KAIRUKI UNIVERSITY

DEPARTMENT OF INTERNAL MEDICINE

ATRIAL FIBRILLATION AMONG HYPERTENSIVE PATIENTS ATTENDING REGIONAL REFERRAL HOSPITALS IN DAR ES SALAAM, TANZANIA.

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A DISSERTATION SUBMITTED IN (PARTIAL) FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF MEDICINE (INTERNAL MEDICINE) AT KAIRUKI UNIVERSITY

2025

CERTIFICATION

It is hereby certified that the undersigned has read and hereby recommends the acceptance by Kairuki University of a dissertation proposal titled: "***ATRIAL FIBRILLATION AMONG HYPERTENSIVE PATIENTS ATTENDING REGIONAL REFERRAL HOSPITALS IN DAR ES SALAAM, TANZANIA,***" in partial fulfillment of the requirements for the degree of Master of Medicine in Internal Medicine.

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DECLARATION AND COPYWRITING

I, Malecha Msabaha, declare that this research titled "Atrial Fibrillation among Hypertensive Patients Attending Regional Referral Hospitals in Dar Es Salaam, Tanzania" is my original work and has not been submitted for the award of any degree or diploma elsewhere. All sources of information and data used in this work have been acknowledged.

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ACKNOWLEDGEMENTS

I want to express my heartfelt gratitude to all those who have contributed to the successful completion of this research.

First and foremost, I thank my supervisors, Prof. Y Mgonda, Dr Warless, and Dr Alice, for their guidance, support, and encouragement throughout the proposal development.

I also thank my family and friends for their moral support and understanding.

Finally, I acknowledge Kairuki University for providing the necessary resources and environment that enabled me to carry out this study.

SUMMARY

This dissertation investigates the prevalence of atrial fibrillation among hypertensive patients attending regional referral hospitals in Dar Es Salaam, Tanzania. The study aims to understand the relationship between hypertension and the occurrence of atrial fibrillation, assess risk factors, and demographic characteristics. Data will be collected from patient interviews, focusing on demographic factors, clinical history, and treatment outcomes. The findings will highlight the significance of controlling hypertension to prevent atrial fibrillation and suggest the need for regular screenings and targeted healthcare interventions.

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LIST OF ABBREVIATIONS.

ACEi	Angiotensin-Converting Enzyme Inhibitors
AF	Atrial fibrillation
ARBs	Angiotensin II Receptor Blockers
BMI	Body Mass Index
BP	Blood pressure
CHA2DS2-VASc	Stroke Risk Stratification Scoring System for AF (Congestive Heart Failure, Hypertension, Age, Diabetes, Stroke history, vascular disease, and Sex)
COPD	Chronic Obstructive Pulmonary Disease
CVS	Cardiovascular System
ECG	Electrocardiogram
EKG	Electrocardiogram (alternative term, commonly used in the US)
HTN	Hypertension
ICD10	International Classification of Diseases, 10th Edition
NCDs	Non-Communicable Diseases
OAC	Oral Anticoagulants
SAH	Systemic Arterial Hypertension
SCD	Sudden Cardiac Death
T2DM	Type 2 Diabetes Mellitus
TIA	Transient Ischemic Attack
WHO	World Health Organization

OPERATIONAL DEFINITIONS

1. **Atrial Fibrillation (AF):** A condition where the heart's atria experience irregular and rapid electrical impulses, leading to an irregular heart rhythm. In this study, AF was diagnosed based on clinical symptoms and electrocardiogram (ECG) findings.
2. **Hypertension (HTN)**: A condition where blood pressure readings consistently exceed 140/90 mmHg. Hypertension is classified based on the latest guidelines by the World Health Organization (WHO).
3. **Regional Referral Hospitals**: Hospitals designated by the Ministry of Health in Tanzania as key health centers serving larger regional areas and offering specialized care for more complex health issues.
4. **Cardiovascular Disease (CVD):** Cardiovascular disease refers to a group of diseases involving the heart and blood vessels, including conditions like hypertension, coronary artery disease, heart failure, and arrhythmia
5. **Body Mass Index (BMI):** a measurement that relates a person's weight to their height and is used to indicate whether an individual has a healthy weight.
6. **CHA2DS2-VASc Score:** The CHA2DS2-VASc score is a clinical tool used to assess the risk of stroke in patients with atrial fibrillation.
7. **Non-Communicable Diseases (NCDs):** Non-communicable diseases are chronic diseases not transmitted from person to person. They include cardiovascular diseases (like hypertension and atrial fibrillation), diabetes, cancer, and chronic respiratory diseases.

Abstract

Introduction: Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia worldwide, contributing substantially to cardiovascular illness and death, especially among individuals with hypertension. It increases the risk of stroke, heart failure, and early mortality, with its global prevalence on the rise. In sub-Saharan Africa, AF is emerging as a major public health issue, yet data on its prevalence and risk factors among hypertensive patients in Tanzania remain limited.

Objective: This study aimed to determine the prevalence and risk factors of AF among hypertensive adults attending regional referral hospitals in Dar es Salaam.

Methods: An analytical cross-sectional study was carried out from March to May 2025 at Temeke and Amana Regional Referral Hospitals, involving 139 hypertensive adults aged 18 years and above selected through convenience sampling. Data were collected using questionnaires, physical measurements, and 12-lead ECGs. Descriptive statistics summarized participant characteristics, while chi-square tests and multivariate logistic regression identified factors associated with atrial fibrillation, with significance set at $p<0.05$.

Results: The prevalence of AF among hypertensive patients was 14.39%. In the adjusted model, left ventricular hypertrophy (AOR = 2.05; 95% CI: 1.20–3.50; p = 0.009) and obesity (AOR = 1.21; 95% CI: 1.03–1.43; p = 0.02) were identified as independent predictors of AF. Other socio-demographic variables (age, sex, education), behavioral factors (smoking, alcohol consumption), and comorbidities (diabetes, chronic kidney disease, heart failure) were not statistically significant after adjustment.

Conclusion: The findings highlight a substantial burden of AF among hypertensive patients in Tanzanian referral hospitals. Routine AF screening using electrocardiography, echocardiographic evaluation for structural heart disease, and integration of weight management strategies into hypertension care are recommended and ultimately improving long-term cardiovascular outcomes in this high-risk population.

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND

Atrial fibrillation (AF) is the most common supraventricular cardiac arrhythmia, due to abnormal electrical activity within the atria of the heart, causing them to fibrillate. It is also the most common arrhythmia of clinical significance worldwide, which is linked to substantial morbidity and mortality [1,2]. AF is characterized as a tachyarrhythmia, which means that the heart rate is often fast and presents with a variety of clinical symptoms[2,] which are further demonstrated by [1] to be clinically characterized by a rapid and irregular heartbeat that can be asymptomatic or lead to symptoms such as palpitations, dyspnea, and dizziness. The condition can also be associated with serious complications, including an increased risk of stroke.

The definitive diagnosis of AF requires both access to electrocardiography (ECG) and expertise to interpret this diagnostic test [12,13], whereas the presence of AF is defined by ECG result, according to European Society of Cardiology guidelines; as a supraventricular arrhythmia with irregularly, irregular R-R intervals, absent P-waves, and irregular atrial activity[27].

Globally it was estimated that the number of people with atrial fibrillation increased rapidly from 19.1 million to 37.6 million between 1990 and 2017[4] and according to [4,5,] these estimations are expected to expectedly increase further in the future where it is projected to reach 12.1 million people in the USA by 2050 and 17.9 million people in Europe by 2060. AF is worldwide to be one of the leading causes of stroke, heart failure, sudden deaths, and cardiovascular disease, and these adverse events can result in high health care costs and pose a significant public health burden[3].

In Sub-Saharan Africa (SSA) there is sharpest increase in cardiovascular mortality[5,6] where AF is another potential major cardiovascular risk factor in sub-Saharan African (SSA) populations and is reported to be prevalent by 4.3%, 0.3%, and 0.7% in individuals aged ≥40 years,[7] aged ≥50 years,[8] and aged ≥70 years[9] in Ethiopia, Ghana, and Tanzania, respectively. Valvular heart disease, in part due to a high burden of rheumatic heart disease, is particularly common in SSA and is a major risk factor for AF in the region [4]. Apart from valvular heart disease, other most prevalent AF risk factors such as hypertension, obesity, and advanced age[5] are expected to result in a growing burden of AF in SSA [6,7]. Indeed, a recent analysis of data from the Global Burden of Disease study found that the burden of AF was increasing more rapidly than any other cardiovascular disease in SSA [8]. To address this growing disease burden[9], further data regarding the epidemiology, care, and outcomes of AF in SSA are needed.

The development of AF is closely related to the socioeconomic level and cultural level, with the globalization of the economy[10,11] .In countries with higher levels of economic development, more adequate health care resources, and higher literacy and education levels, the incidence and prevalence of AF, although higher than in developing countries, Health facilities in Tanzania are now faced with an ever-growing number of hypertensive patients with multiple comorbidities, including atrial fibrillation[2].

This study's findings may help to inform the healthcare stakeholders on the burden and risk factors for atrial fibrillation among adult hypertensive patients to be able to develop rational prevention and treatment policies, allocate health resources at tertiary hospitals in Dar es Salaam, Tanzania, and improve the prognosis of AF patients.

1.2 PROBLEM STATEMENT

Atrial fibrillation (AF) is one of the most common cardiac arrhythmias globally, affecting an estimated 37.5 million people and accounting for substantial cardiovascular morbidity and mortality. Its prevalence increases with age and is particularly high among patients with hypertension a major predisposing factor. Studies show that hypertensive individuals are two to three times more likely to develop AF compared to those with normal blood pressure. In sub-Saharan Africa, AF prevalence ranges from 0.5% to 2.5% in the general population, but is considerably higher among hypertensive patients, reflecting the growing burden of cardiovascular diseases in the region.

Multiple factors are known to contribute to the development of AF, including advanced age, obesity, diabetes mellitus, left ventricular hypertrophy, excessive alcohol intake, and uncontrolled hypertension. Globally and regionally, these determinants have been well-documented; however, data from Tanzania remain limited, especially among hypertensive patients who represent a high-risk group.

AF has serious health consequences, including a fivefold increase in the risk of ischemic stroke and a threefold increase in the risk of heart failure. It also leads to recurrent hospitalizations, loss of productivity, and increased healthcare costs, posing a significant economic burden on both patients and the health system.

Despite its growing clinical and public health importance, the magnitude and associated risk factors of AF among hypertensive patients in Dar es Salaam, Tanzania, are not well understood. Existing hospital data do not adequately capture its prevalence or determinants. Therefore, this study is designed to determine the burden and risk factors of atrial fibrillation among

hypertensive patients attending medical clinics in Dar es Salaam, providing locally relevant evidence to inform targeted prevention, diagnosis, and management strategies.

1.3 STUDY RATIONALE

This study may help to determine the prevalence, and social demographic characteristics of AF among hypertensive patients and hence, this study's findings may help national health authorities gain a comprehensive understanding of the burden of AF and develop rational prevention and treatment policies, allocate health resources, and improve the prognosis of AF among hypertensive patients.

1.4 RESEARCH QUESTIONS

1. What is the prevalence of atrial fibrillation among hypertensive patients attending regional referral hospitals in Dar es Salaam, Tanzania?
2. What are the social-demographic characteristics of patients with atrial fibrillation among hypertensive patients attending regional referral hospitals in Dar es Salaam, Tanzania?
3. What are the risk factors of atrial fibrillation among hypertensive patients attending regional referral hospitals in Dar es Salaam, Tanzania?

