PREVALENCE AND RISK PROFILE OF CARDIOVASCULAR DISEASES AMONG ELDERLY PATIENTS ADMITTED AT MOI TEACHING AND REFERRAL HOSPITAL, ELDORET

BY:

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF MEDICINE IN INTERNAL MEDICINE, MOI UNIVERSITY

DECLARATION

This thesis is my original work and has not been presented before for another degree in any other university.

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DEDICATION

This study is dedicated to my family that has been there to support me in this pursuit. They have been with me every step of the way encouraging me to keep working even when circumstances seemed unfavorable for work. Thank you for being there for me.

ACKNOWLEDGEMENT

I would like to extend my heartfelt gratitude to a number of individuals whose work and consistency have allowed me to put together this thesis. Dr. F. Barasa, whose input and continuous guidance was vital in the entire process. This thesis would not have taken form without his input. I would also like to thank Dr. Shamim Ali for the effort and commitment to this research. The input from my supervisors helped me to build the concept, conduct the research and formulate this thesis. I am grateful to the entire faculty of Moi University department of Medicine whose inputs and constructive criticism during departmental presentations played a big role in the shaping of this study. Further gratitude goes to my colleagues in the department of Internal Medicine for their collegiality. I thank Prof. Ann Mwangi for the biostatistical input she provided. I also thank the entire Moi Teaching and Referral Hospital Cardiac Unit staff who helped me see the possibility of implementing the research within the hospital. Finally, to my entire family that has walked with me in every step of the way and cushioned me along the process, I would like to pass my gratitude.

Thank you all for your input.

LIST OF ABBREVIATIONS

ACC	American College of Cardiologists
AF	Atrial Fibrillation
AFI	Atrial Fibrillation Investigators
AHA	American Heart Association
ANP	Atrial Natriuretic Peptide
ASCVD	Atherosclerotic cardiovascular disease
AV Valves	Atrioventricular Valves
BNP	Brain Natriuretic Peptide
CCF	Congestive Cardiac Failure
CHD	Coronary Heart Disease
CKD	Chronic Kidney Disease
CVD	Cardiovascular Disease
DALYS	Disability Adjusted Life Years
e.g.	For example
ECG	Electrocardiogram
ESC	European Society of Cardiologists
HF	Heart failure
HFpEF	Heart failure with preserved ejection fraction

HFrEF	Heart failure with reduced ejection fraction
HIC	High Income Countries
HRS	Heart Rhythm Society
IREC	Institutional Research Ethics Committee
KNH	Kenyatta National Hospital
LV	Left ventricular
LVD	Left ventricular dysfunction
LVSD	Left ventricular systolic dysfunction
MACE	Major Adverse Cardiovascular Event
MTRH	Moi Teaching and Referral Hospital
NCD	Non-communicable diseases
NOACS	Novel Oral Anticoagulants
NVAF	Non valvular Atrial Fibrillation
PI	Principal investigator
PVD	Pathological Valve Disease
RAAS	Renin Angiotensin Aldosterone System
RHD	Rheumatic Heart Disease
SPAF	The Stroke Prevention in Atrial Fibrillation investigators
SSA	Sub Saharan Africa

T2DM	Type 2 Diabetes Mellitus
TIA	Transient Ischaemic Attack
TTR	Time in Therapeutic range
VAF	Valvular Atrial Fibrillation
VKA	Vitamin K Antagonists
WHO	World Health Organization
YLL	Years of Life Lost

OPERATIONAL DEFINITION OF TERMS

1. **Left ventricular systolic dysfunction**

   In this study, left ventricular systolic dysfunction (LVSD) was defined as an ejection fraction of less than 50%.

2. **Elderly**

   Elderly was defined as a chronological age of 60 years and above.

3. **Pathological valve disease**

   Pathological valve disease was defined as sclerotic or calcific valvular disease with or without regurgitation or stenosis and rheumatic heart disease (RHD) based on World Heart Federation criteria. Hemodynamic significance was defined as an aortic jet velocity >2 m/sec with sclerosis or presence of regurgitation with sclerosis.

4. **Rhythm abnormality**

   A rhythm abnormality was defined as any rhythm that was not a sinus rhythm. The categories defined as abnormalities in the study includes: atrial fibrillation, atrial flutter, multifocal atrial tachycardia, heart blocks, ventricular tachycardia and ventricular paced rhythms.

5. **Cardiovascular disease**

   Cardiovascular disease was defined as the presence of left ventricular systolic dysfunction, pathological valve disease and rhythm abnormality.

6. Traditional cardiovascular risk factors

Presence of the traditional cardiovascular risk factors was defined as presence of these factors; whether newly diagnosed or previously known: hypertension, diabetes mellitus, obesity and overweight, smoking, dyslipidemia, family history of sudden cardiac death and chronic kidney disease.

