THE UNIVERSITY OF NAIROBI, COLLEGE OF HEALTH SCIENCES
DEPARTMENT OF CLINICAL MEDICINE AND THERAPEUTICS

THE PREVALENCE OF ATRIAL FIBRILLATION AMONG PATIENTS WITH ACUTE ISCHEMIC STROKE AT KENYATTA NATIONAL HOSPITAL

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H58/37766/2020

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Award of the Degree of Master of Medicine (Internal Medicine) of the School of Medicine, University of Nairobi

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LIST OF ABBREVIATIONS AND ACRONYMS

AF: Atrial Fibrillation

CT: Computed Tomography

CVA: Cerebrovascular Accident

DAPT: Dual Antiplatelet Agents

ECG: Electrocardiograph

INR: International Normalized Ratio

KNH: Kenyatta National Hospital

LAA: Left Atrial Appendage

MRI: Magnetic Resonance Imaging

NOAC: Novel Oral Anticoagulants

SSA: Sub Saharan Africa

TEE: Trans Esophageal Echo

UON: University of Nairobi

VKA: Vitamin K Antagonist

DEFINITION OF TERMS

Stroke: Stroke is rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer, or leading to death, with no apparent cause other than of vascular origin. (1)

Atrial Fibrillation: AF is a supraventricular tachyarrhythmia characterized by uncoordinated atrial activation with consequent deterioration of atrial mechanical function. (2)

ABSTRACT

Background: Throughout the world, stroke is graded as the second leading cause of death and the commonest cause of long-term incapacity among adults. Around 80% of all deaths due to stroke occur in underdeveloped nations. The global prevalence of atrial fibrillation (AF) is approximately 0.51%, which translates to about 37,574 million cases. AF patients have an exaggerated risk of heart failure, embolic stroke, lower quality of life, cognitive impairment and higher mortality. AF derives importance from its strong association with ischemic stroke.

Objective: To determine the burden of AF among patients with stroke and assess their degree of disability at KNH.

Methods: A cross-sectional study conducted at the KNH neurology unit. The prevalence of AF was calculated as proportion of patients with acute ischemic stroke and AF over the total sample size. The comparison of severity of disease between AF and non-AF groups was determined using multinomial regression at 95% confidence interval. Patient clinical and socio-demographic factors associated with AF was determined using independent t-tests for continuous data and chi square test for categorical data. Odds ratio as well 95% confidence interval were calculated.

Results: A total of **123** patients with acute ischemic stroke were enrolled for this study. 52.8% were female and the mean age of the enrolled population was 62.4 years. The prevalence of AF in ischemic stroke was found at **29.3%.** Majority of those with AF (65%) had moderate to severe disease, while less than 5% of patients without AF has severe disease. Age, smoking, alcohol, marital status, employment, and hypertension were independently associated with the presence of AF.

Conclusion: Atrial Fibrillation is a key component known to have a significant impact in stroke occurrence and severity of disease with respect to degree of disability, length of hospital stays as well as mortality. A high prevalence of AF with subsequent impact on mortality was documented in our setup. Special attention and awareness need to be created among health care providers to provide dedicated early diagnostic approaches and treatment among the predisposed groups to prevent the catastrophic outcome.

1.0 CHAPTER ONE: INTRODUCTION

1.1 Background

Stroke causes approximately 11.6% of deaths every year, making it the second commonest cause of mortality worldwide (3). In sub-Saharan Africa, stroke admissions and case-fatality have been on the rise in the last decade and a half, reflecting the lack of coping capacity of our public health care system (4). Cardio embolic stroke accounts for 14-30% all ischemic strokes (5). Atrial fibrillation (AF), the prevalence of which increases with aging, is a significant cause of cardio embolic stroke (6). The high morbidity and mortality rate is regrettable since cardio embolic stroke is preventable if the risk factors are detected early through screening.

Atrial fibrillation (AF) which is associated with four to five times increment in the risk of stroke is the most prevalent chronic cardiac arrhythmia (6). As reported from the ATRIA study, with an elderly population of ever-increasing size, it is likely that AF associated death and disease will assume growing importance in the future (6)).

A report by Fisher indicated that more than 70% of the strokes associated with AF were fatal or resulted in a catastrophic neurological impairment. According to a study on the Impact of Atrial Fibrillation on Mortality and Stroke by Wolf et al, Patients with AF experienced significantly higher mortality rates than matched patients without AF, a finding that persisted for each age-sex group during the study period (7). However, in more contemporary comparison studies some studies implied a probable role of AF in the risk for severer stroke while others did not. This disparity could be attributed to differences in study design (case-control, case-series, or follow-up study), setting (population or hospital), and/or effect quantification (neurological impairment, functional deficit, or death at several durations after stroke (8,9). Despite AF being a known stroke risk factor that contributes to inexcusable outcome, data expounding on their relation is scarce in African countries.

2.0 CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Atrial fibrillation (AF) is a supraventricular tachyarrhythmia characterized by uncoordinated atrial actuation with ensuing decline of cardiac function (6). AF is a cardiac arrhythmia that is commonly seen in medical practice, contributing to close to a third of admission for rhythm disruptions. The calculated AF prevalence is 0.51% worldwide, translating to 7,574 million cases (10). The prevalence goes up to roughly 6 percent in persons older than 65 years of age and to 10 percent in persons older than 80 (11). AF management primarily involves rate and rhythm control and prevention of thromboembolic events (12).

AF in patients has been shown to have a five times increased stroke risk with an estimate of up to 25% of all strokes in the elderly attributed to it. (11) In a study done by Nduiga Daniel at our facility, valvular lesions were found to be the most common cause of atrial fibrillation. (13). However, the epidemiologic transition in SSA is likely to change the risk factors and associated complications of this arrhythmia. A study in Tanzania identified hypertension as a major risk factor for AF development.(14) A study by Ntep et Al in Cameroon identified the vast majority of AF patients presented with structural heart disease (90.7%), with hypertensive heart disease and rheumatic heart disease as the main etiologies. (15)

2.2 Burden of Stroke

Stroke is a chief source of incapacitation and comes in second as the cause of death worldwide (16) In sub-Saharan Africa (SSA) it accounts for about 8.8% of all deaths (17). It was cited as the principal cardiovascular cause of mortality and impairment in SSA (17)

While the Global Burden of Disease (GBD) data indicated a reduction in occurrence and mortality of stroke in the world, an increasing trend was noted in sub-Saharan Africa (SSA) and the data are now available with annual incidence and prevalence rates of 316 per 100 000 population and 981 per 100 000 population (age standardized) reported (18).

2.3 Burden of Atrial Fibrillation

Atrial fibrillation is not only the commonest encountered sustained arrhythmia, but as recent evidence suggests, the commonest arrhythmia related reason of hospital admissions (19). Data shows that African patients with AF have a higher stroke risk because of suboptimal

antithrombotic treatment. (20). In developed regions, despite the accessible high-quality health care, similar trends of suboptimal anticoagulation is noted (21). Adequate resources and keen attention is key in the prevention and management of AF and related ramifications in Africa and the emergent nations generally. A systematic AF epidemiology review conducted in developing nations showed that the AF prevalence in the continent presently is less than in other investigated areas (20). In a South African facility-based study, AF was found in 4.6% of patients in cardiology, denoting an approximated incidence of 5.6 cases per 100,000 population per year (22). Comparably a systematic review done retrospectively (N=3,908) at an institute of cardiology in Ivory Coast showed the AF prevalence was 5.5% in all patients hospitalized over a period of 10-years (23). A study in Senegal retrospectively also computed AF prevalence at 5.4% contributing to 66% of rhythmic heart conditions (24).

A low rate of AF prevalence was described in a Kenyan study where the prevalence of flutter and AF in a private hospital amidst medical patients was 0.7% (162/22,144); of these 15% came in with a thromboembolic event (25). In a Tanzanian rural community, among the elderly residents of ≥70 years old the prevalence of AF was significantly low, at 0.7% (26). This depicted a significantly lower estimate than the AF rates in elderly patients in the western world, where 5 percent of people older than 65 years and 10 percent of people older than 80 years have been diagnosed with AF (11,27). The low rate of AF reported in some studies in Africa is attributed to poor behavior in health care-seeking and inaccessibility to quality health care. With better access, an increased prevalence of AF is likely to be noted across Sub-Saharan Africa.

