD): Documented echocardiography finding that shows rheumatic valvular heart disease in the patients chart.

Complications: ischemic stroke, heart failure, systemic thromboembolism, cardiogenic shock and death documented on medical records of patients.

Ischemic Stroke: An episode of acute neurological dysfunction presumed to be caused by focal cerebral, spinal, or retinal infarction persisting ≥ 24 h or until death is recorded on the patient's medical chart.

Systemic Thromboembolism: A vascular disorder characterized by obstruction of blood vessels (arteries or veins) due to the formation of an embolus (movement of blood clot from one place to another place) recorded on the patient's medical chart.

Complete patient chart: refers to patient medical record at least that contain echocardiography and electrocardiography findings of patients with rheumatic heart disease.

4.8 Variables

4.8.1. Dependent Variables

- Atrial fibrillation

4.8.2. Independent Variables

- **Sociodemographic factor** : sex, age
- **Behavioral factor** : cigarette smoking, alcohol drinking
- **Investigation related factor:** Echocardiography (mitral valve stenosis, mitral valve regurgitation, tricuspid valve regurgitation, aortic valve regurgitation, left atrial size, mitral valve area in mm, EF in %), laboratory(ESR, INR, lipid profile)
- **Comorbidities:** heart failure, DM, IHD, hyperthyroidism, dyslipidemia
- Medication

4.9. Data Collection Instrument and Procedure

A structured checklist was adapted from reviews of various literature sources (5, 9, 38, 40). The registration book was used to obtain the card numbers of rheumatic heart disease patients. After obtaining the card numbers, patient charts was retrieved from the record and documentation office. The checklist consists of five parts. Part I: socio-demographic and behavioral factors; Part II: investigation related factors; part III: comorbidity-related; Part IV: medication- related; Part V: complication-related. To collect the data, four BSc nurses and one supervisor was trained for two days by the principal investigator. Those

data collectors was assigned to a selected hospital, and the entire data collection period was supervised by one trained health professional and the principal investigator.

4.10. Data Quality Control

To assure the quality of the data, the following measures were undertaken: A pre-test was done of the checklists in 10% of the patient's chart other than the selected years of the study at Tibebe Ghion Specialized Hospital to improve clarity and modify the data collection instrument. The reliability of the tool checked by Guttman Split-Half Coefficient (71%). Based on the findings of the pretest, corrections and modifications were made on some. In addition, data collectors were trained for one day on the purpose of the study, the details of the check list, the importance of privacy, and ensuring the confidentiality of the extracted data. Every day, the collected data was reviewed and checked for completeness and consistency of response by the principal investigator and supervisor, and then necessary feedback was given how on to proceed the next day. A non-overlapping unique code was given for each individually answered checklist.

4.11. Data Analysis and Interpretation

The data was collected by kobo toolbox. All data was undergo visual checks, be coded, and exports into the SPSS version 26 software package for analysis. Following the categorization and determination of variables, descriptive analysis was conducted for each of the independent variables, utilizing frequencies, cross tabulation and percentages. The outcome of interests was computed and presented through text, tables, graphs and charts. For continuous variables medians (interquartile range) were used.

To identify the independently associated variables, associations were investigated using bivariable logistic regression analysis. All independent variables with a p value < 0.2 in the unadjusted model were selected as candidates for multivariable analysis to control the effect of confounding variables. In the multivariable analysis, variables with a p-value < 0.05 were considered statistically significant. The complications of AF were analyzed by comparing the differences in distribution of HF, ischemic stroke, systemic thromboembolism, cardiogenic shock and death between the group with and without AF using Chi-squared tests and two-sided p value of < 0.05 was taken as statistically significant. Multicollinearity and model fitting were assessed using the Hosmer and Lemeshow tests to ensure it is non-significant at a specified level in multivariable analysis.

The degree of associations was expressed by using the odds ratio (ORs) with 95% confidence intervals (CIs).

4.12. Ethical Consideration

A formal letter seeking ethical clearance and approval was obtained from the St. Paul's Hospital Millennium Medical College Ethical Review Committee, Institutional Review Board (Ref. No: om 23/1147), School of Nursing. This official document was submitted to the respective hospitals. Subsequently, a letter of permission was obtained from administrative bodies in the area, enabling communication with relevant entities at the hospital.