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ABSTRACT

Background: Cardiovascular diseases (CVDs) are the leading cause of global mortality with most of them occurring in the low and middle income countries. The elderly bear the highest risk as they have unique age related physiological alterations of the cardiovascular system (CV) that make them vulnerable to quick decompensation and death. In Kenya, there is a national focus to reduce all non-communicable disease related morbidity and mortality with special focus on CVDs and cancer. The study will be important in providing useful data on this population that bears the greatest cardiovascular risk and inform policy.

Objective: To determine the prevalence of cardiovascular diseases and associated risk profile in patients aged 60 years and above admitted at Moi Teaching and Referral Hospital (MTRH).

Methods: This was a cross sectional survey conducted in MTRH adult wards for six months from May to October 2018. Three hundred and thirty six (336) persons aged 60 years and above were recruited from the admitted population of one thousand and forty four (1044) using systematic random sampling. Data collection was done using an interviewer administered questionnaire, laboratory tests, a resting 12-lead ECG and a standard echocardiogram. Presence of CV risk factors, left ventricular systolic dysfunction (LVSD) – Ejection Fraction less than 50%, pathological valve disease (PVD) and cardiac rhythm abnormalities were all analyzed. Descriptive statistics were calculated for continuous variables and frequency listings used for categorical variables. Interval estimates for primary outcomes were calculated at 95% confidence and association between categorical variables was assessed using the Pearson's Chi Square Test.

Results: Males comprised 60% of the participants and the median age was 71 years; interquartile range (64, 78). The prevalence of LVSD was 17.86% (95% CI: 13.91, 22.38) while PVD stood at 20.23% (95%CI: 16.62, 25.57). Rhythm abnormalities were frequent with atrial fibrillation predominating at 13.7%.Traditional CV risks present included hypertension at 44.3%, cigarette smoking at 27.1%, dyslipidemia at 26.8%, obesity and overweight at 25.6%, diabetes mellitus (DM) at 15.5%, chronic kidney disease at 5.4% and family history of sudden cardiac death at 4.5%.Out of all these, only DM and cigarette smoking were positively associated with presence of LVSD and PVD respectively with p-values of 0.024 and 0.033 respectively.

Conclusion: There was a high prevalence of cardiovascular diseases and their associated risk factors in elderly population admitted at MTRH.

Recommendation: Routine and opportunistic screening for cardiovascular diseases and the associated risk factors should be carried out in admitted elderly patients

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

1.1.1Global Burden of cardiovascular disease

Cardiovascular disease (CVD) is on the rise globally with significant morbidity and mortality arising from these conditions. They are now considered to be the leading cause of death worldwide; a major public health concern accounting for 31% worldwide deaths in 2016(WHO, 2017). Most of the CVD mortalities (80%) occur in the low and middle income countries (Cappuchio & Miller, 2016).

Majority of CVD deaths were attributed to ischaemic heart disease and cerebrovascular disease. Between 1996 and 2006, deaths from ischaemic heart disease per 100,000 inhabitants were 139.6, 150.8, 177.7, and 192.8 in Australia, Canada, United States of America and the United Kingdom respectively. A demonstrable rising trend was observed in each of these countries across the decade(Deaton, 2011).

CVD has been dubbed as one of most costly diseases representing a major economic burden on healthcare systems in the developed world. A review on the economic impact of CVD in Canada, United States, Europe and Australia demonstrated significant direct costs that included hospitalizations, costs of drugs and physician follow up, rehabilitation services and indirect costs such as loss in productivity(Tarride, 2009).

The elderly population has the highest risk of cardiovascular disease as they have unique age related changes to their physiology affecting structure and function of the cardiovascular system (Arnold & et_al, 2005).

The risk factors for CVD are tobacco smoking, sedentary lifestyle, dyslipidemia, high salt intake, male gender, chronic kidney disease, obesity, hypertension and diabetes which are also major drivers of CVD mortality (Roth, 2015). The rise in these risk factors is the push behind the rise in the incidence and prevalence of CVD (Deaton, 2011).

The table below, adapted from global and regional patterns of CVD study between 1990 and 2013, shows estimates of causes of CVD globally(Roth, 2015).