2.4 Burden of Atrial Fibrillation in Stroke

AF is a significant stroke risk factor, causing a 2-7 times increase in risk compared to the general population (28) (29). The occurrence of stroke in AF goes up substantially with age, varying from 6.7% in individuals 50–59 years to 36.2% in those that are 80–89.(5,7). A study by Hannon et al in a North Dublin population detected AF in 31.2% of all patients with new stroke incidents and 28.7% of all those with first time events (30). In a systematic review to assess the prevalence of AF and related risk factors for stroke in Africa, Acute Ischemic Stroke patients had an AF prevalence of 17.6% (31). A study done in Ethiopia described the prevalence of AF among stroke patients as 28.7%. The in hospital case fatality of stroke associated with AF and without AF was computed at 22.2% and 8% respectively while the discharged patients improvement rate was 34% and 68% respectively (32).

2.5 Consequences of stroke in Atrial Fibrillation

Strokes as a consequence of AF are associated with an excess risk of consequent morbidity, deaths, and deficient functional outcome compared to stroke secondary to other causes (33) The hemostatic abnormalities following the index event predispose to higher risk of repeated stroke especially within the first year (34,35). A number of studies shown that AF was predisposed to an increased risk of mortality in the first four weeks after an event (33,36).Cardio embolic strokes were associated with higher recurrence rates and higher mortality (37).

A study in a North Dublin population showed AF-associated stroke had a clear-cut profile of repeated, severe and incapacitating disease. (30) Among patients with ischemic stroke who are stratified by increasing stroke severity (NIHSS 0–4, 29.7%; 5–9, 38.1%; 10–14, 43.8%; ≥15, 53.3%, $p < 0.0001$) it was noted that the frequency of AF progressively increases across the strata. (30)

Stroke as a consequence of AF was almost twice as likely to be fatal in a report from the Framingham Study (37). Functional incapacitation was more likely to be severe among survivors and recurrence was frequent. It was estimated that almost 70 percent of stroke victims with AF were markedly reliant on activities of daily living as opposed to the almost a third of their correlates with sinus rhythm. The Frequency of being bed- ridden following the first ischemic stroke nearly doubled in the presence of AF (41.2% in AF patients compared to 23.7% in those without AF) and this increase in severity was independent of advanced age and other stroke risk factors (37).

2.6 Diagnosing AF in Patients with TIA or Stroke

Longer cardiac monitoring is often a requirement in confirming AF diagnosis in patients who present with TIA or stroke. CRYSTAL AF trial (2014) (38) was a multicenter RCT that evaluated AF detection rates in patients who are 55 years and older with ischemic stroke/TIA of uncertain origin with no history of AF, comparing insertable cardiac monitor(ICM) to traditional practice using telemetry or Holter monitoring. A significantly higher detection rate was noted in the ICM group compared to controls at both the 6 and 36 months follow up.

Paroxysmal atrial fibrillation normally goes undetected because of its characteristic episodic, brief duration and often subclinical presentation making it a challenge to detect routinely, resulting in negligible secondary prevention (39). It is common for it to not be detected in a single ECG on admission (40).

New AF rate of detection from a standard 12 lead ECG after ischemic/TIA stroke is 2-5% (41) and from a 24 hour holter monitor is 2-6% (42,43). Holter monitoring only identifies AF in an extra 4.6% of patients as suggested by systematic review (41), not more significant than that noted in groups lacking standard monitoring (44).

Although an improved detection of AF with longer ECG monitoring has been demonstrated in RCTs (38,45), such strategies involve a high cost and is both invasive and strenuous, hence limiting extensive use in clinical practice (Lin et al., 1996). A standard 12-lead ECG is the gold standard tool for the diagnosis of AF and is a basic mandatory device in all hospitals (46). It is straightforward, convenient and cheap to perform a 12-lead ECG on each patient with acute ischemic stroke (46).

2.7 Assessment of Severity of Stroke

For one to objectively assess stroke outcome and to advise patients and families about potential medical decisions, it is crucial to ascertain stroke severity and predict risk of in-hospital mortality (47). Parameters assessed in these scores include level of consciousness, motor and sensory deficit and cranial nerve deficits among others (47). A number of scores have been developed for assessing severity of ischemic stroke and outcome in the acute setting (48,49). In current neurology practice, the National Institutes of Health Stroke Scale (NIHSS) is the most widely used deficit rating scale (50), and has been shown to accurately establish stroke severity and prognosis in the background of clinical trials and clinical practice(51,52). The NIHSS is internally consistent, with a reasonable Cronbach's alpha and reproducible across the purposeful range of users: ED physicians, neurologists and stroke nurses (53). The scale has demonstrated reliability when used by non-neurologists who undergo basic training (54).

2.8 Stroke assessment and prevention in AF

Stroke prevention is a cornerstone in the management of patients with AF. Use of CHA_2DS_2-VASc score for stroke risk assessment (55) and HAS-BLED score for bleeding risk assessment (56) is recommended by all the guidelines. Oral anticoagulant therapy (OAC) with vitamin K antagonists (VKA), e.g. warfarin, reduced the risk of AF-associated stroke by 64% compared

to placebo. (57) Non-VKA antagonist OAC (NOAC), further reduced the risk of stroke or systemic embolic events by 19% compared to warfarin in a pooled analysis of NOACs pivotal trials. (58)

2.9 Clinical Characteristics Associated with Stroke Development among AF Patients

2.9.1 Valvular AF

Patients with AF and valvular heart disease are believed to have an exaggerated risk of thromboembolism compared to those with AF alone (59,60). AF frequently exists with other valve disease but the term "valvular AF" of late narrowed to define AF in the background of moderate-to-severe mitral stenosis or mechanical heart valve (21). This is an important distinction because the essential DOAC trials excluded valvular AF patients. Patients who had other types of valvular disease in the DOAC trials maintained equal reduction in stroke risk and there was no proof to advocate a need for a different regimen of anticoagulants.

2.9.2 CKD Patients

CKD has been demonstrated to be independently linked with an added risk of thromboembolism in AF patients although it is not part of in the CHA2DS2-VASc score. In the ATRIA (Impact of Proteinuria and Glomerular Filtration Rate on Risk of Thromboembolism in Atrial Fibrillation) study, (61) patients who had estimated glomerular filtration rate (eGFR) <45 mL/min had a remarkable increased risk of embolic events, even when other baseline variables such as age; gender; diabetes mellitus, hypertension, stroke history, heart failure or coronary artery disease; and socioeconomic status were adjusted for (adjusted hazard ratio: 1.39, 95% CI: 1.13–1.72).

2.9.3 Patients with Heart Failure

The incidence of stroke among those with heart failure is significantly higher compared to no heart failure. No studies have been done so far regarding a converse association between heart failure and stroke. Studies support that heart failure can lead to development of AF in these patients or increase the stroke risk among patients with preexisting AF (62).

2.10 Socio-Demographic Characteristics Associated with Atrial Fibrillation in Stroke

Socio-demographic and socioeconomic bearing have an effect on cardiovascular outcomes as certain ethnic groups (African, Asian), low level of education, unemployment and low-income status are noted to adversely affect cardiovascular health (63). There is strong evidence denoting an inverse relationship between socioeconomic status and the development of cardiac

diseases. Initially, risk factors for cardiovascular diseases were depicted in populations with higher socioeconomic status, but then a gradual shift was noted where the risk factors were now higher in lower socioeconomic status groups (64). Studied have also revealed that patients with improved socioeconomic status who have non-communicable diseases are more likely to access an array of medical treatments and have better access to specialized hospitals with better-prescribed medicines compared to the lower socioeconomic status (65).

2.11 Justification

In Kenya, scanty information about the risk of stroke in patients who have been diagnosed with AF is available. Scarce scientific studies have assessed the prevalence or occurrence of AF in Kenya. This study will assess the prevalence of atrial fibrillation among patients with acute ischemic stroke and describe the socio-demographic and clinical characteristics in these patients admitted to KNH. Stroke patients who have AF are a vulnerable population that is prone to recurrences of events with poor outcomes. Hence this study will help in highlighting the need for screening these patients and ensuring anticoagulation.

2.12 Research Question

What is the burden of Atrial Fibrillation among patients with acute ischemic stroke at Kenyatta National Hospital?

2.13 Objectives

2.13.1 Broad Objective

To determine the prevalence of AF among patients with acute ischemic stroke and assess the severity of disease at KNH.

2.13.2 Specific Objectives

2.13.2.1 Primary Objective

i. To determine the prevalence of AF among patients with acute ischemic stroke at the KNH
ii. To compare the severity of disease between AF and non-AF associated acute ischemic stroke in patients at KNH.

2.13.2.2 Secondary Objective

i. To compare the clinical and socio-demographic factors between the AF and non-AF subgroups

3.0 CHAPTER THREE: METHODOLOGY

3.1 Study Design

A single center cross-sectional analytical study.