Before initiating data collection, permission was obtained from the outpatient directorate of Tibebe Ghion specialized hospital and FelegHiwot compressive specialized hospital. To uphold confidentiality, the names of patients was replaced with codes, mitigating the risk of individual identifiers.

4.13. Dissemination of results

The research findings will initially be submitted to the Department of Medical-Surgical Nursing, School of Nursing, and St. Paul's Hospital Millennium Medical College. Furthermore, the study findings will be disseminated to the participating hospitals and the Amhara regional health bureau. Additionally, efforts will be made to present the findings in various seminars and workshops. Finally, the research will be submitted for publication in a peer-reviewed and reputable journal.

5. Result

5.1 Sociodemographic and behavioral characteristics of rheumatic heart disease patients

A total of 421 charts of adult rheumatic heart disease patients who were followed up at TGSH and FHCSH from January 1, 2021, to December 30, 2023, were selected. Of those, 402 fulfilled the inclusive criteria. The response rate was 95%. The median age of patients was 41, with an IQR of 26-51. The majority of the age of the patients were less than 31 years old 125 (31.1%). The majority of them were female, 225 (56%). Among all patients, 78 (19.4%) had a history of alcohol drinking, and 70 (17.4%) had a history of cigarette smoking (see table 2).

Table 2. Sociodemographic and behavioral characteristics of rheumatic heart disease patient attending at Bahir dar governmental hospital, Bahir dar, Ethiopia 2024

Variables		Frequency	Percent (%)
Sex	Male	177	44
	Female	225	56
Age	<31	125	31.1
	31-40	70	17.4
	41-50	99	24.6
	>50	108	26.9
Alcohol drinking	yes	78	19.4
	No	324	80.6
Cigarette smoking	Yes	70	17.4
	No	332	82.6

5.2 clinical characteristics of rheumatic heart disease patients

The median left atrium size in mm was 49 with an IQR of 39.75-56 and the median left ventricular ejection fraction was 52 with an IQR of 43-60. Mitral valve regurgitation (MVR) was the most common valve lesion, found in 308 (76.6%) of patients; the majority of them was moderate mitral valve regurgitation 152 (37.8%), followed by mitral stenosis in 293 (72.9%); the majority of them was severe mitral stenosis 150 (37.3%), tricuspid regurgitation in 271 (67.4%), and aortic regurgitation in 194 (48.3%). The highest magnitude of AF was found in those patients with tricuspid valve regurgitation and mitral valve stenosis (68.6% and 65.5%, respectively). In the present

study, it was found that the magnitude of AF increased from moderate (67.4%) to severe MS (83.3%) compared to mild MS (9.8%).

In terms of comorbidity, the most commonly identified comorbid disease was heart failure in 271 (67.4%), with the majority of them being NYHA class III, 95 (23.6%), followed by ischemic heart diseases in 59 (14.7%), dyslipidemia in 42 (10.4%), diabetes mellitus in 32 (8 %), and hyperthyroidism in 30 (7.5%). The most frequently prescribed RHD treatment was benzathin penicillin in 343 (85.3%), followed by diuretics in 305 (75.9%), beta blockers in 271 (67.4%), warfarin in 206 (51.2%), angiotensin-converting enzyme inhibitors in 175 (43.5%), digoxin in 135 (33.6%), and aspirin in 76 (18.9%) (see table 3).

Table 3. Clinical distribution among rheumatic heart disease patient attending at Bahir dar governmental hospital, Bahir dar, Ethiopia 2024

Variables		Frequency	Percent (%)
MS status	No MS	109	27.1
	Mild	51	12.7
	Moderate	92	22.9
	Sever	150	37.3
MR status	No MR	91	22.6
	Mild	105	26.1
	Moderate	152	37.8
	Sever	54	13.4
AR status	No AR	208	51.5
	Mild	94	23.4
	Moderate	78	19.4
	Sever	22	5.5
TR status	No TR	131	32.6
	Mild	59	14.7
	Moderate	109	27.1
	Sever	103	25.6
NYHA functional class	No heart failure	131	32.6
	Class I	30	7.5
	Class II	59	14.7
	Class III	95	23.6
	Class IV	87	21.6
DM	Yes	32	8
	No	370	92