Estimated Causes of CVD

Cause	**Deaths in 2013**
Ischaemic Heart disease	8139852
Ischaemic stroke	3272924
Hemorrhagic and other non ischaemic stroke	3173951
Hypertensive heart disease	1068585
Other CVD and circulatory diseases	544588
Cardiomyopathy and myocarditis	443297
Rheumatic heart disease	275054
Aortic Aneurysm	151493
Atrial Fibrillation and Flutter	112209
Endocarditis	65036
Peripheral arterial disease	40492

1.1.2 Burden of cardiovascular diseases in Sub-Saharan Africa

The overall prevalence of cardiovascular diseases is on the rise in Sub-Saharan Africa (SSA) due to a growth in risk factors. Whilst there is a rise in non-communicable diseases, the burden of communicable diseases remains the same leaving Africa with a double burden of disease (Stambler & Ngunga, 2015). In a review of cardiovascular diseases in Sub-Saharan Africa, it was found that atrial fibrillation (AF) had the highest relative rise in prevalence between 1990 and 2010. The prevalence of atrial fibrillation is increasing in Sub-Saharan Africa due to a growth in the risk factors for non-valvular atrial fibrillation yet the risk of valvular atrial fibrillation secondary to rheumatic heart disease remains as sub optimally treated streptococcal infections are still an issue in the region (Stambler & Ngunga, 2015). The prevalence of atrial fibrillation however is still lower in Africa in comparison to other regions of the world(Nguyen, Hilmer, & Cumming, 2013). Traditionally, rheumatic heart disease has been the leading risk factor for atrial fibrillation. However, the pattern could be changing partly due to a rise in other non-communicable diseases such as diabetes and hypertension (Shavadia & Yonga, 2013) and a decline in the overall incidence of rheumatic heart disease (Andrew & Mohammad, 2013). The burden of AF related complications such as stroke was found to be high in Sub-Saharan Africa than in other regions of the world with higher mortality and disability associated with it (Feigin, Forouzanfar, & Krishnamurthi, 2014).

The leading cause of CVD mortality in SSA is cerebrovascular disease which also had the highest disability rate. Stroke mortality rates in 2010 ranged from 85 per 100,000 persons in Western SSA to 126 per 100,000 person years in Central SSA. Age adjusted DALYS ranged from 1665 per 100,000 persons in Western SSA to 2434 per 100,000 persons in Central SSA. Hemorrhagic and other non-ischaemic strokes

resulted in 55% of stroke deaths and 64% of stroke DALYS(Andrew & Mohammad, 2013).

SSA leads in premature deaths from CVD and the 65thworld health assemblyagreed to reduce premature deaths from CVD by 25% by 2025 (Roth, 2015). The following table shows the leading causes of CVD burden in SSA; adapted from global and regional patterns of CVD study between 1990 and 2013(Roth, 2015).

Leading Causes of Cardiovascular Disease Burden in SSA in 2010

Cardiovascular Disease	**CVD Burden (%)**
Stroke	38.8%
Ischaemic Heart Disease	28.6%
Other Cardio and circulatory	9.1%
Cardiomyopathy	7.8%
Hypertensive Heart Disease	7.0%
Rheumatic Heart Disease	5.9%
Endocarditis	1.0%
Atrial Fibrillation	1.0%
Aortic aneurysm	0.6%
Peripheral Vascular Disease	0.3%

1.1.3 Regional differences in cardiovascular mortality in the elderly

There have been considerable gains made in the management of CVD in the high income countries (HIC) which has significantly reduced premature deaths from CVD. However, CVD deaths still contribute largely to mortality in HIC(Andrew & Mohammad, 2013). The improvements in mortality outcomes can be attributed to better health care services and a reduction in cardiovascular risk factors. (Roth, 2015)In 2010, 8.8% of the mortalities were attributable to CVD in SSA. However, 80% of deaths attributable to CVD globally are from low and middle income countries (Cappuchio & Miller, 2016).

The gains in healthcare and reduction of CVD risk have not been realized in SSA and a patient is more likely to die from complications of CVD in SSA than in a high income country. Late access to proper healthcare, late diagnosis and economic challenges all contribute to worse mortality outcomes is SSA (Stambler & Ngunga, 2015).

The table below, adapted from The Global Burden of Diseases, Injuries and Risk Factors 2010 Study, shows regional differences in CVD mortality. SSA contributes largely to premature deaths from CVD globally(Andrew & Mohammad, 2013).

Average Age at CVD Death and Years of Life Lost (YLL) per capita due to CVD

Super Region	Age at Death	YLL per Capita
Sub-Saharan Africa	64.9 (64.4 – 65.4)	0.0216
East Asia/Pacific	72.6 (72.2 – 72.9)	0.0401
EasternEurope/Central Asia	75.5 (75.5 – 75.7)	0.1084
High Income	81.2 (81.0 – 81.6)	0.0368
Latin America/Caribbean	73.6 (73.3 – 73.9)	0.0294
North Africa/Middle East	68.6 (68.3 – 68.9)	0.0442
South Asia	67.6 (66.9 – 68.2)s	0.0352