1.5 RESEARCH OBJECTIVES

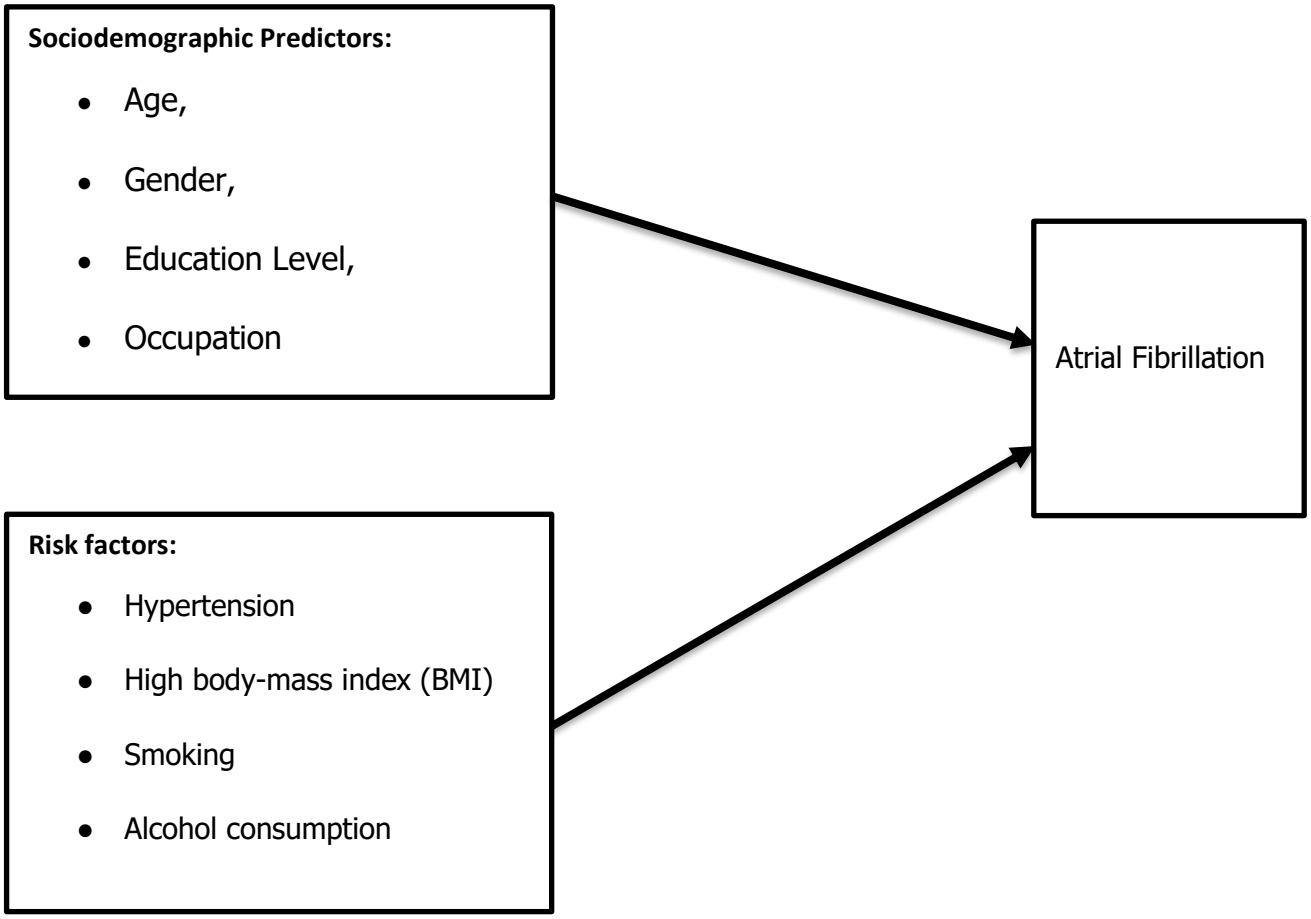
1.5.1 Broad Objective:

1. To determine the prevalence and risk factors of atrial fibrillation among hypertensive patients attending regional referral hospitals in Dar es Salaam, Tanzania, 2025.

1.5.2 Specific Objectives:

1. To determine the prevalence of atrial fibrillation among hypertensive patients attending regional referral hospitals in Dar es Salaam, Tanzania, 2025.
2. To determine the distribution of social-demographic characteristics (Age, Gender, Marital status, Occupation, and level of education) of patients with atrial fibrillation among hypertensive patients attending regional referral hospitals in Dar es Salaam, Tanzania 2025.
3. To determine risk factors (history of CVDs, Obesity, Lifestyle, medication adherence, Alcohol, and smoking) of atrial fibrillation among hypertensive patients attending regional referral hospitals in Dar es Salaam, Tanzania 2025.

1.6 CONCEPTUAL FRAMEWORK



1.6.0 Study Variables

1.6.1 Independent Variables:

Social demographic characteristics (Age, sex, level of education)

Risk factors (smoking, alcohol consumption, high sodium intake, high body mass index)

1.6.2. Dependent Variable:

Atrial fibrillation

CHAPTER TWO

2.0 LITERATURE REVIEW

Atrial fibrillation (AF) is a growing epidemic and a major public health problem worldwide.[1] Furthermore, there are about five million new cases of AF annually, also AF is associated with substantial morbidity and mortality.[1] Individuals with AF have a fivefold increased risk of stroke, [2] threefold increased risk of heart failure,[3] and almost twofold increased risk of overall mortality.[3,4] AF is, therefore, a major contributor to the global burden of cardiovascular disease.

There is a wide variety of pathophysiological mechanisms that play a role in the development of atrial fibrillation (AF); however, it is cardiac remodeling that accounts for most of them. Cardiac remodeling, particularly of atria, results in structural and electrical changes that eventually become the cause of deranged rhythm in AF. Structural remodeling is caused by the changes in myocytes and the extracellular matrix, and fibrous tissue deposition also plays a key role in some etiologies. Any condition that leads to inflammation, stress, damage, or ischemia affecting the anatomy of the heart can result in the development of atrial fibrillation. In some cases, the cause is iatrogenic[12]

Atrial fibrillation is referred to as recurrent when a patient has two or more episodes. The three patterns of atrial fibrillation include:

The presentation of AF can range from asymptomatic to devastating complications such as cardiogenic shock and ischemic stroke. Studies have shown that the most common clinical presentation of participants with AF were palpitation and easy fatigability which were significantly higher compared to no AF group where a similar pattern was observed in Kenya at Aga Khan University Hospital, Nairobi in a study looking at clinical characteristics and outcomes of atrial fibrillation.

Prevalence of AF:

Studies have demonstrated a wide variation in prevalence among populations diagnosed to have AF, for instance it is reported by that AF was found to be prevalent by 1.5% to 28.7% in patients with either ischemic or hemorrhagic stroke. Furthermore, a study done in Ethiopia in both children and adult's patients with rheumatic heart disease (RHD), the prevalence of AF was between 9.5% and 46.8%[5]. The largest studies showed a prevalence of 20.8% in a multinational cohort [13] and 20.7% in Ghana [14] AF

The incidence of atrial fibrillation (AF) is high among individuals with hypertension, and when hypertension is complicated in patients with AF, the incidence of thromboembolic or cardiovascular events is also high. In the Framingham Study, hypertension was shown to cause a 1.4–1.5-fold higher risk of the development of AF, and a meta-analysis identified a similar 1.5-fold risk of AF development when hypertension was present. It is thus expected that the new onset of AF in hypertensive patients can be detected and treated as needed in order to reduce cardiovascular events.

In sub-Saharan Africa (SSA) AF is reported to be 5% in studies done in Congo[15] and 31.5% in a study done in Kenya, [15] among patients with dilated cardiomyopathy. Several studies reported the prevalence of AF in patients admitted in cardiology wards or seen in cardiac outpatient clinics, with rates of 2.7% to 10.6% in studies done in sub-Saharan Africa. AF is also found to be 5.1% of a group of HIV-infected individuals from Cameroon[16].

A study done in Tanzania showed that the prevalence of AF in the patients visiting cardiac institute with hypertension was 10.23%. Comparable results were observed previously in both Western and Asian populations, including (9.75%) of Kosovo, (9.1%) of Turkey, and (8%) of

Brazil, and slightly lower in studies conducted in Senegal (5.35%), South Africa (4.6%), and Thailand (3.4%)[2]

Social demographic characteristics of AF among hypertensive patients.

Socio-demographic factors such as population, age, race, and socio-economic factors such as income, education, and health care resources are found to be important influences on the burden of AF, these findings are reported in a study done in Tanzania[2].

Also, the preponderance of AF and high BP was seen in males compared with females in a study reported which could be due to the degenerative process of atrial muscle and conducting cell[2].

For instance, in 2016, atrial fibrillation was also reported by the European Society of Cardiology (ESC) to be highly prevalent in males 20.9 million than in females was found to 12.6 million around the world[2]

Other factors that could even further increase the prevalence of AF for example, males older than 58 years of age with BP ≥140/80 mmHg have been demonstrated in a study[6].

Risk factors of AF among patients with HTN.

The occurrence of atrial fibrillation is complex, and the main risk factors include hypertension, smoking, alcohol consumption, high sodium intake, and high body mass index[2].

Hypertension is the most reported risk factor for AF as well as the most prevalent. Its prevalence varies from 10.3% to 70.6% with one in three AF patients who had hypertension.

Studies have shown that alcohol is also known to produce arrhythmogenic substrates thus triggering AF which is reported to be prevalent by (42.5%) among hypertensive patients who are alcohol users[17–19].

In three studies, the prevalence of obesity was reported to account for 48.1% (BMI≥25),[20] 5.5% (BMI≥30),[21] and 6.4% (BMI ≥ 35).[22] In most studies, about 20% of patients had cardiomyopathy as the underlying etiologic factor. Most of studies reported a prevalence of coronary artery disease of less than 10% in patients with AF, with variations between 2.7%[23] and 22.9.[24]

Also, lack of awareness and education on regular monitoring and compliance contribute to an increased number of serious strokes related to AF due to the lack of stroke prophylaxis treatment, which is reported in developing countries.

It is reported that the Global Burden of Disease (GBD) 2010 study provided evidence of a progressive increase in worldwide AF burden with significant public health implications[25].However, the GBD study also highlighted the low availability of data from sub-Saharan Africa and the crucial need for better estimates through targeted population surveillance studies [25]. Further, many parts of sub-Saharan Africa are undergoing epidemiological transitions with the gradual adoption of Western lifestyle leading to the development of new cardiovascular risk factors such as hypertension, dyslipidemia, diabetes, and obesity[26]. It is plausible that the higher-than-expected AF prevalence results from poorly managed or untreated risk factors.

Potentially, aggressive risk factors and lifestyle modification may help to control AF without requiring expensive pharmacological therapy or invasive catheter ablation interventions, which are often unavailable in low-resource sub-Saharan countries[27].

However, the best approach for community-based interventions to control non-communicable risk factors remains unclear[20]. Findings from this study may provide useful information for developing targeted interventions or public health policies to curtail the growing epidemic of AF.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Design:

A descriptive Cross-sectional study was be carried out. Cross-sectional studies or prevalence studies are carried out at a certain point in time and in a given geographical area and do not involve follow-up of study participants. This study design enables the collection of information through a survey by means of questionnaires, and/or laboratory or physical examination of individual members of the study population. In this study, it helped to determine the magnitude of atrial fibrillation (AF) in terms of its prevalence among hypertensive patients who are attending at regional referral hospitals in Dar es salaam and disease determinants in this population in terms of their social-demographic characteristics.

3.2 Study Setting:

The study was conducted in Dar es Salaam, the largest city and commercial hub of Tanzania, situated along the eastern coast between latitudes 6°45'S and 7°25'S and longitudes 39°E and 39°55'E. Administratively, Dar es Salaam comprises five municipalities; Kinondoni, Dar es Salaam City, Temeke, Ubungo, and Kigamboni with a total population of 5,383,728 according to the 2022 national census. The city hosts several regional referral hospitals (RRHs) that serve as major referral centers for lower-level health facilities across the region.

The study was carried out in Mwananyamala, Amana, and Temeke Regional Referral Hospitals. These facilities were purposively selected because they provide specialized care for non-communicable diseases, including hypertension and cardiovascular conditions, and have well-established medical outpatient clinics.

Mwananyamala Regional Referral Hospital, located in Kinondoni Municipality, serves as the main referral hospital for the northern zone of Dar es Salaam. It provides a wide range of services, including outpatient and inpatient care, medical and surgical wards, maternal and child health, and specialized clinics such as diabetic and cardiac clinics. The hospital has approximately 350 beds and receives about 800–1,000 outpatients per day.