Ischemic heart disease	Yes	59	14.7
	No	343	85.2
Dyslipidemia	Yes	42	10.4
	No	360	89.6
Hyperthyroidism	Yes	30	7.5
	No	372	92.5
Benzanthin penicillin	Yes	343	85.3
	No	59	14.7
Diuretics	Yes	305	75.9
	No	97	24.1
beta blockers	Yes	271	67.4
	No	131	32.6
warfarin	Yes	206	51.2
	No	196	48.8
angiotensin-converting enzyme inhibitors	Yes	175	43.5
	No	227	56.5
Digoxin	Yes	135	33.6
	No	267	66.4
Aspirin	Yes	76	18.9
	No	326	81.1

MS: Mitral Stenosis, MR: Mitral Regurgitation, TR: Tricuspid Regurgitation, AR: Aortic Regurgitation, DM: Diabetes Mellitus, NYHA: New York Heart Association

5.3. Magnitude of atrial fibrillation among RHD patients

Out of 402 rheumatic heart disease patients, 206 (51.2% with a 95% CI; 46-55) were diagnosed with atrial fibrillation (see figure 3).

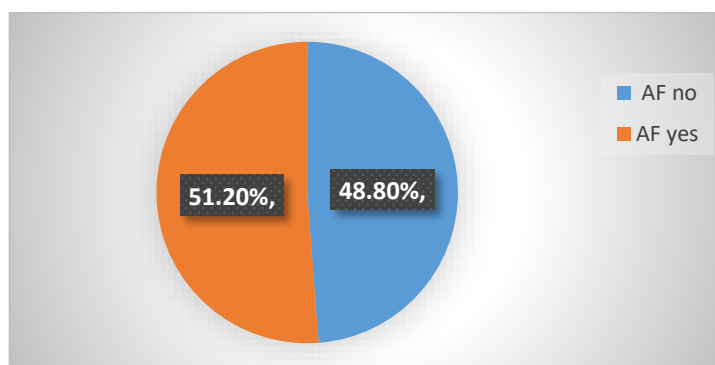


Figure 3. Pie chart showing magnitude of atrial fibrillation among adult rheumatic heart diseases patients in a governmental hospital in Bahir Dar town, northwest Ethiopia 2024

The magnitude of AF increases significantly with age. It ranged from 32% in the age group of less than 31 years to 66.7% in the age group of more than 50 years (see figure 4).

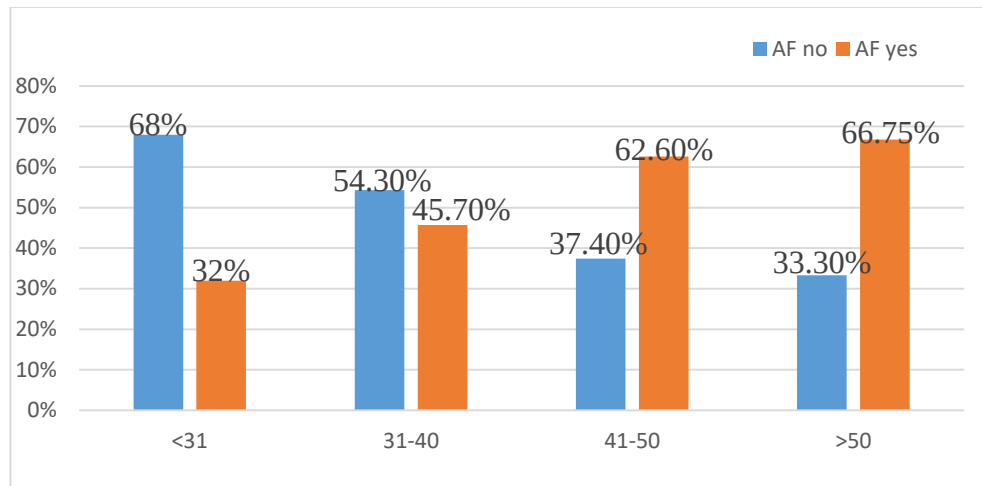


Figure 4. Bar graph showing Classification of patient's age and magnitude of atrial fibrillation by age class among adult rheumatic heart diseases patients in a governmental hospital in Bahir Dar town, northwest Ethiopia 2024