3.2 Study Setting

The study setting was the medical wards at KNH which is a hospital located in Nairobi and is one of the largest referral hospitals in East and Central Africa with an 1800 bed capacity and provides both inpatient and outpatient services including specialized care. There are 8 medical wards on the 7th and 8th floor, equipped with 2 medical ICUs, one on each floor. Principal investigation modalities including electrocardiogram (ECG) and computed tomographic (CT) scan.

3.3 Study Population

This comprised of all adults admitted with a diagnosis of acute ischemic stroke in the medical wards.

3.4 Case Definition

All patients admitted with a diagnosis of ischemic stroke confirmed on CT/MRI presenting with symptoms less than a week.

3.5 Inclusion Criteria

- Patients with confirmed ischemic stroke on MRI/CT scan
- aged 18 years and above.
- Willing to sign an informed written consent form (ICF) personally or through a caregiver.

3.6 Exclusion Criteria

- Presence of concurrent/preexisting neurological comorbidity
- Stroke > 7 days

3.7 Sample Size

Hseih (1998) Method for calculating sample size for logistics regression model was used.

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2}{(P_1 X P_0 x 1/Po)^2} \times \left[\left[\frac{P_0(1-P_0)}{1-\pi}\right] + \left[\frac{P_1(1-P_1)}{\pi}\right]\right]$$

n= The minimum sample size required to conduct meaningful statistical analysis,

α= Significance level of 0.05 will be used.

P_0= The probability of having AF in stroke which will be taken as 0.287

P_1= The probability of having stroke without AF which will be taken as 0.723

π=The portion of patients with AF, in this study a value of 0.287 will be used, that is to say the study will assume that 28.7% of the population at one level of any chosen covariate will have AF.

- Putting values into the formula above, we have the following values.
- $Z_{1-\frac{\alpha}{2}}$=1.96 $Z_{1-\beta}$=0.84 P_1=0.723 P_0=0.287 π=0.6 gives
- $143 = \frac{(1.96+0.84)2}{(0.713x0.287x1/0.713)^2} \times \left[\left[\frac{0.287(1-0.287)}{1-0.287}\right] + \left[\frac{0.713(1-0.713)}{0.287}\right]\right]$
- **Approximately a minimum of 123 subjects will be needed to conduct a meaningful statistical analysis in this study.**

3.8 Sampling Technique

A consecutive sampling of all patients with a diagnosis of stroke presenting to KNH medical wards ward who meet the inclusion criteria was done until the desired sample size was achieved.

3.9 Participant Recruitment Procedure

Patients were sought every day in the medical wards. Those who qualified for the study were approached and study objectives explained to them or their guardians. The study's procedures, including history taking, examination and ECG administration, and the expectations from patients was discussed and a written informed consent sought. Patients who provided consent were recruited until the sample size (123) was reached as shown.

3.10 Data Collection Tools

Patient's history and Information on socio-demographic and clinical characteristics such as age, gender, alcohol use, smoking history and any comorbidities were documented in a questionnaire. Severity of the stroke was measured using the National Institute of Health Stroke Scale (NIHSS) and an ECG conducted on participants to detect AF.

3.10.1 Study Questionnaire

One on one interviews were scheduled with participants at KNH, and patient characteristics documented on a questionnaire. Socio-demographic factors such as age, gender, education level, alcohol use, and cigarette smoking were documented. Clinical factors such as presence

of comorbidities such as diabetes mellitus (DM), hypertension, thyroid disease, heart failure and chronic kidney disease (CKD), and the use of medication such as warfarin, antiplatelet, NOAC, and lipid lowering agents was documented.

3.10.2 National Institute of Health Stroke Scale (NIHSS)

The 15-item NIHSS tool was used to examine the severity of stoke. NIHSS score should be administered within 12 hours of admission for all stroke patients (66). Participants were led into a quiet room within the study area and the tool administered. The PI examined the patients and scored them accordingly. The ratings for each item were graded from 0-5 with 0 being normal. Clinical examination for each patient took approximately ten minutes. (appendix)

3.10.3 Electrocardiograph (ECG)

The chest area was cleaned with rubbing alcohol to remove oil and any other material that might drift ECG signals. Electrodes were placed and leads connected to standard 12 lead ECG machine (46). Printouts were generated, and AF diagnosis conducted following the ACC/AHA/ESC guidelines (2) for 12-lead ECGs as follows:

- Typically, irregular ventricular rate (QRS complexes)
- Absence of discrete P waves.
- Replacement of consistent P waves by rapid oscillations or fibrillary waves that vary in size, shape, and timing, associated with an irregular, frequently rapid ventricular response when atrioventricular (AV) conduction is intact.

3.11 Study Variables

Table 1: Study variables

Variable	Factors
Dependent	Atrial Fibrillation
Independent	Clinical factors ● Comorbid conditions ● Medications Socio-demographic factors ● Age ● Gender ● Level of education ● Employment status Behavioral factors ● Cigarette smoking ● Alcohol Severity of stroke

3.12 Data Management and Analysis

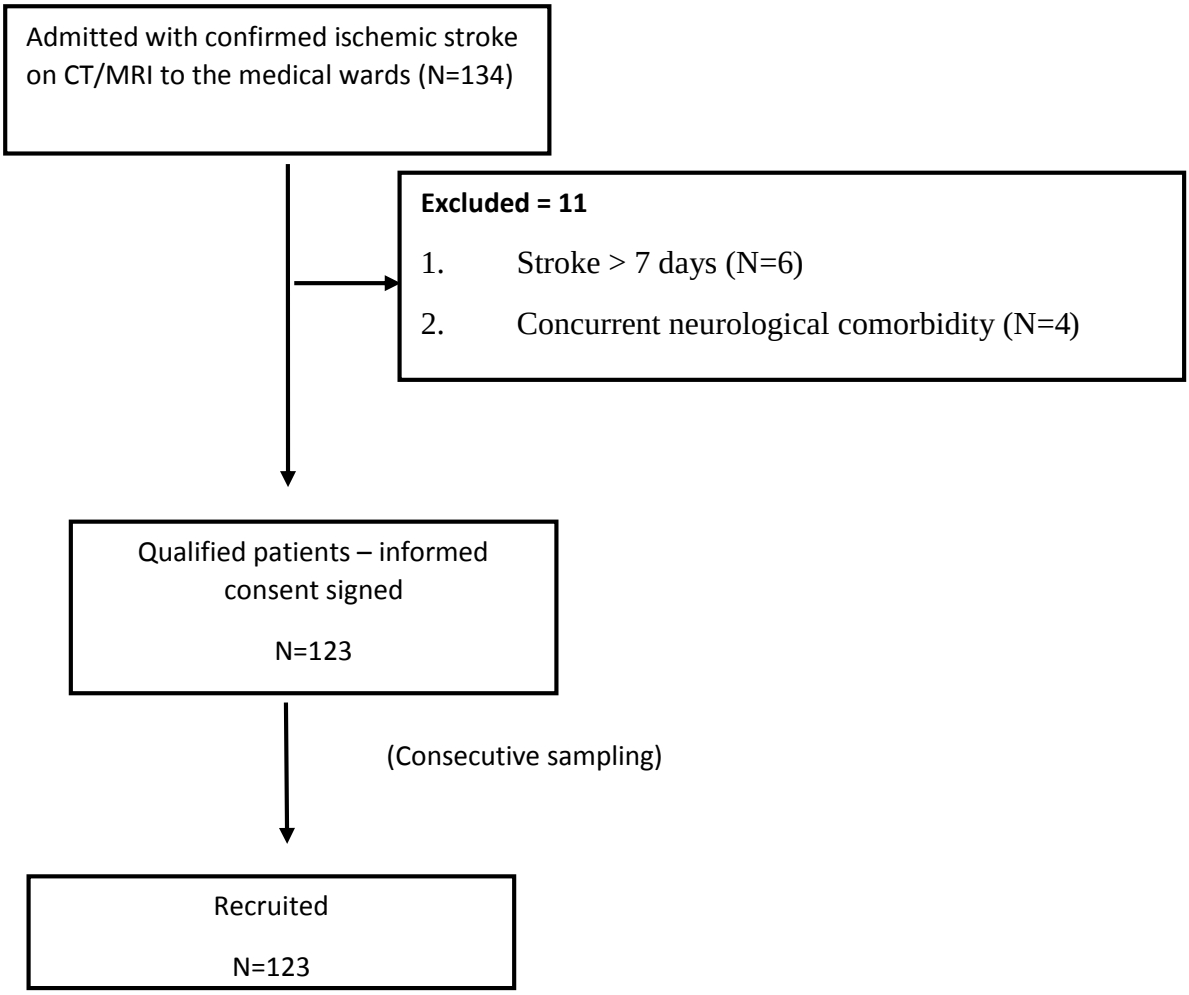
Data was extracted from study tools and uploaded into an excel sheet where it was checked for completeness, examined for typing errors, and cleaned in preparation for analysis. It was then uploaded on a spreadsheet using Statistical Package for Social Scientists (SPSS, version 25) for analysis. Demographic, clinical, and behavioral factors and severity of the disease of patients with stoke was summarized using descriptive statistics and measures of central tendency such as median and mean. The prevalence of Atrial Fibrillation with 95% Confidence Interval (CI) estimates was determined as a proportion of acute ischemic stroke patients with AF over the total sample. The comparison between the clinical and socio-demographic factors associated with AF and non-AF patients who have ischemic stroke was determined using the chi square test for categorical data and independent t-tests for continuous data. Adjusted odds ratios was the measures of effect at a probability value of <0.05. The association between Atrial Fibrillation and severity of stroke was evaluated using multinomial regression at 95% confidence interval.