Amana Regional Referral Hospital, situated in Ilala Municipality, serves as the central referral facility for the city. It offers comprehensive healthcare services, including general medicine, surgery, obstetrics and gynecology, pediatrics, and specialized NCD clinics. With a bed capacity of around 400, Amana receives between 1,000 and 1,200 patients daily, reflecting its role as a high-volume urban facility.

Temeke Regional Referral Hospital, located in Temeke Municipality, serves the southern part of the city and nearby peri-urban areas. It provides both general and specialized services including medical, surgical, maternal, and pediatric care. The hospital has an estimated 300 beds and attends to about 700–900 outpatients daily.

These RRHs were selected because they represent the major referral centers for hypertensive patients within Dar es Salaam, have established cardiac and medical clinics equipped with electrocardiography (ECG) services, and serve a large and diverse population. Their inclusion ensured representativeness of the urban hypertensive population and availability of diagnostic facilities necessary for identifying atrial fibrillation cases.

3.3 Study Population:

All adults who are hypertensive patients aged 18 years and above and are attending regional referral hospitals in Dar es Salaam, Tanzania.

3.4 Sample Size Calculation:

Sample size has been calculated by using the Leslie–Kish formula by using a prevalence of 10.2% obtained from a study done in Dar es Salaam, Tanzania, by

The formula for sample size in prevalence studies was Leslie–Kish.

$$N=\frac{Z^2\,P(1-P)}{e^2}$$

Where

1. Z=2.58
2. P= is the prevalence of atrial fibrillation among hypertensives = 10.2 %
3. e= standard error estimated at 0.01
4. The minimal sample size estimation N,

$$N=\frac{2.58^2\,0.102(1-0.102)}{0.01^2}$$

Calculated sample size, n= **139 patients**.

3.5 Sampling Technique

The study employed a consecutive sampling technique, whereby all hypertensive patients aged 18 years and above who attended the outpatient medical clinics at Amana, Temeke, and Mwananyamala Regional Referral Hospitals during the study period and met the inclusion criteria were recruited until the desired sample size of 139 participants was reached.

Although consecutive sampling is a non-probability method and does not guarantee equal chances of selection for all potential participants, it was deemed the most appropriate and feasible approach for this hospital-based study. This technique minimizes researcher selection bias because every eligible patient presenting consecutively during the data collection period is included, provided they meet the inclusion criteria. It also ensures systematic enrolment without omission or preference, thereby enhancing representativeness within the clinical population.

Given the practical constraints of conducting probability sampling in routine outpatient clinic settings where patient attendance cannot be predicted in advance consecutive sampling offers a balance between methodological rigor and operational feasibility. It is widely used in clinical epidemiological studies and has been shown to yield samples that closely approximate the characteristics of the target population in similar healthcare environments.

3.5.1 Inclusion Criteria

The study included all hypertensive patients aged 18 years and above who attended the medical outpatient clinics at Amana, Temeke, and Mwananyamala Regional Referral Hospitals during the study period. Participants were eligible for inclusion if they had been previously diagnosed with hypertension and were attending follow-up or routine medical visits at the selected facilities. Only patients who provided written informed consent were enrolled in the study.

This criterion ensured that all adult hypertensive patients attending the respective clinics were considered, thereby providing an appropriate denominator for determining the burden and associated factors of atrial fibrillation among hypertensive patients in Dar es Salaam.

3.5.2 Exclusion Criteria

Patients with medical conditions that could independently influence atrial function or confound the diagnosis of atrial fibrillation were excluded from the study. These included individuals with

known valvular heart disease, congenital heart disease, hyperthyroidism, severe electrolyte imbalances, or acute medical illnesses such as severe anemia and active infections.

Excluding these patients minimized potential confounding and ensured that any observed atrial fibrillation was primarily associated with hypertension rather than secondary to other cardiac or metabolic abnormalities.

3.6 DATA COLLECTION TOOLS

Study Questionnaire

A researcher-designed structured questionnaire was used to collect data on socio-demographic and clinical characteristics, including age, sex, marital status, level of education, smoking habits, alcohol use, and duration of hypertension. The questionnaire was first developed in English and then translated into Kiswahili to facilitate ease of understanding among participants. Back-translation into English was performed to ensure consistency and accuracy of meaning.

Validity and Reliability:

The questionnaire was reviewed by two cardiologists and one public health research expert to assess **content validity**, ensuring that all items adequately captured the intended variables related to atrial fibrillation risk factors among hypertensive patients. A **pre-test** was conducted among 10 hypertensive patients at a non-participating hospital (Mnazi Mmoja Hospital) to assess clarity, comprehensiveness, and response consistency. Feedback obtained was used to revise ambiguous items. The tool demonstrated good **internal consistency**, with a Cronbach's alpha coefficient of 0.82 for the main variable domains, indicating reliable measurement.

12-Lead Resting Electrocardiogram (ECG)

A standard 12-lead resting electrocardiogram (ECG) machine was used to detect and confirm atrial fibrillation. The ECG is a non-invasive diagnostic tool that records the electrical activity of the heart through electrodes placed on the skin surface. It provides information on heart rate

and rhythm and is instrumental in identifying irregular atrial activity characteristic of atrial fibrillation.

The conventional ECG setup consists of 12 leads divided into two groups: limb leads and precordial leads. Limb leads assess the heart's electrical activity in the vertical plane, while precordial leads record activity in the horizontal plane. The ECG output was interpreted by a qualified medical officer and confirmed by a cardiologist to ensure **diagnostic reliability**. To enhance **instrument validity**, the ECG machines were calibrated daily before use, and standard operating procedures were strictly followed throughout data collection.

Sphygmomanometer and Stethoscope

A mercury sphygmomanometer and standard stethoscope were used to measure and record blood pressure. Equipment was validated before data collection by cross-checking readings against automated BP monitors, ensuring measurement accuracy.

Stadiometer and Weighing Scale

Height and weight measurements were obtained using a portable stadiometer and a digital weighing scale. Both instruments were calibrated daily to maintain **measurement reliability**, and readings were taken twice for each participant to minimize observer bias.

3.7 DATA COLLECTION PROCEDURE

3.7 Data Collection Procedure

Data collection was conducted between March and May 2025 at Amana, Temeke, and Mwananyamala Regional Referral Hospitals. A team of trained research assistants, supervised by the principal investigator, collected data following standardized clinical and research procedures. All procedures and instruments used were calibrated and verified prior to use to ensure accuracy and reliability.

3.7.1 Informed Consent

All participants who met the inclusion criteria and voluntarily agreed to take part in the study were enrolled after providing written informed consent. The research assistants provided a detailed explanation of the study objectives, procedures involved, potential risks, and benefits in a language understood by the participants. Participants were informed of their right to decline or withdraw at any stage without penalty. Consent procedures followed the principles of the Declaration of Helsinki (2013) for biomedical research involving human subjects.

3.7.2 Administration of Study Questionnaire

A structured, researcher-designed questionnaire was administered through face-to-face interviews by trained research assistants. The tool collected data on socio-demographic and behavioral characteristics, including age, sex, education level, occupation, smoking, alcohol consumption, and duration of hypertension. The questionnaire was originally developed in English, translated into Kiswahili for clarity, and back-translated to ensure conceptual accuracy. Each interview lasted approximately 15–20 minutes and was conducted in a private setting to maintain confidentiality.

3.7.3 Blood Pressure Measurement

Blood pressure was measured using a mercury sphygmomanometer and a standard stethoscope in accordance with the American Heart Association (AHA) and American Society of Echocardiography (ASE) guidelines (2017). Participants were seated comfortably for at least five minutes before the measurement. The cuff was placed on the left upper arm at heart level, and two readings were taken at five-minute intervals. The average of the two readings was recorded as the participant's systolic and diastolic blood pressure.

3.7.4 Anthropometric Measurements

Anthropometric measurements included height and weight, which were used to calculate the Body Mass Index (BMI). A Secco digital weighing scale and a portable stadiometer were used for weight and height measurements, respectively.

- Weight Measurement: Each participant's weight was measured to the nearest 0.5 kg without shoes and in light clothing. Participants stood upright with feet together and arms relaxed at the sides.
- Height Measurement: Height was measured to the nearest 0.5 cm with participants standing barefoot, upright, and looking straight ahead with heels, buttocks, and shoulders touching the measuring rod.
- BMI Calculation: Body Mass Index (BMI) was calculated using the standard formula:

BMI categories were classified based on the World Health Organization (WHO, 2023) standards, as summarized in Table 1.

Table 1; Table shows Body Mass Index parameters.

WEIGHT STATUS	BODY MASS INDEX (BMI) Kg/ m^2
Underweight	<18.5
Normal weight	18.5-24.9
Overweight	25.0-29.9
Obese	≥30

3.7.5 12-Lead Resting Electrocardiogram (ECG) Recording

A standard 12-lead resting electrocardiogram (ECG) was performed on all participants to detect the presence of atrial fibrillation. ECG procedures followed the American College of Cardiology (ACC), American Heart Association (AHA), and Heart Rhythm Society (HRS) guidelines (2017) for ECG performance and interpretation.

Each participant was instructed to rest for at least 10 minutes in a supine position before the procedure. Skin preparation was performed using alcohol swabs to improve electrode contact. Electrodes were placed at standardized anatomical locations four limb leads and six precordial leads (V1–V6) to obtain comprehensive cardiac electrical activity in both frontal and horizontal planes.

The ECG tracings were printed and reviewed immediately by the research clinician and later confirmed by a cardiologist to ensure diagnostic accuracy and inter-observer reliability. Machines were calibrated daily and checked for signal quality before use to maintain measurement validity.

3.8 Data Management and Statistical Analysis

Data were checked daily for completeness and accuracy before entry. All data were coded and entered into Statistical Package for Social Sciences (SPSS) version 20.0 for analysis. Data cleaning was conducted to identify and correct entry errors and inconsistencies prior to statistical analysis.

Descriptive statistics were used to summarize the characteristics of the study participants. Categorical variables such as sex, education level, smoking status, and alcohol use were summarized using frequencies and percentages, while continuous variables such as age, body mass index (BMI), and blood pressure were summarized using means and standard deviations (SD). The results were presented in tables and graphs for clarity.

Bivariate analysis was conducted to assess the association between each independent variable and the dependent variable (presence of atrial fibrillation). Pearson's chi-square test was used for categorical variables, while the Student's t-test was applied for continuous variables. Variables with a p-value ≤ 0.2 in the bivariate analysis were considered potential predictors and were subsequently included in the multivariate model.

A multivariate logistic regression analysis was then performed to identify independent factors associated with atrial fibrillation among hypertensive patients. The regression model was built using the enter method, where all eligible covariates were entered simultaneously. Confounding was assessed by observing changes in regression coefficients, and interaction terms were tested where biologically plausible.

The adjusted odds ratio (AOR) and 95% confidence intervals (CI) were used as measures of effect to estimate the strength and direction of association between predictor variables and atrial fibrillation. Model fitness was assessed using the Hosmer–Lemeshow goodness-of-fit test, and multicollinearity was examined using the variance inflation factor (VIF). All statistical tests were two-tailed, and a p-value < 0.05 was considered statistically significant.

Table2: Study Objectives, Variables, Statistical Tests, and Type of Analysis

Objective	Variables	Statistical Test(s) Used	Type of Analysis
1. To determine the prevalence of atrial fibrillation (AF) among hypertensive patients	• Dependent: Presence of AF (Yes/No) • Independent: N/A (single outcome)	• Descriptive statistics (frequency, proportion)	**Descriptive analysis**
2. To determine the socio-demographic characteristics of hypertensive patients with AF	• Dependent: AF status (Yes/No) • Independent: Age, Sex, Marital status, Education level, Occupation	• Chi-square test (categorical variables) • t-test (continuous variables, e.g., age)	**Descriptive and Bivariate analysis**
3. To determine the risk factors of AF among hypertensive patients	• Dependent: AF status (Yes/No) • Independent: Behavioral factors (smoking, alcohol), Clinical factors (BP control, LVH, Diabetes, CKD, Obesity, Medication adherence)	• Chi-square test (bivariate associations) • Binary Logistic Regression (multivariate)	**Bivariate and Multivariate analysis**

ETHICAL CONSIDERATION

This study adhered to the highest ethical standards throughout its conduct. Ethical clearance was obtained from the Institutional Review Board (IRB) of Kairuki University, and permission to conduct the study was granted by the management of Amana, Temeke, and Mwananyamala Regional Referral Hospitals.