4.4. Factors associated with atrial fibrillation among adult rheumatic heart diseases patients

Bivariate logistic regression was utilized to examine the relationship between independent factors and the dependent variable. Independent variables with P values less than 0.2 were then entered into multivariate logistic regression. Variables that are candidates for multivariate analysis after bivariate analysis with a p-value of <0.2 were: age, severity of mitral valve stenosis, severity of mitral regurgitation, left atrium size, MVA in mm, severity of tricuspid valve regurgitation, severity of aortic valve regurgitation, NYHA class of heart failure, ischemic heart disease, ESR, dyslipidemia, LVEF%, alcohol drinking, cigarette smoking, and benzathin penicillin. The model has a good fit since the Hosmer and Lemeshow tests could not reject the hypothesis of model appropriateness, as the chi-square value is 9.05 and $p = 0.338$.

In the adjusted analysis, factors that continued to be associated with increased odds of AF were age >50 years old, left atrium size, severity of tricuspid regurgitation (severe), and LVEF%. These factors were statistically significant for atrial fibrillation at a p-value of <0.05 with a 95% confidence interval.

According to this analysis, patients with an age greater than 50 years were seven times more likely to increase the odds of developing atrial fibrillation as compared with patients less than 31 years old. For every unit increment of left atrial size in mm, the odds of developing atrial fibrillation increased by 23%. Patients with severe tricuspid valve regurgitation had nearly five times more likely increased the odds of atrial fibrillation as

compared with patients without tricuspid valve regurgitation. For every unit increment of left ventricular ejection fraction in percent, the odds of developing atrial fibrillation decreased by 6%. (See table 4).

Table 4. Bivariable and Multivariable logistics regression analysis of independent factors associated with AF among RHD patients attending at Bahir dar governmental hospital, Bahir dar, Ethiopia 2024

Variables		AF (yes)	AF (No)	COR (CI 95%)	p-value	AOR (CI 95%)	P-value
Age	<31	40 /32%	85 /68%	1	<0.001	1	0.023
	31-40	32 /45.7%	38 /54.3%	1.78 (0.98-3.26)	0.058	2.04(0.58-7.22)	0.266
	41-50	62 /62.6%	37 /37.4%	3.56 (2.04-6.19)	<0.001	2.21(0.71-6.92)	0.171
	>50	72 /66.7%	36 /33.3%	4.25 (2.45-7.35)	<0.001	7.20(2.03-25.46)	0.002*
Alcohol drinking	Yes	54 /69.2%	24 /30.8%	2.54 (1.50-4.31)	0.001	1.97(0.41-9.38)	0.390
	No	152 /46.9%	172 /53.1%	1		1	
Cigarette smoking	Yes	47 /67.1%	23 /32.9%	2.22 (1.29-3.82)	0.004	0.46(0.09-2.16)	0.326
	No	159 /47.9%	173 /52.1%	1		1	
No MS	No MS	14 /12.8%	95 /87.2%	1	<0.001	1	0.702
	Mild	5 /9.8%	46 /90.2%	0.73 (0.25-2.17)	0.581	1.43(0.27-7.54)	0.667
	Moderate	62 /67.4%	30 /32.6%	14.02 (6.89- 28.53)	<0.001	2.99(0.48-18.33)	0.236
	Severe	125 /83.3%	25 /16.7%	32.92 (16.73-68.77)	<0.001	2.97(0.35-24.99)	0.315
MR status	No MR	68 /74.7%	23 /25.3%	1	<0.001	1	0.070
	Mild	64 /61%	41 /39%	0.52 (0.28- 0.97)	0.042	2.30(0.64-8.21)	0.196
	Moderate	49 /32.2%	103 /67.8%	0.16 (0.09-0.28)	<0.001	0.78(0.32-2.54)	0.681
	Severe	25 /46.3%	29 /53.7%	0.29(0.14-0.59)	0.001	3.89(0.85-17.74)	0.079
TR status	No TR	20 /15.3%	111/84.7 %	1	<0.001	1	0.011
	Mild	16 /28.8%	40 /71.2%	2.24 (1.07-4.69)	0.032	0.54(0.15-1.91)	0.345
	Moderate	72 /68.8%	32 /31.2%	12.24 (6.55-22.87)	<0.001	2.83(0.93-8.65)	0.067
	Severe	101/91.3%	10/8.7%	56.05 (25.19-133.37)	<0.001	4.50(1.18-17.20)	0.028*
AR	No AR	135 /64.9%	73 /35.1%	1	<0.001	1	0.681