3.13 Ethical Consideration

Permission to conduct the study was sought from the Department of Clinical Medicine and Therapeutics, The University of Nairobi (UON) and the KNH/UON Ethics and Research committee. Authority to use the medical records at KNH was sought from the head of department, Health Management Information System. All this was conducted before the study begun. Informed consent was sought from patients before recruitment and data collection. The aims of the study, study objectives, and the potential risks and benefits to participants was explained to patients in English and Kiswahili. Queries were discussed and answered comprehensively to ensure that participants have a detailed picture of the study before providing informed consent. The informed consent could be withdrawn at any time during the study without victimization towards the participants. For those participants who were unable to read and self-compare the tools, the consent form was read to them. After data collection, information obtained will be used only for research purposes and confidentiality will be strictly maintained.

4.0 CHAPTER FOUR: RESULTS

Figure 1: Schematic for the recruitment procedure for participants



4.1 Characteristics of the Patients

A total of **123** patients with acute ischemic stroke confirmed both clinically and radiologically (either the CT scan or MRI) were enrolled into the study. 65 (52.8%) were female, and 58 (47.2%) were male. The mean age of the patients was 62.4 (SD 15.6) years. The youngest was 23.0 years, and the oldest patient was 96.0 years. The median age was 63.0 (IQR 51.5–72.5) years. Majority (> 60%) were older than 60 years. Hypertension was noted as the commonest comorbidity at 70.7%, followed by Diabetes at 23.6%. CKD and HF/DCM tied at 12.2%.

Table 2: Patients characteristics

Characteristic		Frequency, *(n=123)*	Percent
Age	≤40	12	9.8
	41- 60	37	30.1
	>60	74	60.2
Gender	Male	58	47.2
	Female	65	52.8
Education	No formal education	28	22.8
	Primary	36	29.3
	Secondary	41	33.3
	Tertiary	18	14.6
Marital	Single	14	11.4
	Married	94	76.4
	Divorced	1	0.8
	Widowed	14	11.4
Employment	Employed	52	42.3
	Unemployed	60	48.8
	Retired	11	8.9
Smoking	Never smoked	75	61.0
	Current smoker	30	24.4
	Former smoker	18	14.6
Alcohol	Yes	47	38.2
	No	76	61.8
Diabetes	Yes	29	23.6
	No	94	76.4
Hypertension	Yes	87	70.7
	No	36	29.3
History of stroke	Yes	10	8.1
	No	113	91.9
Chronic Kidney Disease	Yes	15	12.2
	No	108	87.8
DCM/HF	Yes	15	12.2
	No	108	87.8

4.2 Prevalence of AF among Acute Ischemic Stroke

The prevalence of atrial fibrillation among patients with acute ischemic stroke was found to be **29.3%** (95% CI: 22.0% - 37.8%), and the results are as shown in Fig 2.

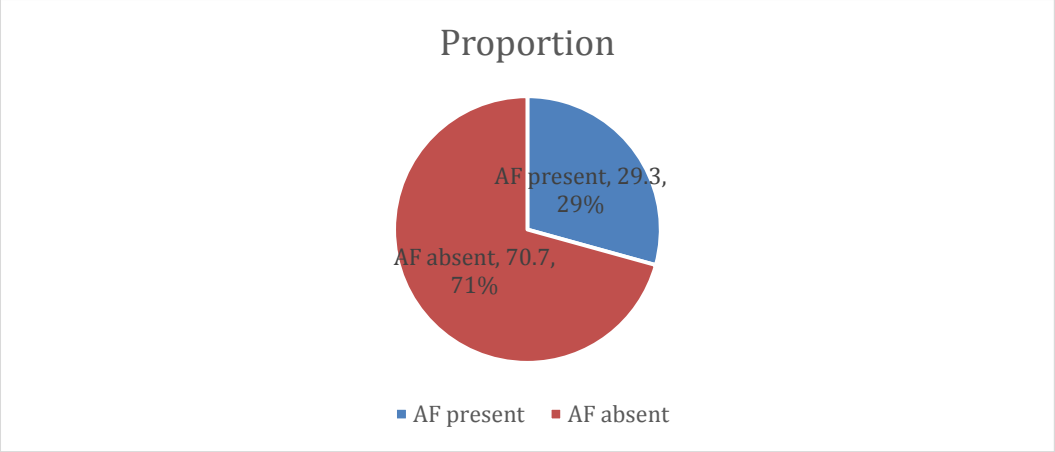


Fig 2: Prevalence of atrial fibrillation

4.3 Disease Severity between AF and Non-AF

The severity of disease between AF and non-AF associated acute ischemic stroke in patients at the KNH was evaluated. The results indicate increased odds as the severity of disease increased, where those with moderate, and moderate to severe were 2.6, and 14.0 the odds of having AF when compared to those patients with minor stroke. The results are as shown on Table 3.

Table 3: Severity of disease between AF and Non-AF

Severity	**AF** *(n=36)* *In %*	**Non-AF** *(n=87)* *in %*	**OR (95% CI)**	**p-value**
Minor stroke (1-4)	2 (2.8)	20 (23.9)	Reference	
Moderate stroke (5-15)	12 (22.2)	60 (71.6)	2.6 (0.3 – 22.2)	0.376
Moderate to severe stroke (16-20)	18 (61.1)	6 (3.4)	14.0 (9.5 – 27.4)	**<0.001**
Severe stroke (21-42)	4 (13.9)	1 (0.0)	-	-

4.4 Sociodemographic and Clinical Correlates

Our study was not powered enough to make adequate association between AF and sociodemographic and clinical correlates. Some variables were also confined to univariate analysis eg Age and retirement, hence subject to confounding effects. However, contemporary correlations indicate that prevalence of AF increased with age with those above 60.0 years almost 15 times likely to have AF compared to below 40 years and this association was statistically significant. On employment, those retired were 5.0 times more at odd of AF when compared with those who are employed with statistical significance, but as stated earlier this

was subject to confounding effects. Patients who had never smoked were less likely to have AF when compared to current smokers, while those who were former smokers were 1.4 times likely to have AF when compared to the current smokers. Significant differences were observed between those who have never smoked and current smokers. Patients who consumed alcohol were 5.6 times the odds for AF, and the association was significant. Hypertensive patients were 23.6 times the odds of AF, and the association was significant.