Prior to data collection, all participants were provided with detailed information regarding the study's objectives, procedures, potential benefits, and possible risks. Written informed consent was obtained from each participant who voluntarily agreed to take part in the study. Participation was entirely voluntary, and participants were informed of their right to withdraw from the study at any stage without any consequences.

To ensure confidentiality, all questionnaires and ECG results were assigned unique identification codes, and no personal identifiers were used during data entry or analysis. All collected data were stored securely in password-protected files accessible only to the research team.

For participants who were diagnosed with atrial fibrillation (AF) during the study, immediate clinical management was ensured in accordance with the hospitals' standard treatment protocols. Each diagnosed patient was counseled on their condition and referred to a cardiologist or the attending physician within the same facility for further evaluation, confirmatory diagnosis, and initiation of appropriate therapy such as rate or rhythm control and anticoagulation where indicated. The research team maintained close communication with the facility medical officers to confirm that each identified case received appropriate medical follow-up and care.

The study was conducted in accordance with the principles outlined in the Declaration of Helsinki (2013) on the protection of human subjects, ensuring respect for autonomy, beneficence, non-maleficence, and justice.

3.10 LIMITATION OF THE STUDY

Recall bias is a potential limitation in this study since participants were required to self-report on their medical history, symptoms, or lifestyle factors. Hypertensive patients may inaccurately recall past events, such as the timing of symptom onset or prior diagnoses, leading to misclassification and affecting the study's findings. This issue is especially relevant if the participants' memory was influenced by their health status or the passage of time, potentially skewing the association between hypertension and atrial fibrillation (AF).

To mitigate recall bias, the study incorporated objective data sources, such as hospital records, laboratory results, or prescription histories, to validate participants' self-reports. Structured interviews with specific, clear, and time-bound questions were used to improve the accuracy of recall.

3.11 DISSEMINATION

The research results will be disseminated to the Kairuki University Library, the Ministry of Health, and the Regional Referral Hospitals in Dar es Salaam through research reports, scientific conferences, and publications.

CHAPTER FOUR

4.0 RESULTS

4.1 Introduction

This study examine the prevalence and associated factors of atrial fibrillation (AF) among hypertensive patients attending Temeke and Amana regional referral hospitals in Dar es Salaam, Tanzania. Study presented using descriptive statistics, bivariate analyses (Chi-square tests), and multivariate logistic regression to identify significant predictors of atrial fibrillation.

The first section describes the socio-demographic and clinical characteristics of the study participants, followed by the overall prevalence of atrial fibrillation. The subsequent sections explore the association between atrial fibrillation and participants' demographic characteristics, behavioral factors, clinical conditions, and access to care. Finally, the results of unadjusted (crude) and adjusted odds ratios are presented to identify independent predictors of atrial fibrillation.

4.2 Socio-Demographic and Clinical Characteristics of the Study Participants

A total of 139 hypertensive patients participated (female (54.67%), males 45.32%.) The majority of respondents were aged 60 years and above, accounting for 53.96%, followed by those aged 45–60 years (31.65%), and 35–44 years (14.39%).

In terms of marital status, 60.43% of participants were married, 16.55% were single, 12.23% were widowed, and 10.79% were divorced. Regarding education level, most participants had attained primary education (40.29%), followed by secondary education (30.94%), tertiary education (16.55%), and no formal education (12.23%).

With respect to occupation, 46.04% of the respondents were employed, 24.46% were engaged in informal work, 20.86% were unemployed, and 8.63% were self-employed.

On behavioral characteristics, a large proportion of participants (72.66%) reported never having smoked, while 20.14% were current smokers. Additionally, 67.62% reported not consuming alcohol, whereas 37.86% indicated alcohol use.

Blood pressure was controlled in 87.05% of the patients, while 12.95% had uncontrolled blood pressure. Regarding nutritional status, 38.13% were underweight, 27.34% were overweight, another 27.34% were obese, and only 7.19% had a normal body mass index.

With respect to comorbidities, 28.78% of participants had diabetes, while 71.22% did not. Heart failure was reported in 17.27% of participants, while 82.73% did not have the condition. Left ventricular hypertrophy (LVH) was present in 35.25% of patients, while 64.75% had no evidence of LVH.

In terms of medication adherence, 68.35% of participants reported good adherence, while 31.65% had poor adherence to prescribed antihypertensive medications. Lastly, 80.58% of respondents reported having access to electrocardiogram (ECG) services, whereas 19.42% did not.

Table 4.1: Distribution of Respondents by Socio-Demographic and Behavioral Characteristics (N = 139)

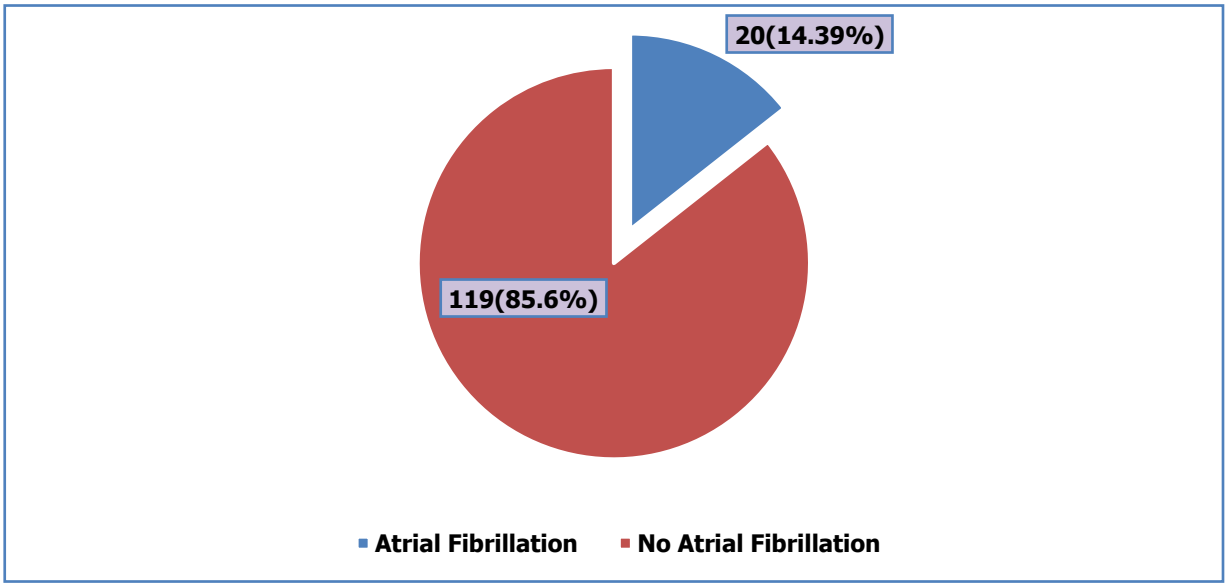
Variable	Category	Frequency	Percent
Age Category	35–44	20	14.39
	45–60	44	31.65
	60+	75	53.96
Sex	Female	76	54.67
	Male	63	45.32
Marital Status	Single	23	16.55
	Married	84	60.43
	Divorced	15	10.79
	Widowed	17	12.23
Education Level	None	17	12.23
	Primary	56	40.29
	Secondary	43	30.94
	Tertiary	23	16.55
Occupation	Employed	64	46.04
	Unemployed	29	20.86
	Informal	34	24.46
	Self Employed	12	8.63
Smoking Status	Never	101	72.66
	Current	28	20.14
Alcohol Consumption	No	96	67.62
	Yes	53	37.86
BP Control	Controlled	121	87.05
	Not Controlled	18	12.95
Nutrition Status	Normal	10	7.19
	Underweight	53	38.13
	Overweight	38	27.34
	Obese	38	27.34

Diabetes	No	99	71.22
	Yes	40	28.78
Heart Failure	No	115	82.73
	Yes	24	17.27
LVH	No	90	64.75
	Yes	49	35.25
Medication Adherence	Good	95	68.35
	Poor	44	31.65
Access to ECG	Not Available	27	19.42
	Available	112	80.58

4.3 The prevalence of atrial fibrillation among hypertensive patients attending regional referral hospitals in Dar es Salaam, Tanzania, 2025.

The prevalence of atrial fibrillation (AF) among hypertensive patients attending regional referral hospitals in Dar es Salaam was found to be **14.39%,** as depicted in Figure 1. Out of the 139 patients enrolled in the study, **20 participants** were diagnosed with atrial fibrillation, while the majority, **119 participants (85.61%),** had no evidence of atrial fibrillation. This highlights a notable burden of AF among hypertensive individuals, underscoring the need for routine screening and early detection in this high-risk population.

Figure 1: Proportion of Respondents Diagnosed with Atrial Fibrillation



4.4 Association Between Socio-Demographic Characteristics and Atrial Fibrillation

Table 4.2 presents the distribution of atrial fibrillation among hypertensive patients according to socio-demographic and behavioral characteristics. Although a higher prevalence of atrial fibrillation was observed among participants aged 60 years and above (16.0%), followed by those aged 45-60 years (13.6%) and 35-44 years (10.0%), the association between age and atrial fibrillation was not statistically significant ($p = 0.782$).

With respect to sex, females had a slightly higher prevalence of atrial fibrillation (15.8%) compared to males (12.7%), though the difference was not statistically significant ($p = 0.605$).

Regarding marital status, atrial fibrillation was most common among married individuals (16.7%), followed by divorced (13.3%), single (13.0%), and widowed participants (5.9%). However, the association was not significant ($p = 0.706$).

Education level showed a statistically significant association with atrial fibrillation ($p = 0.013$). Participants with tertiary education had the highest proportion of atrial fibrillation (21.7%), followed by those with primary education (14.3%), no formal education (11.8%), and secondary education (11.6%).

In terms of occupation, the prevalence of atrial fibrillation was highest among employed individuals (17.2%), followed by the self-employed (16.7%), informal workers (11.8%), and the unemployed (10.3%), although this association was not statistically significant ($p = 0.793$).

Smoking status was significantly associated with atrial fibrillation ($p = 0.004$). Current smokers had the highest prevalence of atrial fibrillation (21.4%), compared to those who never smoked (12.9%) and former smokers (10.0%).

Lastly, alcohol consumption was also significantly associated with atrial fibrillation ($p = 0.033$). Those who consumed alcohol had a slightly higher prevalence (15.1%) than those who did not (14.0%).

Table 4.2: Distribution of social-demographic characteristics of patients with atrial fibrillation among hypertensive patients attending regional referral hospitals in Dar es Salaam.

Variable	Category	Atrial Fibrillation n (%)		P-Value
		Yes	No	
Age Category	35-44	2 (10.0%)	18 (90.0%)	0.782
	45-60	6 (13.6%)	38 (86.4%)	
	60+	12 (16.0%)	63 (84.0%)	
Sex	Male	8 (12.7%)	55 (87.3%)	0.605
	Female	12 (15.8%)	64 (84.2%)	
Marital Status	Single	3 (13.0%)	20 (87.0%)	0.706
	Married	14 (16.7%)	70 (83.3%)	
	Divorced	2 (13.3%)	13 (86.7%)	
	Widowed	1 (5.9%)	16 (94.1%)	
Education Level	None	2 (11.8%)	15 (88.2%)	**0.013**
	Primary	8 (14.3%)	48 (85.7%)	
	Secondary	5 (11.6%)	38 (88.4%)	
	Tertiary	5 (21.7%)	18 (78.3%)	
Occupation	Employed	11 (17.2%)	53 (82.8%)	0.793
	Unemployed	3 (10.3%)	26 (89.7%)	
	Informal	4 (11.8%)	30 (88.2%)	
	Self Employed	2 (16.7%)	10 (83.3%)	
Smoking Status	Never	13 (12.9%)	88 (87.1%)	**0.004**
	Current	6 (21.4%)	22 (78.6%)	
	Former	1 (10.0%)	9 (90.0%)	
Alcohol Consumption	Yes	8 (15.1%)	45 (84.9%)	**0.033**
	No	12 (14.0%)	74 (86.0%)	

4.5 Clinical and Behavioral Risk Factors Associated with Atrial Fibrillation

Table 4.3 presents the distribution of atrial fibrillation in relation to clinical and behavioral risk factors among hypertensive patients. Patients with uncontrolled blood pressure had a higher prevalence of atrial fibrillation (15.7%) compared to those with controlled blood pressure (5.6%). However, this difference was not statistically significant ($p = 0.252$).