1.2 Problem Statement

Cardiovascular diseases are a major public health concern accounting for 31% worldwide deaths in 2016 with 82% of these deaths occurring in the low and middle income countries (WHO, 2017). There is a higher incidence and prevalence of these diseases in the elderly than in the younger persons. (Andrew & Mohammad, 2013). The prevalence of all CVD increases from 40% in men aged 40 to 70 years of age to75% in men aged 60 to 79 years of age in United States. Sub-Saharan Africa has seen an epidemiological transition with CVD emerging as significant cause of morbidity and mortality and especially in the elderly (Cappuchio & Miller, 2016) (Roth, 2015). This has been attributed to the rise in cardiovascular risk factors among the population with the prevalence and incidence of these almost doubling in the elderly (Kenya Ministry of Health NCD Division; KNBS; WHO, 2015). As the elderly population in Sub-Saharan Africa tend to be largely dependent on their younger working family members for livelihood support and healthcare, this has social and economic implications on families and the nation at large(Lloyd-Sherlock, 2000). The economic impact of lost productive years and costs of care in tertiary health is significant. Therefore, it is of utmost importance to highlight the magnitude of the cardiovascular diseases in the elderly population in Sub- Saharan Africa where access to quality care for them is not always available and there is paucity of data; in spite of the elderly bearing the greatest risk and burden of CVD (Nguyen, Hilmer, & Cumming, 2013).

1.3 Justification

The incidence and prevalence of cardiovascular diseases rise with age. The elderly have a higher prevalence of subclinical disease with the attendant consequences on mortality and morbidity (Yazdanyar & Newman, 2009). Epidemiological data on these conditions in the elderly in our population is scanty (Andrew & Mohammad, 2013). As this subset bears the greatest cardiovascular burden, (Roth, 2015) it is important to characterize their risk profile for cardiovascular morbidity and outline the burden of these diseases in the East African Region. This study will contribute to the data on CVD in the elderly in SSA: its burden, risk profile and clinical characteristics and inform policy formulation as the country strives to reduce the morbidity and mortality arising from CVDs.

1.4 Research Question

What is the prevalence of cardiovascular diseases and associated risk profile in elderly patients admitted at Moi Teaching and Referral Hospital Eldoret?

1.5 Objectives

1.5.1 Broad Objective

To determine the prevalence of cardiovascular diseases and associated risk profile in elderly patients admitted at Moi Teaching and Referral Hospital (MTRH), Eldoret.

1.5.2 Specific Objectives

1. To determine the prevalence of left ventricular systolic dysfunction and pathological valve disease among elderly patients admitted at MTRH.
2. To determine the prevalence of cardiac rhythm abnormalities among elderly patients admitted at MTRH.
3. To determine the traditional cardiovascular risk profile among elderly patients admitted at MTRH.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 AGE RELATED CHANGES TO CARDIOVASCULAR PHYSIOLOGY

Aging is a physiological process that is determined by genetics and modified by external environmental conditions. The age related changes in structure and function of the cardiovascular system place the elderly at risk of cardiovascular disease and more severe sequelae. Both the incidence and prevalence of cardiovascular disease increase with age (Maurer, 2011).

The changes that come with aging can be categorized into three broad categories: changes in the heart, changes in the vasculature and changes in the blood. The changes to the heart include those that occur in the conduction system, the musculature and the valves. There is a drop out in atrial pacemaker cells which results in a drop in baseline resting heart rate. Fibrosis of the cardiac skeleton results in calcification of the aortic valve and damage to the Bundle of His as it perforates the right fibrous trigone. Deposits of the aging pigment lipofuscin lead to degeneration of the cardiac muscles and valves leading to stiffening. The elderly are therefore at risk of valve sclerosis. There is a decreased response to adrenergic nervous system and to baroreceptor and chemoreceptor activation. An increase in circulating catecholamines also occurs. These changes predispose to isolated systolic hypertension, diastolic dysfunction and heart failure, atrioventricular conduction defects and aortic valve calcification(Cheitlin, 2003).

With aging, there is a decrease in elasticity and an increase in stiffness of the vasculature. This increases the peripheral resistance and in turn increases after load. This results in left ventricular hypertrophy and other changes in the left ventricular wall that prolong ventricular relaxation in diastole. There is also a rise in systolic

blood pressure. These changes to the vasculature also make the capillaries stiffer and hence become less effective in exchange. Also, the baroreceptors become less sensitive to positional change predisposing the elderly to orthostatic hypotension (Cheitlin, 2003).

Aging also results in reduction of total body water with resultant reduction in blood volume. Apart from this, the red cell production response to stress or sudden blood loss is reduced giving the elderly a slower response to anemia or sudden blood loss (Cheitlin, 2003).