Table 4: Clinical and sociodemographic correlation with AF

Characteristic		**AF** *(n=36)*	**Non-AF** *(n=87)*	**OR (95% CI)**	**p-value**
Age	≤40	0 (0.0)	12 (13.8)	-	
	41- 60	2 (5.6)	35 (40.2)	Reference	
	>60	34 (94.4)	40 (46.0)	14.9 (3.3 – 66.4)	**<0.001**
Gender	Male	16 (44.4)	42 (48.3)	Reference	
	Female	20 (55.6)	45 (51.7)	1.2 (0.5 – 2.5)	0.699
Education	No formal education	9 (25.0)	19 (21.8)	1.7 (0.4 – 6.5)	0.468
	Primary	15 (41.7)	21 (24.1)	2.5 (0.7 – 9.1)	0.165
	Secondary	8 (22.2)	33 (37.9)	0.8 (0.2 – 3.3)	0.812
	Tertiary	4 (11.1)	14 (16.1)	Reference	
Marital	Single	1 (2.8)	13 (14.9)	Reference	
	Married	26 (72.2)	68 (78.2)	5.0 (0.6 – 39.9)	0.131
	Divorced/Widowed	9 (25.0)	6 (6.9)	19.5 (2.0 – 190.9)	**0.011**
Employment	Employed	10 (27.8)	42 (48.3)	Reference	
	Unemployed	20 (55.6)	40 (46.0)	2.1 (0.9 – 5.0)	0.096
	Receiving pension	6 (16.7)	5 (5.7)	5.0 (1.3 – 19.9)	**0.021**
Smoking	Never smoked	12 (33.3)	63 (72.4)	0.2 (0.1 – 0.6)	**0.002**
	Current smoker	14 (38.9)	16 (18.4)	Reference	
	Former smoker	10 (27.8)	8 (9.2)	1.4 (0.4 – 4.6)	0.552
Alcohol	Yes	24 (66.7)	23 (26.4)	5.6 (2.4 – 12.9)	**<0.001**
	No	12 (33.3)	64 (73.6)	Reference	
Diabetes	Yes	9 (25.0)	20 (23.0)	1.1 (0.5 – 2.8)	0.811
	No	27 (75.0)	67 (77.0)	Reference	
Hypertension	Yes	35 (97.2)	52 (59.8)	23.6 (3.1 – 180.0)	**0.002**
	No	1 (2.8)	35 (40.2)	Reference	
History of stroke	Yes	4 (11.1)	6 (6.9)	1.7 (0.4 – 6.4)	0.441
	No	32 (88.9)	81 (93.1)	Reference	
Chronic Kidney Disease	Yes	6 (16.7)	9 (10.3)	1.7 (0.6 – 5.3)	0.334
	No	30 (83.3)	78 (89.7)	Reference	
DCM/HF	Yes	6 (16.7)	9 (10.3)	1.7 (0.6 – 5.3)	0.334
	No	30 (83.3)	78 (89.7)	Reference	

5.0 CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

In our setup, data on Atrial Fibrillation among patients with acute ischemic stroke is scarce, hence this study was conducted to determine the prevalence of AF among acute ischemic stroke patients and compare the severity of disease between those with AF and those without. Our key findings suggested that more than a quarter of ischemic stroke patients can have underlying AF as a risk factor for stroke and need adequate measures for secondary prevention. The prevalence of Atrial Fibrillation observed in our study population was 29.3% which is consistent with results from other studies. A study done in University of Gondar Hospital, Ethiopia also described the prevalence of AF among stroke patients as 28.7%. (32) This was done in a similar population characteristic to our patients with similar geographical and socioeconomic data.

In a systematic review on atrial fibrillation in Africa by Jacobs et al, stroke patients had a prevalence of AF between 1.5%-17.6%. This low prevalence was attributed to inadequate data and lack of proper screening of patients with Ischemic stroke.(31)

A hospital based study by Deepak et al in India also documented prevalence of AF at 25% among acute ischemic patients (67). The study also suggested that stroke patients with AF had a significantly high NIHSS score and poor outcome.

A study done by Hannon et al in a North Dublin population detected AF in 31.2% of all patients with new stroke incidents and was associated with a distinct profile of recurrent, severe and disabling stroke.(30)

The association of AF with severe stroke has been reported both in clinical (37,68)and pathologic studies (69). A study in a North Dublin population showed AF-associated stroke had a clear-cut profile of repeated, severe and incapacitating disease. (30)Among patients with ischemic stroke who are stratified by increasing stroke severity (NIHSS 0–4, 29.7%; 5–9, 38.1%; 10–14, 43.8%; ≥15, 53.3%, $p < 0.0001$) it was noted that the frequency of AF progressively increases across the strata. (30)This was depicted in our study population which shows the severity of disease was more adverse in patient with AF compared to non-AF patients. (NIHSS 0-4, 2.8%; 5-15, 22.2%, > 15, 75%, $p < 0.01$).

A study by Hans et al showed at baseline, patients with definite AF had more severe hypoperfusion (median volume 48 vs. 29mL, p=0.02) compared to patients with no AF. At outcome, patients with definite AF had greater infarct growth (median volume 47 vs. 8mL, p=0.001), larger infarcts (median volume 75 vs. 23mL, p=0.001), more frequent parenchymal

hematoma grade hemorrhagic transformation (30 vs. 10%, p=0.03), worse functional outcomes (median mRS score 4 vs. 3, p=0.03) and higher mortality (36 vs. 16%, p=0.03) compared to patients with no AF.(70)

Older age is one of the most important risk factors for ischemic stroke in AF among individual risk factors which were included in the CHA_2DS_2-VASc score. The prevalence of AF in our acute stroke cohort varied drastically with age, with patients above 60 almost 15 times more likely to have AF compared to below 60 years and was found to be statistically significant. This was also depicted in a study by Dulli et al where half of the patients above 85 years had AF. (71)

In a study by Aronow et al, hypertension and atrial fibrillation were both shown to increase with age (72,73) and both were associated with an increased incidence of stroke. (72) Hypertension and left ventricular hypertrophy caused by hypertension are major risk factors for atrial fibrillation (73). Hypertension is present in more than 80% of patients with atrial fibrillation. This is similar to our study where hypertensive patients were >20 times the odds for AF.

Smoking predisposes to atrial fibrillation in a dose–response manner. (74,75) Possible mediators include diabetes mellitus, hypertension, and heart failure – all diseases that are likely to be caused by smoking. Smoking is associated with more than a two-fold increased risk of AF, and quitters showed a lower trend of incident AF compared with current smokers. (74) In our study, current smokers had statistically significant increased odds of AF. Although the risk of AF increases, smoking also increases the risk of stroke in the general population (76,77). Previous studies have also shown an association between smoking and an increased risk of stroke and death in patients with AF (77)

Alcohol intake may directly increase the risk for ischemic stroke in some manner, and alcohol cessation may reduce this risk. (78) Alcohol intake has been demonstrated to increase the risk of incident AF (79)and this was depicted in our cohort as patients' who took alcohol had 5.6 times odds of having AF as compared to non-drinkers. Alcohol consumption has been associated with electrical and structural changes in the left atrium, with direct cellular effects on atrial myocytes and influences on autonomic function, creating a milieu for onset and maintenance of AF. (79)

5.2 Conclusions

Atrial Fibrillation is a key component known to have a significant impact in stroke occurrence and severity of disease with respect to degree of disability, length of hospital stays as well as mortality. The best practices in stroke suggest that thrombolysis (medical or endovascular), supportive medical therapy, effective rehabilitation, and effective secondary prevention can minimize death and disability. The secondary prevention of stroke is very important to prevent recurrent stroke that causes progressive disability and death of high-risk patients. The best way of preventing recurrent stroke depends on specific risk factors for the first stroke. Antiplatelet medications are a mainstay of the primary and secondary prevention in atherosclerotic stroke and oral anticoagulation (older or newer) in stroke with AF or with cardio embolic background. Special attention and awareness need to be created among health care providers to provide dedicated early diagnostic approaches and treatment among the predisposed groups to prevent the catastrophic outcome.

5.3 Limitations

This is a single center study, with no variance in terms of socio-economic characteristics hence generalization to the population might not be appropriate. Since this study was conducted in a tertiary level hospital, referral filter bias is probable. The presence of AF was done using a 10 seconds 12 lead ECG hence might have underestimated the burden of the disease.

5.4 Recommendations

- ✓ All patients admitted with ischemic stroke should have ECG done as part of baseline workups.
- ✓ Screening ECG for all patients on follow up with high-risk conditions for AF eg CKD, DM, hypertension and other diseases.
- ✓ A prospective study with a larger sample size and longer follow-up period for evaluation of clinical outcome in terms of hospital stay, long term disability and mortality.
- ✓ Use of longer monitoring devices eg Holter ECG that can pick paroxysmal AF for better depiction of the population burden of the disease.

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APPENDICES

Appendix I: Informed Consent Form (English Version)

Study Number…… Sex……..……

Name…….…… Age...……..…

Introduction

Hello. I am **Habiba Ibrahim Hassan,** a post-graduate student in the Department of Clinical Medicine and Therapeutics, University of Nairobi. This information form seeks informed consent for your participation in the study that seeks to assess "**The Prevalence of Atrial Fibrillation among Stroke Patients being attended to at Kenyatta National Hospital Neurology Unit."** Atrial Fibrillation is a very important causative agent of Stroke. The findings of this study will be used as an evidence-based epidemiological and clinical research reference point that could be utilized in informing decisions in patient care and management.

Purpose of the Study

- To assess the prevalence of AF, impact on severity of disease and associated clinical and socio-demographic factors among stroke patients at the neurology unit at KNH.