Regarding nutritional status, the highest prevalence of atrial fibrillation was observed among underweight individuals (20.0%), followed by those with normal nutritional status (18.9%). Overweight and obese participants each had a prevalence of 10.5%. These differences were not statistically significant ($p = 0.564$).

Diabetes was not significantly associated with atrial fibrillation ($p = 0.687$). Among diabetic participants, 12.5% had atrial fibrillation compared to 15.2% among non-diabetics. Similarly, heart failure showed no significant association with atrial fibrillation ($p = 0.727$), with slightly higher prevalence among those with heart failure (16.7%) than those without (13.9%).

Only 9.1% of participants with chronic kidney failure had atrial fibrillation compared to 14.8% of those without the condition, but this association was not statistically significant ($p = 0.602$).
Left ventricular hypertrophy (LVH) showed a statistically significant association with atrial fibrillation ($p = 0.013$). Atrial fibrillation was more common among participants with LVH (16.3%) than among those without LVH (13.3%).
Medication adherence was not significantly associated with atrial fibrillation ($p = 0.386$). Among participants with poor adherence, 18.2% had atrial fibrillation, compared to 12.6% among those with good adherence. Finally, access to ECG services was not statistically associated with atrial fibrillation ($p = 0.589$). Atrial fibrillation was present in 15.2% of participants who had access to ECG and 11.1% of those who did not.

Table 4.3: Risk factors of atrial fibrillation among hypertensive patients attending regional referral hospitals in Dar es Salaam.

Variable	Category	Atrial Fibrillation n (%)		P-Value
		Yes	No	
BP Control	Controlled	1 (5.6%)	17 (94.4%)	0.252
	Uncontrolled	19 (15.7%)	102 (84.3%)	
Nutrition Status	Underweight	2 (20.0%)	8 (80.0%)	0.564
	Normal	10 (18.9%)	43 (81.1%)	
	Overweight	4 (10.5%)	34 (89.5%)	
	Obese	4 (10.5%)	34 (89.5%)	
Diabetes	Yes	5 (12.5%)	35 (87.5%)	0.687
	No	15 (15.2%)	84 (84.8%)	
Heart Failure	Yes	4 (16.7%)	20 (83.3%)	0.727
	No	16 (13.9%)	99 (86.1%)	
Chronic Kidney Failure	Yes	1 (9.1%)	10 (90.9%)	0.602
	No	19 (14.8%)	109 (85.2%)	
LVH	Yes	8 (16.3%)	41 (83.7%)	**0.013**
	No	12 (13.3%)	78 (86.7%)	
Medication Adherence	Good	12 (12.6%)	83 (87.4%)	0.386
	Poor	8 (18.2%)	36 (81.8%)	
	Not Available	3 (11.1%)	24 (88.9%)	

4.6 Multivariate Analysis of Factors Associated with Atrial Fibrillation

Table xx presents the results of both crude and adjusted odds ratios (COR and AOR) with 95% confidence intervals for variables associated with atrial fibrillation (AF) among hypertensive patients. After adjusting for potential confounders in multivariate logistic regression, some variables that were statistically significant in the bivariate analysis lost their significance, while others gained strength or precision in their association with AF.

While the 45–60 age group showed a higher likelihood of AF in both COR (1.66) and AOR (2.15), the association remained statistically insignificant (p = 0.19). Similarly, although females had higher odds in the adjusted model (AOR = 1.04), the result was not statistically significant (p = 0.44), consistent with the bivariate findings.

In the bivariate analysis, education level was significantly associated with AF (p = 0.013), especially among those with tertiary education. However, after adjustment, this association lost significance across all categories (e.g., tertiary AOR = 0.47, p = 0.51), likely due to confounding by other factors such as age or comorbidities.

Smoking was significantly associated with AF in the bivariate analysis (p = 0.004), with higher prevalence among current smokers. However, in the adjusted model, current smoking showed a reduced and statistically non-significant association (AOR = 0.51, p = 0.25). This loss of significance may be due to interactions with other risk factors such as alcohol use or LVH.

Alcohol use remained an important factor in the adjusted model (AOR = 0.59, p = 0.19), though it lost statistical significance compared to the bivariate finding (p = 0.033). This attenuation might be due to shared variance with other lifestyles or clinical factors.

Although bivariate findings showed no significant association, in the multivariate model, being obese became significantly associated with atrial fibrillation (AOR = 1.21; 95% CI: 1.03–1.43; p = 0.02). This suggests obesity independently contributes to AF risk when other variables are held constant.

Heart failure, which was not significant in bivariate analysis (p = 0.727), showed a strong and statistically significant negative association in the multivariate model (AOR = 0.18; 95% CI: 0.05–0.72; p = 0.015). This shift may indicate a suppressor effect heart failure might be more common in the non-AF group when adjusting for other comorbidities.

LVH remained a significant predictor in both bivariate (p = 0.013) and multivariate analyses (AOR = 2.05; 95% CI: 1.20–3.50; p = 0.009), suggesting it is an independent and robust risk factor for AF.

Both diabetes and CKD remained non-significant in the adjusted model, consistent with bivariate results. Their adjusted odds (AOR = 2.27 and 1.69 respectively) suggest possible associations that may not have reached significance due to limited power or confounding.

Poor medication adherence showed a strong unadjusted association (COR = 2.02), but the adjusted odds (AOR = 0.51) were non-significant (p = 0.64), indicating possible confounding or misclassification. Access to ECG, similarly, had an elevated AOR (2.07) but was not statistically significant (p = 0.09).

The multivariate analysis helps isolate the independent effects of each variable by adjusting for potential confounders. Variables such as LVH and obesity retained or gained significance, confirming their role as independent predictors of atrial fibrillation in hypertensive patients. Conversely, variables like education level, smoking, and alcohol consumption lost statistical significance, possibly due to confounding or effect modification. These changes highlight the importance of adjusted analyses in understanding true associations in complex clinical settings.

Table 4.4: Crude and Adjusted Odds Ratios (COR and AOR) with 95% Confidence Intervals and P-values for Factors Associated with Atrial Fibrillation among Hypertensive Patients Attending Regional Referral Hospitals in Dar es Salaam, 2025

Variable	Category	COR (95% CI)	P-value	AOR (95% CI)	P-value
Age Category	35–44 (Ref)				
	45–60	1.66 (1.28–1.77)	0.96	2.15 (1.97–2.32)	0.19
	60+	0.99 (0.91–1.08)	0.86	1.03 (0.93–1.15)	0.54
Sex	Male (Ref)	1.36 (0.95–1.54)	0.51	1.64 (1.52–1.98)	0.18
	Female	0.54 (0.06–1.03)	0.80	1.04 (0.90–1.41)	0.44
Education Level	None (Ref)				
	Primary	2.21 (1.86–2.44)	0.07	1.05 (0.82–1.44)	0.64
	Secondary	2.26 (1.97–2.41)	0.70	2.00 (1.68–2.41)	0.49
	Tertiary	1.50 (1.23–1.61)	0.12	0.47 (0.18–1.21)	0.51
Smoking Status	Never (Ref)				
	Current	1.00 (0.89–1.34)	0.50	0.51 (0.30–0.97)	0.25
	Former	0.70 (0.40–1.19)	0.25	1.81 (1.41–2.01)	0.72
Alcohol Consumption	No (Ref)				
	Yes	1.17 (0.82–1.52)	0.54	0.59 (0.16–0.82)	0.19
BP Control	Controlled (Ref)				
	Uncontrolled	0.94 (0.58–1.37)	0.56	1.51 (1.31–1.65)	0.89
Nutrition Status	Normal (Ref)				
	Underweight	2.29 (1.94–2.53)	0.35	1.92 (1.46–2.37)	0.77
	Overweight	0.41 (0.25–0.73)	0.69	1.77 (1.58–2.15)	0.24
	Obese	0.99 (0.93–1.06)	0.80	1.21 (1.03–1.43)	**0.02**

Diabetes	No (Ref)				
	Yes	0.96 (0.76–1.45)	0.39	2.27 (1.92–2.69)	0.50
Heart Failure	No (Ref)				
	Yes	0.72 (0.43–1.20)	0.21	0.18 (0.05–0.72)	**0.015**
Chronic Kidney Failure	No (Ref)				
	Yes	2.37 (1.99–2.70)	0.11	1.69 (1.19–1.85)	0.52
LVH	No (Ref)				
	Yes	1.78 (1.12–2.81)	0.01	2.05 (1.20–3.50)	**0.009**
Medication Adherence	Good (Ref)				
	Poor	2.02 (1.83–2.37)	0.09	0.51 (0.20–0.83)	0.64

***Note**: Reference categories (Ref) are indicated in parentheses. AOR = Adjusted Odds Ratio; COR = Crude Odds Ratio; CI = Confidence Interval.*

CHAPTER FIVE

5.0 DISCUSSION

5.1 Introduction

This chapter discusses the findings of the study on the prevalence and risk factors of atrial fibrillation (AF) among hypertensive patients attending regional referral hospitals in Dar es Salaam, Tanzania, in 2025. AF is the most common sustained cardiac arrhythmia globally, associated with increased risk of stroke, heart failure, and mortality[4]. Hypertension is the leading modifiable risk factor for AF, yet there is limited local evidence on its burden and determinants in sub-Saharan Africa. In this study, AF prevalence was found to be 14.39%, with left ventricular hypertrophy (LVH) and obesity identified as independent predictors in multivariate analysis, while socio-demographic variables, lifestyle factors, and other comorbidities were not significantly associated after adjustment. The discussion is organized according to the study's specific objectives, comparing these results with previous local, regional, and international studies, exploring similarities and differences, and highlighting implications for clinical practice and future research.

5.2 The Prevalence of Atrial Fibrillation among Hypertensive Patients

The prevalence of atrial fibrillation (AF) in the present study was 14.39% among hypertensive patients attending Temeke and Amana Regional Referral Hospitals in Dar es Salaam. This estimate highlights a considerable AF burden in this high-risk group and situates the study within the upper range of prevalence figures reported in similar hospital-based hypertensive populations in sub-Saharan Africa (SSA). It is well recognized that hypertension is the most common modifiable risk factor for AF, with structural and electrical remodeling of the atria in hypertensive patients creating a substrate for arrhythmogenesis[7].

Within Tanzania, the most directly comparable data come from the Jakaya Kikwete Cardiac Institute (JKCI), a national tertiary cardiac referral hospital. Bhalia et al. reported an AF prevalence of 10.23% among 391 hypertensive outpatients[8]. Although slightly lower than the 14.39% in our study, the JKCI authors similarly characterized AF as "considerably prevalent" in this subgroup. The difference in prevalence may be partly attributable to variations in case ascertainment; our study employed active ECG screening of all participants, likely identifying more asymptomatic or paroxysmal AF cases that would be missed with opportunistic diagnosis.

Findings from neighboring Uganda support the consistency of this burden. Jama et al. reported an AF prevalence of 10% among hypertensive outpatients at Fort Portal Regional Referral Hospital[9]. Despite differences in sample size and diagnostic protocol, both the Ugandan and Tanzanian estimates demonstrate that AF prevalence in hypertensive outpatients in East African hospital settings tends to fall in the double-digit range.