2.2 Left Ventricular Dysfunction

The left ventricular dysfunction (LVD) can result from a structural or functional impairment of the ventricle that either results in systolic or diastolic dysfunction. LVD with heart failure is the final common pathway of cardiac disorders. Its causes include: ischaemic heart disease, cardiomyopathy, hypertension, valve disease or myocarditis. Once left ventricular dysfunction occurs, compensatory mechanisms are activated which lead to remodeling of the left ventricle. The mechanisms at play are: neuro-hormonal, hemodynamic and molecular. They are meant to compensate for the functional loss which initially works in increasing the cardiac output but in the long run lead to heart failure (Armstrong, 2000).

The neuro-hormonal networks that are activated include the sympathetic nervous system which results in an increased heart rate, increased myocardial contractility and peripheral vasoconstriction. Stimulation of the renin angiotensin aldosterone system (RAAS) leads to increased concentration of renin, angiotensin II and aldosterone. Angiotensin II is a potent vasoconstrictor and constricts the renal efferent arteriole and the peripheral vasculature effectively increasing the peripheral resistance. It also

increases the release of norepinephrine from the sympathetic nerve terminals with the aforementioned effects. It also promotes the release of aldosterone leading to salt and water retention. Angiotensin II has an effect on the cardiac myocytes that lead to hypertrophy but in the long run leads to endothelial dysfunction (G. Jackson, 2000).

The atrial and brain natriuretic peptides increase in response to volume expansion and pressure overload on the heart. Their effect antagonizes the effects of RAAS on vascular tone and sodium and water retention. The levels of BNP and ANP are increased in patients with heart failure.

The ideal therapeutic goals in heart failure include: Reduction in heart rate, reduction in oxygen consumption, reduction in neuro-hormonal activation, restoration of autonomic balance and promotion of favorable cardiac and vascular remodeling(Armstrong, 2000). Angiotensin converting enzyme (ACE) inhibitors and beta blockers are beneficial in patients with systolic dysfunction.

2.2.1 Echocardiographic Classification of Left Ventricular Dysfunction

Left ventricular diastolic dysfunction

This has been classified echocardiographically by the American Society of Echocardiography into four grades: (Chapman, Ewer, Kelly, & et_al, 2013).

American Society of Echocardiography grading of diastolic dysfunction

	NORMAL	GRADE 1 (Mild)	GRADE 2 (Moderate)	GRADE 3 (Severe)
Mitral E/A ratio	>0.8	≤0.8	0.8–2.0	>2.0
Deceleration time (msec)	140–200	>200	160–200	<160
e′ septal (cm/sec)	≥8	<8	<8	<8
e′ lateral (cm/sec)	≥10	<10	<10	<10
Averaged E/e′ (cm/sec)		<8	9 – 12	≥13
Left Atrial Size (mL/m2)	<34	≥34	≥34	≥34
Pulmonary vein systolic inflow diastolic inflow ratio		>1	<1	<1
AR-A (msec)		<0	>30	>30
Change in E/A ratio with Valsalva		Decrease by <50%	Decrease by ≥ 50%	Decrease by ≥ 50%

Left ventricular systolic dysfunction

The table below shows the Echocardiographic features of LV systolic dysfunction according to an update by the American Society of Echocardiography and European Association of cardiovascular imaging: (Lang, Badano, & et_al, 2015).

American Society of Echocardiography criteria for LV systolic dysfunction

MALE				
	Normal range	**Mildly abnormal**	**Moderately abnormal**	**Severely abnormal**
LVEF (%)	52 – 72	41 – 51	30 – 40	<30
Maximum LA Volume/BSA (mL/m^2)	16–34	35–41	42–48	>48
FEMALE				
	Normal range	**Mildly abnormal**	**Moderately abnormal**	**Severely abnormal**
LVEF (%)	54–74	41–53	30–40	<30
Maximum LA Volume/BSA (mL/m^2)	16–34	35–41	42–48	>48

2.2.2Prevalence and clinical characteristics of left ventricular dysfunction

The overall prevalence of cardiovascular diseases is on the rise in Sub-Saharan Africa (SSA) due to a growth in risk factors(Stambler & Ngunga, 2015). A study conducted in Nigeria to assess diastolic dysfunction among patients with hypertension, left ventricular diastolic dysfunction occurred in 62% of systemic hypertension and 11.3% of the controls (Adamu, 2010). Another study looking at left ventricular systolic

dysfunction found a prevalence of 18.1% in hypertensive patients in Nigeria aged 56.0 ± 12.7 for the women and 56.9 ± 13.3 for the men(Ogah, 2011).