Procedure

If you agree to participate in this study, you will receive an identification number and questionnaires to fill yourself or with your attendant's help. The questions in the questionnaires are about socio-demographic and clinical data. An ECG will also be done on you as part of the investigations for the study and also as part of the general procedure for all stroke patients.

Risks/ Discomforts

There are no anticipated risks in participating in this study. However, if there are any problems that may arise due to your participation, you will be assisted accordingly.

Benefits

It is hoped that the outcome of the study will lead to awareness of the burden of AF among stroke patients in our setup, and hence enable/lead to a greater understanding of how to manage/prevent the conditions. If you are found to have a AF you will be managed accordingly.

Alternatives to participation/withdrawal from the study

If you decide not to take part in this study no one will force you to, so you will be free to make your own decision. You are free to withdraw from the study, and this shall not affect your care in any way, and you will not be discriminated against in any way. You can also choose to take part in any other studies in the future.

Confidentiality

Any information you provide during the study will be kept strictly confidential. Your name will not appear on any study document and instead, a unique number shall be assigned to your questionnaire that will match both questionnaires.

Voluntariness

Your participation in this study, which will be in the form of a self-reported interview. You are free to choose whether or not to participate in this study. You are also free to withdraw from the study at any time you wish to do so.

In case of any questions or concerns about this study, please feel free to contact any of the following persons:

Principal Investigator:

Habiba Ibrahim Hassan,
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Or

The Secretary

KNH/ERC (Kenyatta National Hospital/Ethics & Review Committee)

TEL: 020-2726300/0722829500/0733606400/EXT 44102. P.O. Box 20723, Nairobi

Declaration

I have read and understood the study information. I have been given the opportunity to ask questions about the study. I understand that my taking part is voluntary; I can withdraw from the study at any time and I will not be asked questions about why I no longer want to take part. I understand my personal details will be kept private. I hereby consent to participate in the said study as has been explained and as I have understood.

Participants' name: .....

Participants' signature: .....

Date: .....

Name of the Investigator: Habiba Ibrahim Hassan,

Signature of the Investigator: .....

Date: .....

Appendix II: Informed Consent Form (Kiswahili Version)

Fomu ya Ridhaa

Nambari ya masomo/utafiti ……

Jina …… Umri ... ……

Utangulizi

Mimi ni **Dkt Habiba Ibrahim Hassan**, kutoka Chuo Kikuu cha Nairobi. Kwa sasa na somea uzamili katika Tiba ya Ndani. Kama sehemu ya masomo yangu yauzamifu,nahitajika kufanya mradi wautafiti.Ninafanya uchunguzi kuhusu hali ya ugonjwa wa fibrillation ya atria (mpigo wa moyo usio wa kawaida kwa wagonjwa walio na ugonjwa wa stroke katika Hospitali ya Kitaifa ya Kenyatta.

Wakati huo huo, shida ya fibrillation ya atria ni moja ya sababu za kusababisha ugonjwa wa stroke. Matokeo ya utafiti huu yatakuwa kumbukumbu ya msingi wa uchunguzi wa ugonjwa na wa utafiti wa kliniki ambayo inaweza kutumika katika kuarifu maamuzi katika utunzaji na usimamizi wa mgonjwa.

Kusudi la utafiti

- Untathmini wa hali ya ugonjwa ya fibrillation ya atria kwa wagonjwa walio na stroke.

Utaratibu

Ikiwa unakubali kushiriki katika utafiti huu, utapokea nambari ya kujitambulisha na hojaji ya kujaza wewe mwenyewe. Maswali yaliyo kwenye dodoso ni juu ya data ya jamii na data ya kliniki.

Hatari / Ubaya

Hakuna hatari zinazotarajiwa kushiriki katika utafiti huu. Walakini, ikiwa kuna shida yoyote ambayo inaweza kutokea kwa sababu ya ushiriki wako, utasaidiwa ipasavyo.

Faida

Inatarajiwa kuwa matokeo ya utafiti yatasababisha mwamko wa utathmini kwa matatizo ya fibrillation ya atria kwa wagonjwa walio na ugonjwa wa stroke na kwa hivyo kuwezesha - au kusababisha uelewa mkubwa juu ya jinsi ya kudhibiti ugonjwa/tatizi hili.

Ukigundulika kuwa na tatizo ya fibrillation ya atria utasimamiwa ipasavyo.

Njia mbadala za kushiriki / kujiondoa kutoka kwa masomo

Ukiamua kutoshiriki katika utafiti huu hakuna atakayekulazimisha, kwa hivyo utakuwa huru kufanya uamuzi wako mwenyewe. Uko huru kujiondoa kwenye masomo, na hii haitaathiri utunzaji wako kwa njia yoyote, na hautabaguliwa kwa njia yoyote ile. Unaweza pia kuchagua kushiriki katika masomo mengine yoyote katika siku zijazo.

Usiri

Habari zozote unazotoa wakati wa masomo zitahifadhiwa kwa siri. Jina lako halitaonekana kwenye hati yoyote ya kusoma na badala yake, nambari ya kipekee itapewa kwa dodoso lako litakalofanana na dodoso zote mbili.

Kujitolea

Ushiriki wako katika utafiti huu, ambao utakuwa katika hali ya mahojiano yaliyoripotiwa. Uko huru kuchagua au kushiriki katika utafiti huu. Pia uko huru kujiondoa kutoka kwa masomo

Ukiwa na maswali au maoni yeyote Kuhusu utafiti huu unaweza kuwasliana na wafuatao:

Mtafiti Mkuu:

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Wasimamizi:

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Au

Katibu / Mwenyekiti
KNH / UoN ERC Hospitali ya Kitaifa ya Kenyatta –Kamati ya Maadili ya Utafiti ya Chuo Kikuu cha Nairobi kwa Namba ya simu 2726300 Ext. 44102 barua pepe uonknh_erc@uonbi.ac.ke.

Azimio

Nimesoma na kuelewa habari ya kuhusu utafiti huu. Nimepewa nafasi ya kuuliza maswali juu ya utafiti huo. Ninaelewa kuwa kushiriki kwangu ni kwa hiari; Naweza kujiondoa kutoka kwa masomo wakati wowote na sitaulizwa maswali juu ya kwanini sitaki tena kushiriki. Ninaelewa maelezo yangu ya kibinafsi yatawekwa siri. Kwa hivyo ninakubali kushiriki katika utafiti uliyosemwa kama ilivyoelezea na kama nimeelewa.

Jina la mshiriki wa utafiti: ……

Saini ya mshiriki wa utafiti: ……..

Tarehe: .....

Jina la Mpelelezi: Dkt. Habiba Ibrahim Hassan

Appendix III: English Version of the Socio-demographic and Clinical Characteristics Questionnaire

Patient Identifier (KNH-Clinic File No): Date of interview:

Question Number	Question	Coding categories	Response
1.	How old are you?	Number of completed years	[ ]
2.	Gender?	M = Male F=Female	[ ]
3.	Highest level of education?	1=No education 2=Incomplete Primary 3=Primary 4=Secondary 5= college and Graduate	[ ]
4.	Are you married?	1=yes 2=no	
5.	What's your cigarette smoking history?	1=Current smoker 2=Former smoker 3=Never smoked	[ ]
6.	Are you currently employed?	1=Employed 2=Unemployed 3=Receiving pension	[ ]
7.	Do you take alcohol?	1=Yes 0=No	[ ]
	Co-morbid conditions		
8	Diabetes mellitus	1=Yes 0=No	[ ]
	Hypertension	1=Yes 0=No	[ ]
	History of stroke	1=Yes 0=No	[ ]
	Chronic kidney disease/ESRD	1=Yes 0=No	[ ]
	What were your medications before the stroke		
9	Warfarin	1= Yes 2= No	
	NOAC	1= Yes 2= No	
	Antiplatelets	1= Yes 2= No	
	Lipid lowering agent	1= Yes 2= No	

Appendix IV: Kiswahili Version of the Socio-demographic and Clinical Characteristics Questionnaire