In contrast, community-based hypertensive cohorts particularly in low- and middle-income countries (LMICs) report substantially lower prevalence rates. Wang et al. observed an AF prevalence of just 1.4% in a large rural Chinese hypertensive cohort[10], a striking difference from our findings. Several factors likely account for this: community samples are generally younger, with lower comorbidity burdens, earlier-stage hypertension, and less cumulative atrial remodeling. Moreover, healthcare-seeking patterns differ; many community-detected hypertensives in China were identified through screening campaigns, rather than presenting with advanced disease, thereby reducing the observed AF rate.

Similar patterns emerge from African community studies. Kavishe et al. found an AF prevalence of <1% in a rural Tanzanian general population cohort[11], while Sliwa et al. noted that AF prevalence in community samples across SSA rarely exceeds 3–4%, even in older adults[12].

These figures stand in marked contrast to hospital-based cardiovascular clinic data, where prevalence rates are consistently higher due to referral bias and case-mix severity.

Several regional reviews confirm this dichotomy. A systematic review by Noubiap et al. reported that AF prevalence in SSA hospital-based cardiovascular populations ranged from 3.8% to 59%, depending on patient inclusion criteria, age distribution, and diagnostic methods, with hypertensive patients representing a substantial proportion of cases[13]. Oyediran et al., analyzing data from a Tanzanian emergency department, found AF to be one of the most frequent arrhythmias, albeit with alarmingly low anticoagulation uptake[14]. Although their setting differed from ours, these findings indirectly support the notion that AF is far from rare in Tanzanian healthcare facilities.

Evidence from other high-risk cardiovascular hospital populations further contextualizes our results. Heart failure (HF) registries in Ghana and South Africa have reported AF prevalence rates between 6% and 12% among inpatients[15,16]. While these figures are not hypertensive-specific, they illustrate the heightened arrhythmia burden in hospitalized cardiovascular populations and highlight the overlap in risk factors particularly hypertension, LVH, and atrial dilation between HF and hypertensive AF patients.

Methodological factors also influence the prevalence differences observed between studies. Hospital-based research that uses systematic ECG screening such as our study detects both symptomatic and asymptomatic AF, including paroxysmal episodes. In contrast, studies relying solely on opportunistic detection may underestimate prevalence, especially in patients with intermittent or silent AF. Our study's proactive screening approach, combined with the fact that over half of our participants were aged ≥60 years and many had structural heart changes such as LVH, created a clinical environment where AF detection was more likely.

The clustering of high-risk characteristics in our study population; older age, high rates of obesity, and structural heart disease; aligns with the profile described in global AF epidemiology, where these factors act synergistically to increase arrhythmia risk[1,17]. The observed prevalence thus reflects both the clinical composition of our sample and the structural realities of referral-based hospital care in Tanzania, where more complex and advanced hypertensive cases predominate.

In summary, the prevalence reported here is consistent with the higher end of African hospital-based hypertensive cohort estimates and markedly higher than community-based figures in both SSA and other LMICs. This difference underscores the importance of care setting, population characteristics, and screening methodology in determining measured AF burden. The findings make a compelling case for routine AF screening in hypertensive clinics, particularly in tertiary and regional referral hospitals, where the disease burden is concentrated and the potential for stroke prevention through early detection and management is substantial.

5.3 Socio-Demographic Associations with Atrial Fibrillation

In this study, socio-demographic characteristics specifically age, sex, and education level showed associations with atrial fibrillation (AF) in unadjusted analyses; however, none remained statistically significant after multivariate adjustment. Marital status and occupation were also not significant predictors in either analysis. These findings contrast with the consistent results from large-scale international studies, where age and sex are among the most robust independent predictors of AF, and where lower socio-economic status is often linked to higher AF risk.

The Framingham Heart Study, one of the foundational epidemiological investigations in cardiovascular medicine, demonstrated a strong, graded increase in AF risk with advancing age,

with incidence roughly doubling with each decade beyond middle age, and with men consistently showing higher rates than women[18]. Similar results have been reported in the ARIC study, which found age and male sex to be independent predictors of AF after controlling for other cardiovascular risk factors[19]. Meta-analyses of population-based cohorts further confirm these trends[20 21]. The absence of significant age and sex effects in the present study is therefore noteworthy and may be explained by methodological and contextual factors.

One likely explanation is statistical power. With only 20 AF cases in the sample, the study's ability to detect moderate independent associations was limited. Additionally, the study population was relatively homogeneous: all participants had hypertension, a major AF risk factor, and over half were aged 60 years or older. This "risk saturation" effect, where the entire cohort shares high baseline cardiovascular risk, can attenuate the relative impact of demographic variables in multivariate models. Furthermore, older participants in this cohort were also more likely to exhibit comorbidities such as left ventricular hypertrophy (LVH), which may mediate the relationship between age and AF.

The relationship between education level and AF in this study was unexpected. In unadjusted analysis, participants with tertiary education had the highest prevalence of AF, but this association disappeared after adjusting for other factors such as obesity and LVH. In high-income countries, higher educational attainment is generally associated with lower AF risk, partly due to healthier lifestyles and better access to preventive care[22]. However, in the Tanzanian hospital context, higher education may be linked to greater health literacy and therefore greater likelihood of undergoing diagnostic ECG testing, which could inflate AF detection in this subgroup. Additionally, sedentary work patterns, higher obesity prevalence, and urban lifestyles among highly educated individuals may counteract potential protective effects.

Marital status and occupation showed no significant association with AF in the current study. Internationally, the evidence for these variables is mixed. Some studies have suggested that being single or widowed may modestly increase AF risk, possibly through psychosocial stress or reduced healthcare engagement[23], while others have found no independent effect once other risk factors are controlled for. Similarly, occupational category has rarely been identified as an independent risk factor for AF after adjustment for socio-economic and lifestyle variables.

Evidence from African studies reveals similar variability. In a Tanzanian hypertensive cohort at the Jakaya Kikwete Cardiac Institute, no significant sex differences in AF prevalence were observed after adjustment[8]. A Nigerian hospital study, however, reported higher AF prevalence among older men[24], consistent with global trends. A community-based Ugandan study found age to be a significant predictor of AF detection but reported no association with education level[25]. These differences highlight the influence of study setting, sample composition, and detection methods on observed socio-demographic associations.

In summary, while global evidence supports age, sex, and lower education as independent predictors of AF, the present findings suggest that in hospital-based hypertensive cohorts, these socio-demographic effects may be overshadowed by clinical and structural factors such as LVH and obesity. This underscores the importance of focusing preventive strategies on modifiable clinical risk factors in advanced disease populations, while recognizing that demographic variables retain importance in population-level risk modelling.

5.4 Clinical and Behavioral Risk Factors Associated with Atrial Fibrillation

This study identified left ventricular hypertrophy (LVH) and obesity as the only independent predictors of atrial fibrillation (AF) in hypertensive patients after adjustment for confounding factors. Other variables, including smoking, alcohol consumption, medication adherence, blood

pressure control, diabetes, chronic kidney disease (CKD), and history of heart failure, were not statistically significant in the multivariate model, although some showed crude associations in bivariate analyses.

The association between LVH and AF observed in this study (AOR = 2.05) is consistent with robust evidence linking structural heart disease to atrial arrhythmogenesis. LVH, a common sequela of long-standing hypertension, contributes to diastolic dysfunction, left atrial enlargement, and fibrosis, all of which promote abnormal conduction and re-entry circuits[26]. Global data from the Framingham Heart Study demonstrated that LVH, assessed via ECG or echocardiography, is an independent predictor of AF incidence[27]. In sub-Saharan Africa, hospital-based studies in Tanzania[8] and Ghana[28] have similarly reported higher AF prevalence among hypertensive patients with LVH, reinforcing the current finding that structural remodeling is a key pathophysiological driver.

Obesity emerged as another independent predictor in this study (AOR = 1.21). This is consistent with multiple large-scale studies demonstrating a dose–response relationship between body mass index (BMI) and AF risk[29 30]. Mechanistically, obesity promotes atrial dilatation, systemic inflammation, and neurohormonal activation[31]. Notably, the LEGACY study in Australia found that sustained weight loss reduced AF burden and progression[32]. The significance of obesity in our adjusted model, despite no bivariate association, suggests that when structural and metabolic factors are considered simultaneously, adiposity exerts a measurable, independent impact.

Although poorly controlled blood pressure was associated with higher AF prevalence in bivariate analysis, the relationship was not statistically significant after adjustment. This aligns with some cross-sectional studies[33] but contrasts with longitudinal cohorts showing that elevated systolic blood pressure is a strong predictor of AF incidence[19]. The discrepancy likely reflects our

study's cross-sectional design, where most participants were already on antihypertensive treatment, limiting variability in blood pressure measurements.

Unexpectedly, heart failure showed an inverse association with AF in the multivariate model (AOR = 0.18). This finding diverges from the majority of literature, which recognises AF as both a cause and consequence of heart failure[34] [30]. Possible explanations include residual confounding, underrepresentation of severe heart failure cases in the AF group, or treatment effects as heart failure patients may be more likely to receive beta-blockers, ACE inhibitors, or mineralocorticoid receptor antagonists, which could suppress AF onset or recurrence.

In the bivariate analysis, smoking and alcohol consumption were significantly associated with AF, but both lost significance after adjustment. Similar attenuation has been observed in other studies once structural variables and comorbidities are included in the model[35]. While chronic alcohol use is a recognized risk factor for AF ("holiday heart syndrome"), its impact in hypertensive cohorts appears smaller when structural heart disease is the dominant risk pathway. Smoking likewise contributes to atrial oxidative stress and inflammation, but its independent role is often reduced when adjusting for concomitant cardiovascular risk factors.

Neither diabetes nor CKD were significantly associated with AF in this study, although international evidence often points to modest increases in AF risk for both conditions[30] [36]. In our case, the small number of participants with CKD and the cross-sectional design likely reduced statistical power to detect these effects. Moreover, the influence of these metabolic conditions may be mediated by structural heart changes, which were already included in the adjusted model.

Poor medication adherence showed a crude association with AF but was not significant in the adjusted analysis. Given that antihypertensive adherence reduces long-term cardiovascular strain, it is plausible that a larger sample size or longitudinal design might reveal a stronger

independent relationship. In summary, this study confirms that in hypertensive populations, structural heart abnormalities (LVH) and metabolic status (obesity) are central to AF risk, overshadowing the independent contributions of lifestyle factors and other comorbidities once confounding is addressed. These findings align with the "structural heart first" hypothesis, which posits that arrhythmia susceptibility in hypertension is primarily determined by anatomical and functional remodeling rather than by demographic or isolated behavioral exposures. The results highlight the clinical importance of routine echocardiographic assessment for LVH and weight management interventions in hypertensive care to mitigate AF risk.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study set out to determine the prevalence and risk factors of atrial fibrillation (AF) among hypertensive patients attending Temeke and Amana Regional Referral Hospitals in Dar es Salaam, Tanzania, in 2025. Guided by three specific objectives, the investigation provides valuable local evidence on a condition that is increasingly recognized as a major contributor to cardiovascular morbidity and mortality worldwide.

With respect to the first objective**,** the prevalence of AF was found to be 14.39% in this hospital-based hypertensive cohort. This prevalence is notably higher than most community-based estimates in sub-Saharan Africa, which typically range below 5%, but aligns with the upper range of figures reported in other hospital-based studies across the region. Such a high prevalence reflects both the older age distribution and advanced cardiovascular disease burden in this population, as well as the hospital setting, where patients are more likely to have undergone diagnostic evaluation such as ECGs. The finding underscores AF as a significant and relatively common comorbidity in Tanzanian hypertensive outpatients, warranting systematic screening and early intervention.

In relation to the second objective**,** examining socio-demographic characteristics of patients with AF, unadjusted analyses suggested possible associations with age, sex, and education level. However, these associations did not remain statistically significant in multivariate models, in contrast to large-scale international studies that consistently show age and male sex as independent predictors of AF. The lack of independent associations here may be due to the homogeneous risk profile of the cohort, where the majority of participants already presented

with long-standing hypertension and elevated cardiovascular risk. This pattern suggests that in such high-risk groups, structural and metabolic factors may outweigh demographic predictors in determining AF risk.