Left ventricular dysfunction is a largely undiagnosed condition in the elderly.It is important though because asymptomatic left ventricular dysfunction is an indicator of impending or pre-existing heart failure. In high income countries, it has been found to be a disease of the elderly(Arnold & et_al, 2005). The prevalence of LVD has been found to be twice as high in persons aged 80 years and above. In a study done in Dorset, the risk factors that predicted LVD were: previous diagnosis of heart failure and vascular disease(Morgan, Smith, & Simpson, 1999).

A study done in Kenyatta National Hospital showed a younger peak age of heart failure among patients with left ventricular dysfunction. The peak age bracket was 20 – 40 years. Only 50% of patients with left ventricular dysfunction were symptomatic(Barasa, 2009). This same finding was seen in another study where 52% of elderly patients with LVD had never been diagnosed to have heart failure (Morgan, Smith, & Simpson, 1999).

Diagnosis and treatment of LVD has been shown to decrease rates of hospitalization and has also shown mortality benefits. The prevalence of undiagnosed LVD in the elderly was found to be 7.5% in a study that looked at the clinical characteristics of LVD. Men were more affected than women (Morgan, Smith, & Simpson, 1999). Data on the burden of left ventricular dysfunction in the elderly in Kenya and Sub-Saharan Africa is scarce. Inadequate registration systems have presented a challenge in SSA on epidemiological studies (Andrew & Mohammad, 2013).

2.3 Pathological Valve Disease in the Elderly

The changes that occur with aging result in thickening (sclerosis) of the valves of the heart. The aortic valve is mostly affected with sclerosis being a common finding in the elderly. However, any of the other valves may be affected with the mitral valve coming in second(Freeman, 2005). It is a marker of increased cardiovascular risk and shares a similar pathogenesis with atherosclerosis(O'Brien, 2006). The pathogenetic processes involved are: lipid accumulation, inflammation, and calcification. Calcification is the predominant process at the later stages and increased calcification leads to narrowing of the lumen resulting in stenosis (O'Brien, 2006).

The prevalence of aortic valve sclerosis with or without stenosis increases with age. Sclerosis of the aortic valve is found in about 25% of persons aged 65 and above. This prevalence is even higher in persons above 75 years of age(Freeman, 2005). Advancing age has been found to be a very important clinical characteristic in progression to stenosis. Male gender is the other risk factor that has been identified(Novaro, 2007). The prevalence has also been found to be higher in patients with hypertension and those with end stage renal disease on dialysis with the later group having prevalence of up to 69% for aortic valve sclerosis and 60% for mitral valve sclerosis(Straumann, 1992).

Significant focus has been given to this condition that was once thought to be benign. The ejection systolic murmur found in the presence of the aortic valve sclerosis was termed innocent. However, it has been demonstrated that this condition is not as silent or innocent. Whereas it has no hemodynamic significance, it is marker of increased cardiovascular risk (Nightingale, 2005). Presence of aortic sclerosis is independently associated with a higher incidence of all causemortality and also death from

cardiovascular disease. The study also found a higher risk for myocardial infarction among persons with aortic valve sclerosis even without significant hemodynamic obstruction(Otto, 1999).

The former positionon the risk of aortic sclerosis was informed by review of risk of endocarditis and embolism from a sclerotic valve. Such progression was rarely seen. However, progression to aortic stenosis has been clearly demonstrated. It is known that severe symptomatic aortic valve stenosis is associated with a poor prognosis unless surgical intervention is done(Otto, 1999). The progression is related to age and is due to mechanical stress factors on the valve and also exposure to risk factors(Nightingale, 2005).

2.4 Rhythm Abnormalities in the Elderly

There are many cardiac rhythm abnormalities seen in the elderly. These rhythm abnormalities occur with a higher frequency with increasing age: bradyarrhythmias, atrial fibrillation and ventricular arrhythmias (Goyal & Rich, 2016). This is because of the age related changes to the cardiovascular system that affect the elderly. Atrial fibrillation is the most common cardiac arrhythmia affecting the elderly patients affecting approximately 2.3 million Americans, comprising around 6% of those over 65 years and 12% of individuals above 85 years (Chow, Marine, & Fleg, 2013). In Sub-Saharan Africa, it has also been found to be the most common rhythm abnormality in the elderly(Stambler & Ngunga, 2015).