status							
	Mild	36 /61.7%	58 /38.3%	0.33 (0.20-0.55)	<0.001	1.99(0.63-6.20)	0.235
	Moderate	24 /30.8%	54 /69.2%	0.24 (0.13-0.42)	<0.001	1.91(0.36-3.91)	0.770
	Severe	11 /50%	11 /50%	0.54 (0.22-1.30)	0.172	1.01(0.21-4.72)	0.988
NYHA functional class	No heart failure	39 /29.8%	92 /70.2%	1	<0.001	1	0.804
	Class I	5 /16.7%	25 /83.3%	0.47 (0.16-1.32)	0.153	0.81(0.11-5.77)	0.838
	Class II	37 /62.7%	22 /37.2%	3.96 (2.07-7.57)	<0.001	1.29(0.32-5.22)	0.715
	Class III	68 /71.6%	27 /28.4%	5.94 (3.31-10.63)	<0.001	2.03(0.60-6.85)	0.251
	Class IV	57 /65.5%	30 /34.5%	4.48 (2.51-8.00)	<0.001	1.49(0.42-5.20)	0.529
Ischemic heart disease	Yes	40 / 67.8%	19 /32.2%	2.24 (1.25-4.03)	0.007	1.93(0.54-6.82)	0.307
	No	166 /48.4%	177 / 51.6%	1		1	
Dyslipidemia	Yes	29 /69%	13 / 31%	2.30 (1.16-4.58)	0.017	0.83(0.26-2.66)	0.759
	No	177 /49.2%	183 /50.8%	1		1	
Benzathine penicillin	Yes	159 / 46.4	184 /53.6%	0.22 (0.11-0.43)	<0.001	0.63(0.18-2.17)	0.468
	No	47 / 79.7%	12 /20.3%	1		1	
LVEF in %	Median 52 (IQR 43-60)			0.91(0.89-0.93)	<0.001	0.94(0.89-0.99)	0.021*
MVA in mm	Median 1. 6 (IQR 0.9-3.62)			0.29 (0.23-0.37)	<0.001	0.56(0.28-1.12)	0.103*
left atrium size	Median 49 (IQR 39.75-56)			1.35 (1.28-1.42)	<0.001	1.23(1.14-1.33)	<0.001**
ESR	Median 8 (IQ 5.75-14)			1.05 (1.01-1.07)	0.005	1.03(0.96-1.10)	0.343

1 = indicate for reference group, LVEF%: Left ventricular ejection fraction, MVA: Mitral Valve Area, ESR: Erythrocyte Sedimentation Rate, IQR: Interquartile Range, COR: Crude Odd Ratio, AOR: Adjusted Odd Ratio, CI: Confidence Interval, AF: Atrial Fibrillation, RHD; Rheumatic Heart Disease, TR: Tricuspid Regurgitation, MS: Mitral Stenosis, MR: Mitral Regurgitation, AR: Aortic Regurgitation, NYHA: New York Heart Association, * $p < 0.05$, ** $p < 0.001$

5.5. Complications of atrial fibrillation among rheumatic heart disease patients

The present study showed that the complications of atrial fibrillation among rheumatic heart disease was heart failure (72.8% vs. 25%) $p < 0.001$, ischemic stroke (34.4% vs.

7.7%) $p < 0.001$, systemic thromboembolism (12.1% vs. 6.1%) $p = 0.009$, cardiogenic shock (4.4% vs. 2.2%) $p = 0.187$, and death (3.4% vs. 0.5%) $p = 0.03$, in patients with AF as compared to those without AF (see table 5).