For the third objective, identifying clinical and behavioral risk factors, left ventricular hypertrophy (LVH) and obesity emerged as the only independent predictors of AF in multivariate analysis. LVH, a structural marker of chronic hypertension, predisposes to atrial dilation and conduction abnormalities, thereby increasing AF susceptibility. Obesity likely contributes through hemodynamic overload, systemic inflammation, and metabolic dysregulation. Interestingly, other potential risk factors including smoking, alcohol use, diabetes, chronic kidney disease, and poor medication adherence did not retain statistical significance after adjustment, despite some showing associations in bivariate analysis. This suggests that in populations with entrenched hypertension, structural heart changes and metabolic status play a more decisive role in AF pathogenesis than isolated lifestyle behaviors.

Overall, the findings indicate that AF is not only prevalent but also strongly linked to structural and metabolic changes in the heart among hypertensive patients in Tanzania. The results highlight the importance of comprehensive cardiovascular care that integrates routine AF screening, echocardiographic assessment for LVH, and targeted weight management interventions into standard hypertension management. Addressing these factors proactively has the potential to reduce AF incidence, prevent its complications, and improve long-term outcomes in this high-risk population.

6.2 Recommendations

6.2.1 Clinical Practice

Routine AF Screening: Establish systematic AF screening protocols in all regional referral hospitals, incorporating resting 12-lead ECG as a standard component of hypertension follow-up visits. Screening should prioritize patients with echocardiographic evidence of left ventricular hypertrophy (LVH) and those with obesity, as these groups demonstrated the highest independent risk in this study. Early detection may facilitate the timely initiation of anticoagulation or rhythm-control strategies, thereby reducing the risk of stroke and other AF-related complications.

Echocardiographic Assessment: Embed echocardiography into standard hypertension management pathways to enable early detection of LVH, atrial enlargement, and other structural cardiac abnormalities. Findings from echocardiography should be used to stratify patients according to AF risk and inform more intensive follow-up schedules for those with structural changes.

Weight Management in Hypertension Clinics: Develop and integrate structured, multidisciplinary weight management programs within hypertension clinics. Such programs should involve nutritionists, physiotherapists, and clinical staff to provide dietary counselling, physical activity guidance, and behavioral modification support. Given the role of obesity as an independent risk factor for AF, targeted weight loss could substantially reduce AF incidence and improve overall cardiovascular outcomes.

Integrated Risk Factor Control: Adopt a holistic cardiovascular risk management approach that combines optimal blood pressure control, lipid management, glycemic control (where relevant), and smoking/alcohol cessation counselling. AF surveillance should be incorporated into these integrated care models, ensuring that all modifiable risk factors are addressed concurrently rather than in isolation.

6.2.2 Public Health and Policy

Guideline Revision: Revise and update the Tanzanian national hypertension management guidelines to include explicit recommendations for AF risk assessment, ECG screening in high-risk patients, and the use of echocardiography for structural heart disease evaluation.

Healthcare Worker Training: Implement nationwide training program to enhance the capacity of healthcare professionals particularly in district and regional hospitals to accurately interpret ECGs, recognize AF patterns, assess stroke risk using validated scoring systems, and initiate appropriate anticoagulation therapy where indicated.

Public Awareness Campaigns: Design and implement targeted community-based education campaigns to raise awareness about AF symptoms (such as palpitations, fatigue, and breathlessness), its potential complications, and the importance of regular cardiovascular screening. Special emphasis should be placed on reaching high-risk groups, including older adults with hypertension and individuals with obesity.

6.2.3 Research

Longitudinal Cohort Studies: Undertake prospective cohort studies to investigate the temporal relationships between hypertension, LVH progression, obesity, and the onset of AF. This would help clarify causality and identify optimal intervention windows.

Community-Based Surveys: Conduct large-scale epidemiological surveys to determine the prevalence, awareness, treatment, and control rates of AF in the general Tanzanian population. Such data would guide resource allocation, policy formulation, and targeted intervention strategies.

Intervention Trials: Design and implement clinical trials to evaluate the effectiveness of targeted interventions such as aggressive blood pressure control, regression of LVH, structured weight loss programs, and lifestyle modification in reducing AF incidence and improving outcomes in hypertensive patients.

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APPENDICES

APPENDIX I: INFORMED CONSENT FORM (ENGLISH VERSION).

TITLE: ATRIAL FIBRILLATION AMONG HYPERTENSIVE PATIENTS ATTENDING REGIONAL REFERRAL HOSPITALS IN DAR ES SALAAM, TANZANIA.

I, Dr. Malecha Msabaha, a Department of Internal Medicine resident, would like to conduct the above study to fulfill my postgraduate studies. Your participation is required to acquire necessary information regarding your health to be used as data in this study.

The study aims to determine the prevalence and risk factors of Atrial Fibrillation in hypertensive patients attending regional Referral Hospitals in Dar es Salaam. Findings from this study shall be helpful in the recommendation of early screening of Atrial Fibrillation among adults with hypertension thus early intervention before the development of further complications and treating them accordingly. Those adults with hypertension in Dar es Salaam, who will meet the inclusion criteria will be recruited into the study and will be interviewed using a questionnaire, including their social demographic characteristics, and clinical features. An ECG will be done, and Study findings will not be released to any unauthorized person. The participant will not be asked for any fee/money and will be free to withdraw at any time during the study. People to contact in case of questions or problems, Prof Y. Mgonda, chairperson of the Department of Internal Medicine or Director of Post Graduate Studies and Research Institute KU.

I……...have read/been told of the contents of this form and understood its meaning. Hence, I agree to participate in this study.

Signature …… (Participant), Signature of PI……., Date……...

APPENDIX II: FOMU YA IDHINI (SWAHILI VERSION).

MATIBABU YA KUPATWA NA MAPIGO YA MOYO YASIYO YA KAWAIDA (ATRIAL FIBRILLATION) MIONGONI MWA WAGONJWA WENYE SHINIKIZO LA DAMU WANAOHUDHURIA HOSPITALI ZA RUFAA ZA MKOA HAPA DAR ES SALAAM, TANZANIA.

Mimi, Dkt. Malecha Msabaha, Mwanafunzi wa shahada ya uzamili ya Magonjwa ya ndani katika Chuo kikuu cha Kairuki, ninapanga kufanya utafiti huu kama sehemu ya kutimiza mahitaji ya masomo yangu ya uzamili. Ushiriki wako unahitajika ili kupata taarifa muhimu kuhusu afya yako zitakazotumika kama data kwenye utafiti huu.

Lengo la utafiti huu ni kubaini kiwango cha maambukizi na sababu hatarishi za kupatwa na mapigo ya moyo yasiyo ya kawaida (Atrial Fibrillation) kwa wagonjwa wenye shinikizo la damu wanaohudhuria hospitali za rufaa za mkoa hapa Dar es Salaam. Matokeo ya utafiti huu yatasaidia katika kutoa mapendekezo ya uchunguzi wa mapema wa hali hii kwa watu wazima wenye shinikizo la damu, ili kuingilia kati mapema kabla ya kuzuka kwa matatizo zaidi na kuyatibu ipasavyo.

Wagonjwa watu wazima wenye shinikizo la damu hapa Dar es Salaam watakaokidhi vigezo vya ushiriki watajumuishwa kwenye utafiti huu. Watashiriki mahojiano kupitia dodoso ambalo litaangazia sifa zao za kijamii na kidemografia, pamoja na dalili za kliniki. Pia, kipimo cha ECG kitafanyika. Matokeo ya utafiti hayatatolewa kwa mtu yeyote asiyeidhinishwa. Mshiriki hatatakiwa kulipa ada yoyote au kutoa pesa, na atakuwa na uhuru wa kujiondoa wakati wowote katika utafiti huu.

Watu wa kuwasiliana nao iwapo kuna maswali au matatizo ni:

Prof. Y. Mgonda, Mwenyekiti wa Idara ya Tiba ya Ndani au Mkurugenzi wa Taasisi ya Utafiti na Masomo ya Uzamili, Chuo Kikuu cha KU.

Mimi……nimesoma/nimeelezwa kuhusu maudhui ya fomu hii na nimeelewa maana yake. Hivyo, nakubali kushiriki katika utafiti huu.

Saini ya Mshiriki……..…

Saini ya Mtafiti Mkuu……..……

Tarehe…….……

APPENDIX III: ENGLISH VERSION QUESTIONAIRE.

Section 1: Demographic Information

1. **What is your age?**

   [ ] 18-30

   [ ] 31-40

   [ ] 41-50

   [ ] 51-60

   [ ] 61-70

   [ ] 71 and above

2. **What is your gender?**

   [ ] Male

   [ ] Female

3. **What is your marital status?**

   [ ] Single

   [ ] Married

   [ ] Widowed

   [ ] Divorced

4. **What is your occupation?**

   [ ] Employed

   [ ] Self-employed

   [ ] Student

   [ ] Unemployed

   [ ] Retired

5. **What is your level of education?**

   [ ] No formal education

   [ ] Primary school

   [ ] Secondary school

   [ ] Tertiary education

   [ ] Other (Please specify): _____

Section 2: Medical History

6. **Have you been diagnosed with hypertension (high blood pressure)?**

   [ ] Yes

   [ ] No

7. **At what age were you first diagnosed with hypertension?**

   [ ] Below 30

   [ ] 31-40

   [ ] 41-50

   [ ] 51-60

   [ ] 61-70

   [ ] 71 and above

8. **How long have you been living with hypertension?**

   [ ] Less than 1 year

   [ ] 1-5 years

   [ ] 6-10 years

   [ ] More than 10 years

9. **Have you ever been diagnosed with atrial fibrillation (AF)?**

   [ ] Yes

   [ ] No

10. **If yes, when were you diagnosed with atrial fibrillation?**

    [ ] Less than 1 year ago

    [ ] 1-5 years ago

    [ ] 6-10 years ago

    [ ] More than 10 years ago

11. **Do you have any of the following chronic conditions? (Check all that apply)**

    [ ] Diabetes

    [ ] Stroke

    [ ] coronary artery disease

    [ ] Kidney disease

    [ ] None of the above

Section 3: Symptoms

12. **Have you ever experienced any of the following symptoms? (Check all that apply)**

    [ ] Palpitations (feeling the heart beating rapidly or irregularly)

    [ ] Shortness of breath

    [ ] Fatigue or weakness

    [ ] Dizziness or lightheadedness

    [ ] Chest pain or discomfort

[ ] Fainting or near-fainting episodes

[ ] None of the above

13. **How often do you experience these symptoms?**

    [ ] Rarely

    [ ] Occasionally

    [ ] Frequently

    [ ] Always

14. **Do these symptoms get worse with physical activity?**

    [ ] Yes

    [ ] No

    [ ] Not sure

Section 4: Lifestyle and Medication Adherence

15. **Are you currently taking any medication for hypertension?**

    [ ] Yes

    [ ] No

16. **If yes, how regularly do you take your hypertension medication?**

    [ ] Always as prescribed

    [ ] Sometimes miss doses

    [ ] Rarely take medication

17. **Do you follow a healthy lifestyle (diet and exercise)?**

    [ ] Yes

    [ ] No

    [ ] Occasionally

18. **Do you consume alcohol?**

    [ ] Yes

    [ ] No

19. **Do you smoke?**

    [ ] Yes

    [ ] No

Section 5: Risk Factors

20. **Do you have a family history of cardiovascular diseases (e.g., heart disease, stroke)?**

    [ ] Yes

    [ ] No

21. **Has your blood pressure ever been poorly controlled or out of range?**

    [ ] Yes

    [ ] No

22. **Do you engage in regular physical activity or exercise?**

    [ ] Yes

    [ ] No

23. **What is your body mass index (BMI)?**

[ ] Underweight

[ ] Normal weight

[ ] Overweight

[ ] Obese

APPENDIX IV: DODOSO SWAHILI VERSION

Sehemu ya 1: Habari za Kijamii

1. **Una umri gani?**

   [] 18-30

   [ ] 31-40

   [ ] 41-50

   [ ] 51-60

   [ ] 61-70

   [ ] 71 na zaidi

2. **Jinsia yako ni ipi?**

   [] Mwanaume

   [ ] Mwanamke

3. **Hadhi yako ya ndoa ni ipi?**

   [ ] Single (Bila ndoa)