2.4.1. Atrial fibrillation

Atrial fibrillation is the leading sustained cardiac arrhythmia. There are approximately eleven million people living with atrial fibrillation in the United States and Europe(Coyne, 2006). It has been found to be the most common cardiac arrhythmia among elderly patients and is more prevalent among the males than the females (Wann, 2011). It is the leading cause of arrhythmia related admissions to hospitals (Friberg, 2003). Remodeling of atrial tissue induced by external stressors such as structural heart disease, AF itself or hypertension result in a slow process that eventually lead to structural and ion function changes in the atria. Activation of fibroblasts, enhanced connective tissue deposition, and fibrosis are the hallmarks of this process. There is also atrial fatty infiltration and inflammatory infiltrates. The resulting effect is dissociation between the muscles and the conducting system which favors reentry and arrythmogenesis. As the AF persists, it perpetuates more AF making it more persistent (Task Force for the management of atrial fibrillation of the European Society of Cardiology, 2016). A study done in the medical out-patients clinics in Kenyatta national Hospital (KNH) showed a period prevalence of AF in KNH to be 2.77%. Valvular heart disease was the leading cause of AF and especially in the younger patients (97% of AF cases aged less than 65 years). In the older population, non-valvular AF was more common with the most common associated co-morbidity being hypertension (53.5%). Another study done in Aga Khan University Hospital Nairobi found that non-valvular AF was more prevalent in this set up than was initially thought. The prevalence of atrial fibrillation not associated with rheumatic heart disease was higher than it has been traditionally in Sub-Saharan Africa. They however noted the fact that the study was conducted in a private hospital that serves the middle to high income socio-economic group and cited this as a

limitation to this finding. They also found that the associated co-morbidities included hypertension (68%), heart failure (38%), diabetes mellitus (33%), and valvular abnormalities (12%) (Shavadia & Yonga, 2013). The Framingham study found the risk factors for NVAF to be advancing age, male sex, hypertension, clinically significant cardiac murmur, heart failure and being overweight(Schnabel RB, 2010).

Cardiovascular morbidity and mortality associated with atrial fibrillation

There have been considerable gains made in the management of AF in the developed world though AF still remains to be a major cause of adverse cardiovascular outcomes with the resultant effect on the economy. Unfortunately, these gains have not been necessarily realized in Sub-Saharan Africa where diagnosis tends to be delayed as access to quality healthcare is not readily available (Stambler & Ngunga, 2015). The various cardiovascular outcomes that are associated with AF have been reviewed by the ESC in the 2016 guidelines for management of AF: (Task Force for the management of atrial fibrillation of the European Society of Cardiology, 2016). The outcomes reviewed include mortality, where there has been a clear demonstration of increased risk of all cause mortality, (Benjamin EJ, 1998), stroke, with 20-30% of all strokes arising from AF. 10-40% of patients with AF are hospitalized every year increasing health care costs and risk of mortality. Quality of life is also affected. Left ventricular (LV) dysfunction and heart failure, cognitive decline and vascular dementia may also arise as a consequence of AF(Task Force for the management of atrial fibrillation of the European Society of Cardiology, 2016).

Therapeutic goals in AF include rate or rhythm control and stroke prevention. The focus on management centers around two things: stroke prevention and symptom control which can either be done through rate control or rhythm control (Wann,

2011). The clinical symptoms arise from the hemodynamic instability resulting from the increased heart rate, atrio-ventricular asynchrony and left atrial and ventricular dysfunction (Andrew & Mohammad, 2013). The treatment strategies employed largely in Sub-Saharan Africa and in Kenya are rate control over rhythm control strategies. In a private hospital in Nairobi, rate control was the most common management strategy employed (Shavadia & Yonga, 2013). This was also the case in KNH and MTRH(Nduiga, 2009); (Bloomfield GS, 2015). For stroke prevention, patients hailing from an urban setting are more likely to receive anticoagulation than patients in rural settings. Vitamin K Antagonists (VKA) are more widely used than Novel Oral Anticoagulants (NOACS)(Stambler & Ngunga, 2015). A study done in MTRH showed that patients on VKA (Warfarin) attending the pharmacist run anticoagulation clinic had an average Time in Therapeutic Range (TTR) of 64.6% with rate of major bleeds per year being 1.25%. The TTR rate compares to other settings in the developed world(Manji & et-al, 2011). In stroke prevention, the CHA2DS2-VASc score is used to determine patients with NVAF that would benefit from anticoagulation(Task Force for the management of atrial fibrillation of the European Society of Cardiology, 2016).

2.4.2. Bradyarrhythmias

There are many age related changes that make bradyarrhythmias more common in the elderly than in their younger counterparts. They include fibro-fatty infiltration of the conduction system and a reduction of the number of functional pace maker cells. These plus the fact that the calcium handling is impaired lead to bradyarrhythmias. There may be dysfunction of the SAN and there may also be AVN blocks. The causes include: Hypothyroidism, non-dihydropyridine calcium channel blockers prescribed for hypertension, coronary artery disease and atrial fibrillation (Goyal & Rich, 2016).

The management depends on whether there are symptoms or not. Symptomatic bradycardia may present as synchopal attacks with falls, decreased exercise tolerance and heart failure. Pacing is indicated for symptomatic bradycardia. 70% of patients requiring pacing are above the age of 70 years (Goyal & Rich, 2016).