Table 5. Complications of atrial fibrillation among rheumatic heart disease patients using chi-square test two sided p -value < 0.05 was statistically significant at Bahir dar governmental hospital, Bahir dar, Ethiopia 2024

Characteristics	Atrial fibrillation (yes)	Atrial fibrillation (no)	P –value
Ischemic stroke	70(34.4%)	15(7.7%)	$<0.001^{**}$
Systemic thromboembolism	25 (12.1%)	12 (6.1%)	0.037*
Heart failure	150(72.8%)	49(25%)	$<0.001^{**}$
Cardiogenic shock	9(4.4%)	4 (2.2%)	0.187
Death	7(3.4%)	1(0.5%)	0.038*

** $P < 0.001$, * $p < 0.05$

This finding showed that atrial fibrillation was associated with a fivefold increased risk of ischemic stroke and a twofold increased risk of systemic thromboembolism compared to sinus rhythm.

6. Discussion

This study revealed the magnitude and associated factors of atrial fibrillation, and its complications among adult rheumatic heart disease patients. According to this findings showed that RHD patients have a magnitude of AF (51.2%; 95% CI: 46-55). This is consistent with a study conducted at Tikur Anbessa Specialized Hospital (46.8%) ⁽⁹⁾. This may be due to similar socio-demographic characteristics, and a similar study design. However, it is higher than the prevalence found in studies conducted in the HP-RF/RHD Registry, in which the AF prevalence was reported in India (23.9%), Nepal (36.3%), South Korea (20.9%), and Iran (33%) ⁽³⁷⁻⁴⁰⁾.

This discrepancy may be due to different socio-demographic characteristics, variations in healthcare infrastructure, management of RHD, and different economic status. But lower than a study conducted in Tanzania reported that the prevalence of AF was 57% ⁽⁴¹⁾. This discrepancy may be due to resting electrocardiography and 24 hour ambulatory Holter monitoring electrocardiography was done but in the present study only resting electrocardiography was done.

The highest prevalence of AF was found in those patients with tricuspid valve regurgitation and mitral valve stenosis (68.6% and 65.5%, respectively). The high prevalence of AF in patients may be explained by the fact that such patients have a larger left atrial size, elevated left atrial pressure, and elevated right atrial pressure both of which can increase the risk of developing AF⁽⁵⁹⁾. In the present study, patients with AF were less likely to take benzathin penicillin prophylaxis than those without AF (77.2% versus 93.9%). However, it is higher than studies conducted at Tikur Anbessa Specialized Hospital, where benzathin penicillin prophylaxis was taken by AF patients versus those without AF (69.7% versus 83.5%) ⁽⁹⁾. This discrepancy may be due to the present study being multi-center and having a different study period.

Age >50 was one of the significant associated factors with AF in this study, rheumatic heart disease patients age > 50 was 7 times increased the odds developing atrial fibrillation as compared with patients age < 31years [AOR = 7.20; 95% (2.03-25.46)] with a p-value of 0.002. This finding is supported by several studies conducted in Tikur Anbessa Specialized Hospital, Australia, Buellton, Spain, USA, India, and Pakistan ^(9, 40, 42, 44-46). This may be because the atrial myocardium undergoes electrical and structural remodeling with age, both of which may play an important role in the initiation of atrial

fibrillation. A longer disease period and inflammatory processes in older patients were also suggested to be contributing factors predisposing to AF ⁽⁶⁰⁾. Other contributing factors included the type of valve lesion, LVEF%, and left atrial size.

According to this study, rheumatic heart disease patients with increased left atrial size the odds of developing atrial fibrillation was increased by 23%, [AOR = 1.23; 95% CI (1.14-1.33)]. This finding supported by study conducted in India and Tanzania ^(40, 41). This may be due to atrial dilation and fibrosis, as multiple re-entrant circuits can occur in an enlarged atrium ⁽⁶¹⁾.

Based on this study, severe TR had increased the odds of atrial fibrillation nearly five times as compared with patients without tricuspid regurgitation [AOR= 4.50(1.18-17.20)] with a p- value of 0.028. Another study also showed that severity of TR were also reported as risk factors for AF in Tikur Anbesa Specialized Hospital, and India ^(9, 40). This might be brought on by pressure and volume overload, as they could trigger the biological processes that generate atrial myocardial hypertrophy and myocardial fibrosis, which could put a person at risk for atrial fibrillation (AF) ⁽⁶²⁾.