Taarifa Binafsi Na Historia Ya Kiafya

Nambari ya swali	Swali	Aina ya kodi	Jibu
1.	Umri?	Miaka	[ ]
2.	Jinsia?	M = Kiume F=Kike	[ ]
3.	Umefikisha wapi masomo?	1=Hujasoma 2=Hujamaliza shule ya msingi 3=Shule ya msingi 4=Shule ya upili 5= chuo cha katu na Mhitimu chuo kikuu na zaidi	[ ]
4.	Unaishi na mpenzi?	1=Ndiyo 0=Hapana	[ ]
5.	Ulishawahi kuvuta sigara?	1=Anavuta sigara 2=Aliiacha kuvuta sigara 3=Hujawahi vuta sigara	[ ]
6.	Unafanya kazi kwa sasa?	1=Umeajiriwa 2=Hujaajiriwa 3=Kupokea pensheni	[ ]
7.	Unatumia kileo/pombe?	1=Ndiyo 0=Hapana	[ ]
8.	Ugonjwa la kisukari	1=Ndiyo 0=Hapana	[ ]
	Shinikizo la damu/blood pressure	1=Ndiyo 0=Hapana	[ ]
	Historia ya tukio mshipal/stroke	1=Ndiyo 0=Hapana	[ ]
	Kutofanya kwa figo	1=Ndiyo 0=Hapana	[ ]
	Dawa gani unatumia kabla ya ugonjwa?		
	Warfarin	1=Ndiyo 0=Hapana	
	NOAC	1=Ndiyo 0=Hapana	
	Antiplatelet agent	1=Ndiyo 0=Hapana	
	Lipid lowering agent	1=Ndiyo 0=Hapana	

Appendix V: National Institute of Health Severity Scale (NIHSS) SCORE

Patient Identification. ___ ___-___ ___ ___-___ ___ ___ Date of Birth ___ ___/___ ___/___
Hospital _____(___ ___-___ ___) Date of Exam ___ ___/___ ___/___

Interval: [ ] Baseline [ ] 2 hours post treatment [ ] 24 hours post onset of symptoms ±20 minutes [ ] 7-10 days [ ] 3 months [ ] Other _____(___ ___)

Time: ___ ___:___ ___ [ ]am [ ]pm

Person Administering Scale _____

Administer stroke scale items in the order listed. Record performance in each category after each subscale exam. Do not go back and change scores. Follow directions provided for each exam technique. Scores should reflect what the patient does, not what the clinician thinks the patient can do. The clinician should record answers while administering the exam and work quickly. Except where indicated, the patient should not be coached (i.e., repeated requests to patient to make a special effort).

Instructions	**Scale definition**	**Score**
1a. Level of Consciousness: The investigator must choose a response if a full evaluation is prevented by such obstacles as an endotracheal tube, language barrier, orotracheal trauma/bandages. A 3 is scored only if the patient makes no movement (other than reflexive posturing) in response to noxious stimulation.	***0 = Alert***; keenly responsive. ***1 = Not alert***; but arousable by minor stimulation to obey, answer, or respond. ***2 = Not alert***; requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make movements (not stereotyped). ***3 = Responds only with reflex motor or autonomic effects or totally unresponsive, flaccid, and areflexic.***	
1b. LOC Questions: The patient is asked the month and his/her age. The answer must be correct - there is no partial credit for being close.	***0 = Answers both*** questions correctly. ***1 = Answers one*** question correctly. ***2 = Answers neither*** question correctly.	

Aphasic and stuporous patients who do not comprehend the questions will score 2. Patients unable to speak because of endotracheal intubation, orotracheal trauma, severe dysarthria from any cause, language barrier, or any other problem not secondary to aphasia are given a 1. It is important that only the initial answer be graded and that the examiner not "help" the patient with verbal or non-verbal cues.		
1c. LOC Commands: The patient is asked to open and close the eyes and then to grip and release the non-paretic hand. Substitute another one step command if the hands cannot be used. Credit is given if an unequivocal attempt is made but not completed due to weakness. If the patient does not respond to command, the task should be demonstrated to him or her (pantomime), and the result scored (i.e., follows none, one or two commands). Patients with trauma, amputation, or other physical impediments should be given suitable one-step commands. Only the first attempt is scored.	***0 = Performs both tasks correctly.*** ***1 = Performs one task correctly.*** ***2 = Performs neither task correctly.***	
2. Best Gaze: Only horizontal eye movements will be tested. Voluntary or reflexive (oculocephalic) eye movements will be scored, but caloric testing is not done. If	***0 = Normal.*** ***1 = Partial gaze palsy***; gaze is abnormal in one or both eyes, but forced deviation or total gaze paresis is not present.	

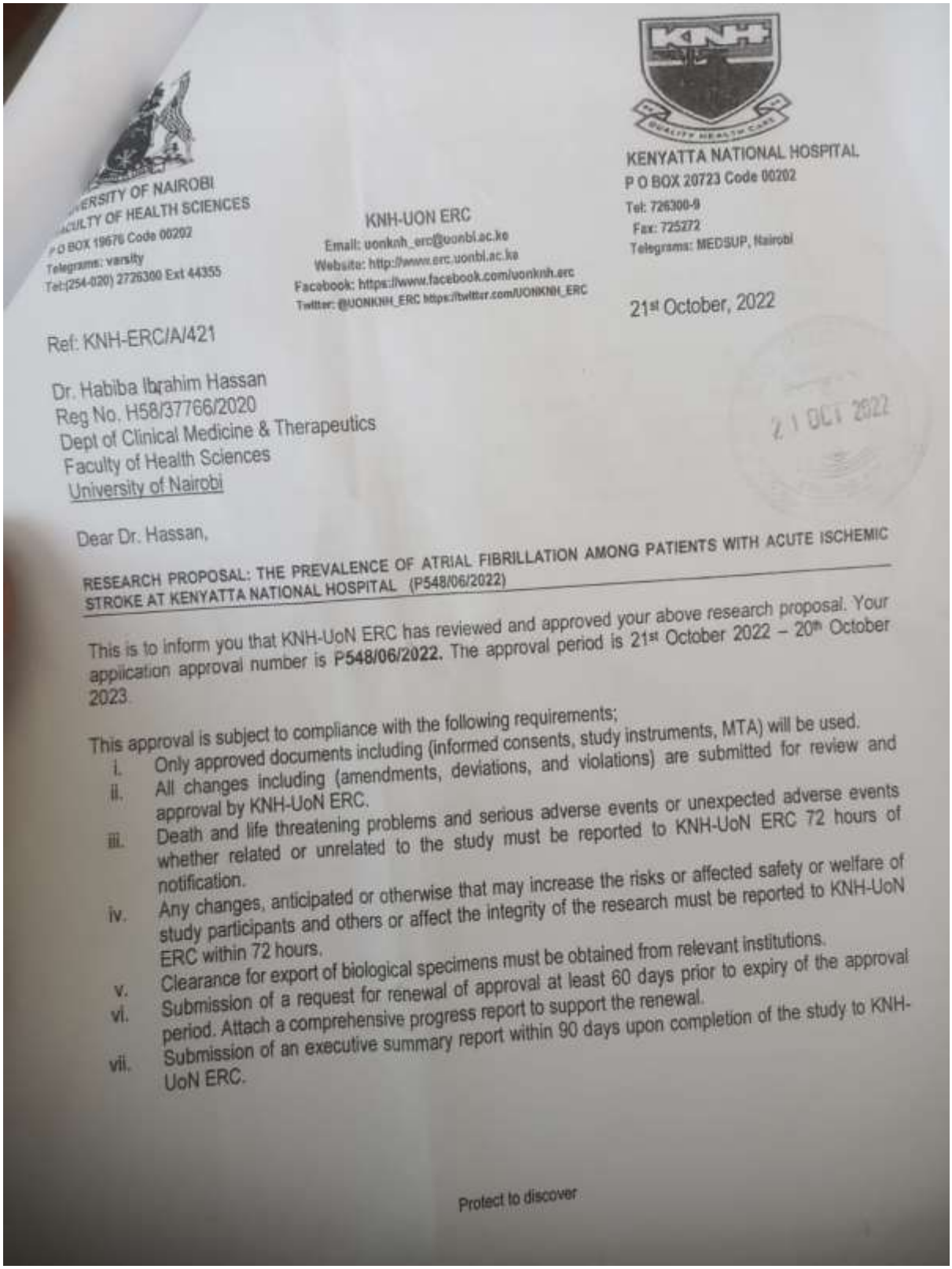
the patient has a conjugate deviation of the eyes that can be overcome by voluntary or reflexive activity, the score will be 1. If a patient has an isolated peripheral nerve paresis (CN III, IV or VI), score a 1. Gaze is testable in all aphasic patients. Patients with ocular trauma, bandages, pre-existing blindness, or other disorder of visual acuity or fields should be tested with reflexive movements, and a choice made by the investigator. Establishing eye contact and then moving about the patient from side to side will occasionally clarify the presence of a partial gaze palsy.	***2 = Forced deviation,*** or total gaze paresis not overcome by the oculocephalic maneuver.	
3. Visual: Visual fields (upper and lower quadrants) are tested by confrontation, using finger counting or visual threat, as appropriate. Patients may be encouraged, but if they look at the side of the moving fingers appropriately, this can be scored as normal. If there is unilateral blindness or enucleation, visual fields in the remaining eye are scored. Score 1 only if a clear-cut asymmetry, including quadrantanopia, is found. If patient is blind from any cause, score 3. Double simultaneous stimulation is performed at this point. If there is extinction, patient receives a 1, and the results are used to respond to item 11.	***0 = No visual loss***. ***1 = Partial hemianopia***. ***2 = Complete hemianopia***. ***3 = Bilateral hemianopia*** (blind including cortical blindness).	
4. Facial Palsy: Ask – or use pantomime to encourage – the patient to show teeth	***0 = Normal*** symmetrical movements.	