   [ ] Ndoa

   [ ] Mjane

   [ ] Talaki

4. **Unajishughulisha na nini?**

   [ ] Kazi

   [ ] Kujiajiri

   [ ] Mwanafunzi

   [ ] Bila kazi

   [ ] Mstaafu

5. **Elimu yako ni ipi?**

   [ ] Hakuna elimu rasmi

   [ ] Shule ya Msingi

   [ ] Shule ya Sekondari

   [ ] Elimu ya juu

   [ ] Nyingine (Tafadhali fafanua): _____

Sehemu ya 2: Historia ya Afya

6. **Je, umewahi kugundulika na shinikizo la damu (hipertension)?**

   [ ] Ndiyo

   [ ] Hapana

7. **Ulipoanzishwa na shinikizo la damu, ulikuwa na umri gani?**

   [ ] Chini ya miaka 30

   [ ] Miaka 31-40

   [ ] Miaka 41-50

   [ ] Miaka 51-60

   [ ] Miaka 61-70

   [ ] Miaka 71 na zaidi

8. **Umeishi na shinikizo la damu kwa muda gani?**

   [ ] Chini ya mwaka 1

   [ ] Miaka 1-5

   [ ] Miaka 6-10

   [ ] Zaidi ya miaka 10

9. **Je, umewahi kugundulika na atrial fibrillation (AF)?**

    [ ] Ndiyo

    [ ] Hapana

10. **Ikiwa ndiyo, ulipogundulika na atrial fibrillation ilikuwa lini?**

    [ ] Chini ya mwaka 1 uliopita

    [ ] Miaka 1-5 iliyopita

    [ ] Miaka 6-10 iliyopita

    [ ] Zaidi ya miaka 10 iliyopita

11. **Je, una hali yoyote ya kiafya sugu? (Chagua zote zinazofaa)**

    [ ] Kisukari

    [ ] Stroke

    [ ] Ugonjwa wa moyo

    [ ] Ugonjwa wa figo

    [ ] Hakuna kati ya hizi

Sehemu ya 3: Dalili

12. **Je, umewahi kupata dalili zifuatazo? (Chagua zote zinazofaa)**

    [ ] Kupiga moyo kwa haraka au kwa usumbufu

    [ ] Kupumua kwa shida

    [ ] Uchovu au udhaifu

    [ ] Kizunguzungu au kupoteza fahamu

    [ ] Maumivu ya kifua

    [ ] Kufeli au karibu kupoteza fahamu

    [ ] Hakuna kati ya hizi

13. **Dalili hizi hutokea mara ngapi?**

    [ ] Mara chache

    [ ] Mara kwa mara

    [ ] Mara nyingi

    [ ] Kila wakati

14. **Je, dalili hizi huwa mbaya zaidi unapofanya shughuli za kimwili?**

    [ ] Ndiyo

    [ ] Hapana

    [ ] Si hakika

Sehemu ya 4: Mabadiliko ya Maisha na Utii wa Dawa

15. **Je, unatumia dawa yoyote kwa ajili ya shinikizo la damu?**

    [ ] Ndiyo

    [ ] Hapana

16. **Ikiwa ndiyo, je, unachukua dawa yako ya shinikizo la damu mara ngapi?**

    [ ] Kila mara kama ilivyoagizwa

    [ ] Mara kwa mara nakosa

    [ ] Kidogo sana

17. **Je, unaishi kwa mtindo wa maisha wa afya (lishe na mazoezi)?**

    [ ] Ndiyo

    [ ] Hapana

    [ ] Wakati mwingine

18. **Je, unakunywa pombe?**

    [ ] Ndiyo

    [ ] Hapana

19. **Je, unavuta sigara?**

    [ ] Ndiyo

    [ ] Hapana

Sehemu ya 5: Vichocheo vya Hatari

20. **Je, una historia ya familia ya magonjwa ya moyo (e.g., magonjwa ya moyo, stroke)?**

    [ ] Ndiyo

    [ ] Hapana

21. **Je, shinikizo lako la damu lilikuwa linadhibitiwa vibaya au lilikuwa nje ya kiwango?**

    [ ] Ndiyo

    [ ] Hapana

22. **Je, unashiriki katika mazoezi au shughuli za kimwili mara kwa mara?**

    [ ] Ndiyo

    [ ] Hapana

23. **Je, umekuwa na uzito wa mwili wa aina gani?**

    [ ] Uzito pungufu

    [ ] Uzito wa kawaida

    [ ] Uzito mkubwa

    [ ] Obesi

THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF HEALTH

AMANA REGIONAL REFERRAL HOSPITAL

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Phone: 022—2861903

REF. NO. MoHCDGEC/ARRH/R.1/VOL V/

Date: 06/08/2025

Director, Postgraduate Studies and
Research Institute,
Kairuki University,
P.O. Box 65300,
DAR ES SALAAM.

Re: PERMISSION FOR DATA COLLECTION

Refer to your letter dated 6th August, 2025 which requested us to allow **Dr. Malecha Msabaha Mgumba** to conduct research and collect data in our institution.

We are here to acknowledge your request with the following conditions, that he must submit the results of his research after completion of analysis in order the hospital to make use of data's to solve hospital problems.

Regards.

MEDICAL OFFICER I/C
AMANA REGIONAL REFERRAL HOSPITAL
P.O. BOX 25411
DAR ES SALAAM

Dr. Rose Ntambuto
FOR: MEDICAL OFFICER INCHARGE
AMANA REGIONAL REFERRAL HOSPITAL

JAMUHURI YA MUUNGANO WA TANZANIA
WIZARA YA AFYA.
HOSPITAL YA RUFAA YA MKOA YA TEMEKE

Baruapepe:temekerh@afya.go.tz,S.L.P 45232 Dar es Salaam,Simu 0222856007

Kumb. Na. TRRH/RSC/9/8/50 **Tarehe: 06/08/2025.**

Ndg. Malecha Msabaha Ugumba
Kairuki University (KU)
S.L.P. 65300
DAR ES SALAAM.

YAH: OMBI LA KUFANYA UTAFITI KUHUSU 'INVESTIGATING ARTIAL FIBRILLATION AMONG HYPERTENSIVE PATIENTS ATTENDING REGIONAL REFERRAL HOSPITALS, DAR ES SALAAM TANZANIA".

Tafadhali husika na somo tajwa hapo juu.

2. Nimepokea barua yako ya tarehe **4 August, 2025** kuhusu ombi lako la kufanya Utafiti (Research) katika Taasisi yetu, kuhusu '**investigating artial fibrillation among hypertensive patients attending regional referral hospitals, dar es salaam tanzania"**

3. Ombi lako limekubaliwa, utatakiwa kulipa ada ya utafiti kiasi cha Tshs. **100,000/=** kwa kipindi chote utakachokuwa hapa hospitalini kwetu. Hivyo wasiliana na mhasibu wa mapato wa Hospitali ili akupatie control Number kwa ajili ya malipo ya ada hii ili uweze kuruhusiwa kufanya utafiti.

4. Asante kwa ushirikiano.

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19 AUG 2025

Dkt. Husna Msangi
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Nakala: **Kiongozi wa (CSCO)** - ***Tafadhali hakikisha taarifa ya utafiti inabaki hospitalini***

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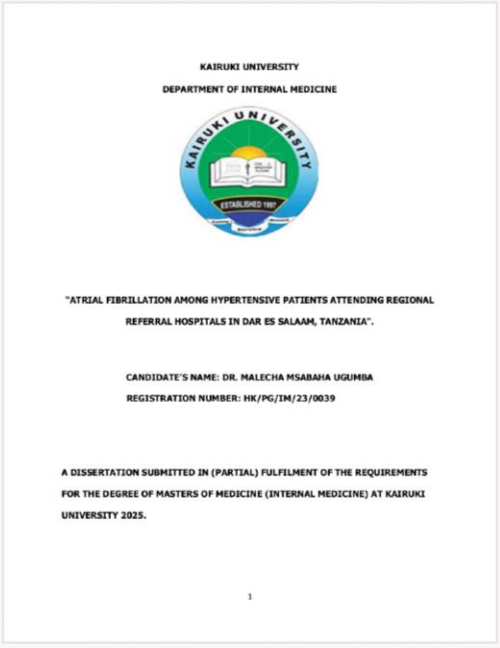

KAIRUKI UNIVERSITY

DEPARTMENT OF INTERNAL MEDICINE

"ATRIAL FIBRILLATION AMONG HYPERTENSIVE PATIENTS ATTENDING REGIONAL REFERRAL HOSPITALS IN DAR ES SALAAM, TANZANIA".

CANDIDATE'S NAME: DR. MALECHA MSABAHA UGUMBA

REGISTRATION NUMBER: HK/PG/IM/23/0039

A DISSERTATION SUBMITTED IN (PARTIAL) FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF MEDICINE (INTERNAL MEDICINE) AT KAIRUKI UNIVERSITY 2025.

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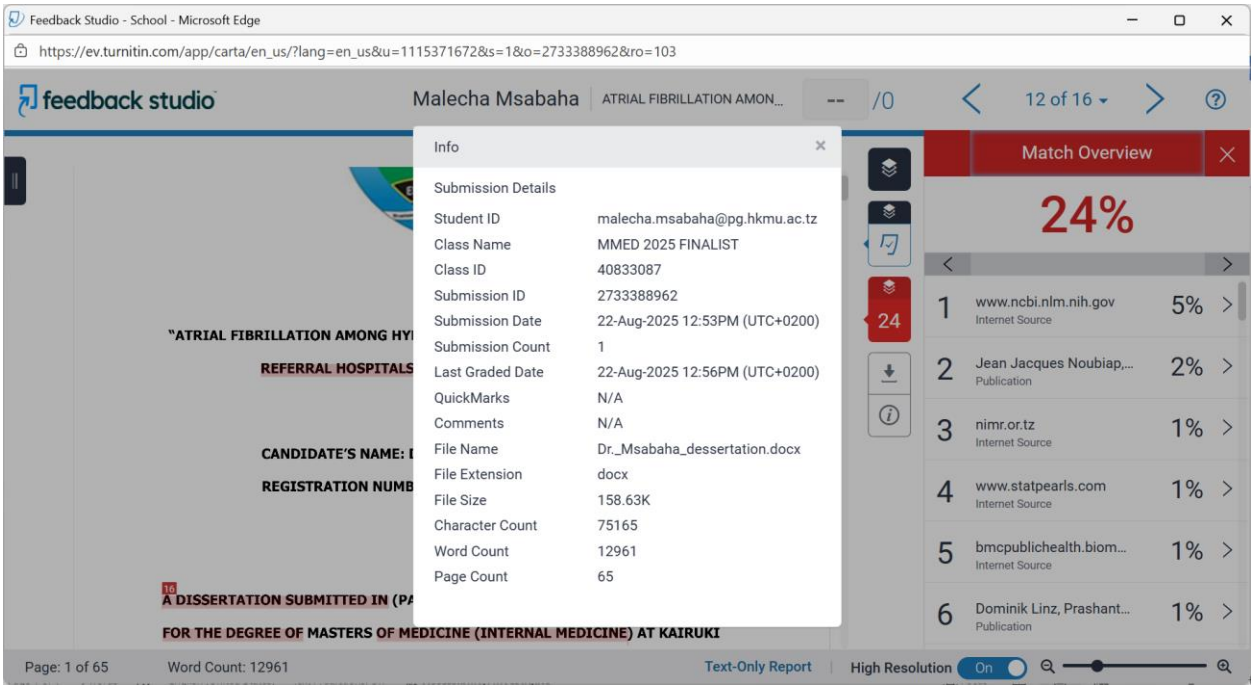
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