Another contributing factor to atrial fibrillation was LVEF% with the odds of [AOR = 0.94; 95% CI (0.89-0.99)]. Left ventricular ejection fraction was significantly associated with AF in another study conducted in Iran ⁽³⁹⁾. This may be due to structural and neurohormonal changes in cardiac muscle, as a reduced ejection fraction increases the possibility of AF development.

According to this study, showed that a higher prevalence of HF (72.8%), ischemic stroke (34.4%), and systemic thromboembolism (12.1%), in patients with atrial fibrillation as compared to studies conducted in India and Nepal the prevalence of HF (25.7%), systemic thromboembolism (8.6%), left atrial clot (9.1%) and stroke (8.3%) ^(38, 40). This may be due to the fact that the prevalence of AF in the present study was higher (51.2%) as compared to other studies (23.9%) and 36.3%), respectively. Patients in this study the healthcare settings may have limited access to preventive measures or specialized care for conditions like HF or stroke, leading to higher prevalence rates of these complications.

But lower than studies in western India, the prevalence of heart failure (85%), and cardiogenic shock (10%) among AF patients ⁽⁵⁵⁾. This may be due to a sample size variation. In the present study, the sample size was much higher as compared to western

India (421 vs. 40). Based on this study, the prevalence of death among AF patients is also higher (3.4%) as compared with studies conducted in South Korea (2.1%) ⁽⁵²⁾. This discrepancy may be due to different socio-demographic characteristics and economic status.

7. Strength and Limitation of the study

The strength of this study was that it was multicenter and the first study in the study area. The limitations of this study were that since there was no Holter monitoring ECG, AF was documented based on a standard 12-lead ECG, which could have missed cases of paroxysmal AF. Since this study was a retrospective review of medical records, a lack of proper documentation for other risk factors, such as body mass index (BMI), CRP, COPD, and CKD, might underestimate the contribution of these risk factors to AF.

8. Conclusion

More than half of the study participants with RHD were found to have atrial fibrillation. The magnitude of AF increased with age. In addition, this research identified risk factors associated with the development of atrial fibrillation in rheumatic heart disease patients which includes being Age >50 years old, left atrium size, severity of tricuspid regurgitation (severe), and LVEF%. AF was linked to an increased risk of ischemic stroke, heart failure, systemic thromboembolism, and death. In this study, atrial fibrillation was associated with a fivefold increased risk of ischemic stroke and a twofold increased risk of systemic thromboembolism compared to sinus rhythm.

9. Recommendation

To Hospitals: Advancing screening strategies, such as Holter monitoring, focuses on all RHD patients to detect AF early and reduce its complications, particularly stroke.

Expanded a cardiology unit and increased the number of cardiologists to improve the quality of care.

For the health professionals: atrial fibrillation is the most common final complications of rheumatic heart disease with other related factors which can be prevented by improving level of service delivery and give special attentions to those patients having the this disease problem that lead to atrial fibrillation. Health care providers, especially those working in cardiac clinic and other cardiovascular disorder treatment units must give increased attention to atrial fibrillation patients to prevent complications.

For the researchers: Prospective follow-up study should be conducted to address the limitation of this study.

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11. Appendix

Information sheet and informed voluntary consent form for administration of TGSH and FHCSH.

My name is **Diress Abebe**. I am studying MSc in Cardiovascular Nursing at St. Paul Hospital Millennium Medical College. I kindly request that you lend me your attention to explain to you about the study and why your institution being selected as the study setting.

1. The aim of the study was to assess the magnitude and associated factors of atrial fibrillation, and its complications among patients with rheumatic heart diseases in a governmental hospital in Bahir Dar town, northwest Ethiopia 2024.

2. Procedure and Duration

We was collect medical records from the hospital card room with permission. Then we was fill in secondary data from the medical records chart of each patient for 30 minutes.

3. Risks and Benefits

The risk of taking secondary data from the patient file is minimal, but the findings from this research may reveal important information for the hospital, providers, and patients.

4. Confidentiality

The information that is provided was kept confidential. There was no information that was identify the participants in particular. The findings of the study was general for the study community and was not reflect anything particular about the individual persons. A code is given to the questionnaires to avoid showing names and card numbers.

5. Right

The hospital or card room has the right to get the medical chart of the patient at any time. The hospital has the right to stop this study if any misdeeds or unethical procedures are observed during the data collection process on the hospital premises.