or raise eyebrows and close eyes. Score symmetry of grimace in response to noxious stimuli in the poorly responsive or non-comprehending patient. If facial trauma/bandages, orotracheal tube, tape or other physical barriers obscure the face, these should be removed to the extent possible.	***1 = Minor paralysis*** (flattened nasolabial fold, asymmetry on smiling). ***2 = Partial paralysis*** (total or near-total paralysis of lower face). ***3 = Complete paralysis*** of one or both sides (absence of facial movement in the upper and lower face).	
5. Motor Arm: The limb is placed in the appropriate position: extend the arms (palms down) 90 degrees (if sitting) or 45 degrees (if supine). Drift is scored if the arm falls before 10 seconds. The aphasic patient is encouraged using urgency in the voice and pantomime, but not noxious stimulation. Each limb is tested in turn, beginning with the non-paretic arm. Only in the case of amputation or joint fusion at the shoulder, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice.	***0 = No drift***; limb holds 90 (or 45) degrees for full 10 seconds. ***1 = Drift;*** limb holds 90 (or 45) degrees, but drifts down before full 10 seconds; does not hit bed or other support. ***2 = Some effort against gravity;*** limb cannot get to or maintain (if cued) 90 (or 45) degrees, drifts down to bed, but has some effort against gravity. ***3 = No effort against gravity;*** limb falls. ***4 = No movement***. UN = Amputation or joint fusion, explain: _____ ***5a. Left Arm 5b. Right Arm***	
6. Motor Leg: The limb is placed in the appropriate position: hold the leg at 30 degrees (always tested supine). Drift is scored if the leg falls before 5 seconds. The aphasic patient is encouraged using urgency in the voice and pantomime, but not noxious stimulation. Each limb is tested in turn, beginning with the non-paretic leg. Only in the case of amputation or joint fusion at the hip, the	0 = No drift; leg holds 30-degree position for full 5 seconds. ***1 = Drift;*** leg falls by the end of the 5-second period but does not hit bed. ***2 = Some effort*** against gravity; leg falls to bed by 5 seconds, but has some effort against gravity. ***3 = No effort*** against gravity; leg falls to bed immediately. ***4 = No movement.*** UN =	

examiner should record the score as untestable (UN), and clearly write the explanation for this choice	Amputation or joint fusion, explain: _____ ***6a. Left Leg 6b. Right Leg***	
7. Limb Ataxia: This item is aimed at finding evidence of a unilateral cerebellar lesion. Test with eyes open. In case of visual defect, ensure testing is done in intact visual field. The finger-nose-finger and heel-shin tests are performed on both sides, and ataxia is scored only if present out of proportion to weakness. Ataxia is absent in the patient who cannot understand or is paralyzed. Only in the case of amputation or joint fusion, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice. In case of blindness, test by having the patient touch nose from extended arm position	***0 = Absent.*** ***1 = Present in one limb.*** ***2 = Present in two limbs.*** ***UN = Amputation*** or joint fusion, explain: _____	
8. Sensory: Sensation or grimace to pinprick when tested, or withdrawal from noxious stimulus in the obtunded or aphasic patient. Only sensory loss attributed to stroke is scored as abnormal and the examiner should test as many body areas (arms [not hands], legs, trunk, face) as needed to accurately check for hemisensory loss. A score of 2, "severe or total sensory loss," should only be given when a severe or total loss of sensation can be clearly demonstrated. Stuporous and aphasic patients will, therefore,	***0 = Normal***; no sensory loss. ***1 = Mild-to-moderate*** sensory loss; patient feels pinprick is less sharp or is dull on the affected side; or there is a loss of superficial pain with pinprick, but patient is aware of being touched. ***2 = Severe to total sensory loss;*** patient is not aware of being touched in the face, arm, and leg.	

probably score 1 or 0. The patient with brainstem stroke who has bilateral loss of sensation is scored 2. If the patient does not respond and is quadriplegic, score 2. Patients in a coma (item 1a=3) are automatically given a 2 on this item		
9. Best Language: A great deal of information about comprehension will be obtained during the preceding sections of the examination. For this scale item, the patient is asked to describe what is happening in the attached picture, to name the items on the attached naming sheet and to read from the attached list of sentences. Comprehension is judged from responses here, as well as to all of the commands in the preceding general neurological exam. If visual loss interferes with the tests, ask the patient to identify objects placed in the hand, repeat, and produce speech. The intubated patient should be asked to write. The patient in a coma (item 1a=3) will automatically score 3 on this item. The examiner must choose a score for the patient with stupor or limited cooperation, but a score of 3 should be used only if the patient is mute and follows no one-step commands.	***0 = No aphasia; normal***. ***1 = Mild-to-moderate aphasia***; some obvious loss of fluency or facility of comprehension, without significant limitation on ideas expressed or form of expression. Reduction of speech and/or comprehension, however, makes conversation about provided materials difficult or impossible. For example, in conversation about provided materials, examiner can identify picture or naming card content from patient's response. ***2 = Severe aphasia***; all communication is through fragmentary expression; great need for inference, questioning, and guessing by the listener. Range of information that can be exchanged is limited; listener carries burden of communication. Examiner cannot identify materials provided from patient response. ***3 = Mute, global aphasia***; no usable speech or auditory comprehension.	
10. Dysarthria: If patient is thought to be normal, an adequate sample of speech must be obtained by asking patient to read or	***0 = Normal.*** ***1 = Mild-to-moderate*** dysarthria; patient slurs at least some words and, at worst, can be understood with some difficulty.	

repeat words from the attached list. If the patient has severe aphasia, the clarity of articulation of spontaneous speech can be rated. Only if the patient is intubated or has other physical barriers to producing speech, the examiner should record the score as untestable (UN), and clearly write an explanation for this choice. Do not tell the patient why he or she is being tested.	***2 = Severe dysarthria***; patient's speech is so slurred as to be unintelligible in the absence of or out of proportion to any dysphasia, or is mute/anarthric. ***UN = Intubated or other physical barrier***, explain:	
11. Extinction and Inattention (formerly Neglect): Sufficient information to identify neglect may be obtained during the prior testing. If the patient has a severe visual loss preventing visual double simultaneous stimulation, and the cutaneous stimuli are normal, the score is normal. If the patient has aphasia but does appear to attend to both sides, the score is normal. The presence of visual spatial neglect or anosognosia may also be taken as evidence of abnormality. Since the abnormality is scored only if present, the item is never untestable.	***0 = No abnormality***. ***1 = Visual, tactile, auditory, spatial, or personal inattention*** or extinction to bilateral simultaneous stimulation in one of the sensory modalities. ***2 = Profound hemi-inattention or extinction to more than one modality***; does not recognize own hand or orients to only one side of space.	



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21st October, 2022

Ref: KNH-ERC/A/421

Dr. Habiba Ibrahim Hassan
Reg No. H58/37766/2020
Dept of Clinical Medicine & Therapeutics
Faculty of Health Sciences
University of Nairobi

21 OCT 2022

Dear Dr. Hassan,

RESEARCH PROPOSAL: THE PREVALENCE OF ATRIAL FIBRILLATION AMONG PATIENTS WITH ACUTE ISCHEMIC STROKE AT KENYATTA NATIONAL HOSPITAL (P548/06/2022)

This is to inform you that KNH-UoN ERC has reviewed and approved your above research proposal. Your application approval number is **P548/06/2022.** The approval period is 21st October 2022 – 20th October 2023.

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by KNH-UoN ERC.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to KNH-UoN ERC 72 hours of notification.
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH-UoN ERC within 72 hours.
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to KNH-UoN ERC.

Protect to discover

SUPERVISOR APPROVAL

This dissertation has been submitted with our approval as the lead supervisor and chairman.

Prof. Elijah S. N. Ogola
Professor of Medicine
Consultant Physician and Cardiologist
Department of Clinical Medicine and Therapeutics
University of Nairobi.

Signature..... Date 23/11/2022

Prof. Erastus O Amayo
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Signature..... Date 16/11/2022