6. Contact address

Diress Abebe: Principal investigator

Phone Number: +251-9 22 04 34 28

E-mail: diressa024@gmail.com

7. Declaration of informed voluntary consent

I have read the participant information sheet. I have clearly understood the purpose of the research, the procedures, confidentiality, the risks and benefits, the issues of confidentiality, the rights to get the patient's file at any time, and the contact address for

any queries. I was given the opportunity to ask questions about things that may have been unclear. I am informed that the hospital has the right to stop this study if any misdeeds or unethical procedures are observed during the data collection process on the hospital premises .Therefore, I declare my voluntary consent on behalf of hospital management to allow the study to be conducted in the hospital with my initials.

Name and signature of hospital administration: _____ Date: _____

Name and signature of the data collector: _____ Date _____

Appendix I. ENGLISH VERSION CHECKLIST

Checklist for the contributing factor of atrial fibrillation and its complications among patients with rheumatic heart disease.

PART I: - socio demographic and behavioral factor of patients

ID NO	Variables	Category	Skip
101	Age	_____	
102	Sex	1. Male 2. Female	
103	Cigarate smoking	1. Yes 2. No	
104	Alcohol drinking	1. Yes 2. No	

Part II: -Investigation related factor of atrial fibrillation

ID NO	Variable	Category	Remark
201	Electrocardiography	1. Yes 2. No	
202	Atrial Fibrillation (AF)	1. yes 2. no	
203	Echocardiography	1.yes 2. no	
202	Mitrial valve stenosis	1.yes 2. no	If no, skip to Q205
203	MVA in mm	_____	
204	Severity of Mitrial valve stenosis	1.mild 2.moderat 3.severe 4.very severe	
205	Mitrial valve regurgitation	1.yes 2. no	If no, skip to Q207
206	Severity of Mitrial valve regurgitation	1.Mild 2.Moderate 3.severe	

207	Aortic valve regurgitation	1.yes 2.no	If no, skip to Q209
208	Severity of aortic valve regurgitation	1.mild 2.moderate 3.severe	
209	Tricuspid valve regurgitation	1.yes 2. no	If no, skip to Q211
210	Severity of tricuspid valve regurgitation	1.mild 2.moderate 3. severe	
211	left atrium demission in mm	_____	
212	LVEF in %	_____	
213	INR value	_____	
214	LDL	_____	
215	HDL	_____	
216	Total Cholesterol	_____	
217	ESR	_____	

Part III: -comorbidity related factor

ID No	Variable	Category	Remark
301	Heart failure	1. yes 2.no	
302	NYHA class	I II III IV	
303	DM	1.yes 2. no	
304	Hyperthyroidism	1.yes 2.no	
305	Dyslipidemia	1.yes 2. no	
306	Ischemic Heart Disease	1.yes 2.no	
307	COPD	1. yes 2. no	
308	CRP	_____	
309	CKD	1. yes 2. no	

Part IV: medication related checklist

ID No	Variable	Category	Remark
501	Beta blocker	1. yes 2. no	
502	Calcium channels blocker	1. yes 2. no	

503	Warfarin	1. yes 2. no	
504	Aspirin	1. yes 2. no	
505	Digoxin	1. yes 2. no	
506	Benzanthin penicillin	1. yes 2. no	
507	Diuretics	1. yes 2. no	
508	Angiotensin converting enzyme inhibitor	1. yes 2. no	
509	Other	_____	

Part V: Complications related checklist

ID NO	Variable	Category	Remark
401	Complication	1.yes 2.no	If yes continue the next question
402	Ischemic stroke	1. Yes 2. No	
403	Systemic thromboembolism	1. yes 2. no	
404	Heart failure	1. yes 2. no	
405	Death	1. yes 2. no	
406	Other	_____	

Declaration

Declare that this research thesis **Magnitude and associated factors of atrial fibrillation, and its complications among adult rheumatic heart diseases patients in a governmental hospital in Bahir Dar town**, is my own work that has not been addressed in the study area as far as my knowledge has touched and all the sources I used have been indicated and acknowledged as complete references.

Name of investigator

Signature

Date

1. _____

Name of adviser/s

1. _____

2. _____

Name of invigilators

1. _____

2. _____