2.4.3. Ventricular arrhythmias

These may range from benign disorders such as premature ventricular depolarization to life threatening disorders such as ventricular tachycardias and ventricular fibrillation. These almost always occur in the setting of structural heart disease secondary to hypertension or ischaemic heart disease (Goyal & Rich, 2016). They may lead to sudden cardiac death. In select patients, there is an indication to have implantable cardioverter defibrillator devices.

2.5 CARDIOVASCULAR RISK STRATIFICATION

2.5.1 Cardiovascular Risk Assessment

Cardiovascular risk indicates the chance of one suffering a major adverse cardiovascular event (MACE); with the classical three point MACE being defined by a composite of nonfatal stroke, nonfatal myocardial infarction and cardiovascular death. The traditional cardiovascular risk factors that have been described include: advancing age, male gender, diabetes, hypertension, hyperlipidemia, obesity and overweight, family history, cigarette smoking and chronic kidney disease (Ami15).

Presence of these traditional factors can be used as an estimate of cardiovascular disease (CVD) risk. However, a more precise way to determine this is desirable for purposes of designing an individualized treatment plan (Wilson, 2020). It is recommended that persons aged 20 to 79 years get CVD risk assessment periodically with the persons with a higher predicted 10 year risk having shorter timelines between

the periodic assessments. Patients with low 10 year risk are reassessed every four to six years(Wilson, 2020).

2.5.2Cardiovascular Risk Calculation

Risk scores have been used to predict the ten year risk for cardiovascular events. However, they have the limitation of not being accurate in predicting individual risks for these events. They are however useful in predicting the population risk. Risk mitigation strategies are indicated for high risk patients(Ker, 2014). There are three ways of calculating cardiovascular risk in a population:

1. Risk charts such as the Framingham risk score, systematic coronary risk evaluation (SCORE) score, QRESEARCH cardiovascular risk algorithms (QRISK1 and QRISK2) and Prospective Cardiovascular Münster (PROCAM) score.
2. Non-laboratory based risk calculations which have been recommended for resource limited settings which include the non-laboratory based Framingham, non-laboratory based Gaziano, non-laboratory based WHO/ISH, Swedish consultation based method and the UK general practice model.
3. Screening for subclinical disease for instance by use of coronary artery calcium (CAC)

A review of the non-laboratory based evaluation found that the Framingham and Gaziano non-laboratory based evaluations met majority of the Cooney criteria for evaluating clinically useful risk assessment algorithms (Table 6). The Gaziano evaluation was developed with a sample size of 6186 participants who were free of cardiovascular disease. The sample had both males and females adequately

represented and they had racially and ethnically diverse participants making likely to be generalized across multiple ethnicities. It also has user friendly charts for both the males and the females. The Framingham non- laboratory based evaluation also met most of the criteria but the population was not racially diverse and their calculator are on an excel worksheet fitted onto an interactive online platform making it not so user friendly in places that have poor access to technology(Kariuki, Stuart-Shor, Leveille, & Hayman, 2013).

Cooney's Criteria for evaluating clinically useful risk assessment algorithms

Cooney's Criteria for evaluating clinically useful risk assessment algorithms
1. Appropriateness of statistical method used to derive the function ▪ Representativeness of algorithm's derivation sample, optimal statistical power and methods and clarity of end points predicted by the function
2. Performance of the function: internal and external validity ▪ Discrimination, calibration and sensitivity of algorithm(s) in derivation and external data sets
3. Usability of the algorithm ▪ Impact of an algorithm's format on its use and uptake in clinical in clinical settings
4. Inclusion of appropriate risk factors ▪ Inclusion of major risk factors known to be prevalent in the target population
5. Measurable health gains associated with use of algorithm(s) ▪ Tangible clinical benefits associated with use of the algorithm(s)

The traditional cardiovascular risk profile entails the modifiable and non-modifiable risk factors. The modifiable risk factors include: Physical inactivity, cigarette smoking, high salt diet, hypertension, dyslipidemia, obesity and alcohol abuse. The non-modifiable risk factors include: family history of sudden cardiac death, age with increase in age being the risk factor, gender with males having a higher risk profile, ethnicity with Asians and Africans having a higher risk (Roth, 2015).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Design

This was a descriptive cross sectional study of elderly patients admitted in Moi Teaching and Referral Hospital.

3.2 Study Setting

The study was conducted in the adult in wards at Moi Teaching and Referral Hospital, Eldoret. This is a level six facility and the second largest national referral hospital that attends to patients from all over the country. However, majority of the patients hail from the Rift Valley, Nyanza and Western regions of the country. It is a hub for teaching, training and research for Moi University and other institutions of higher learning such as the Kenya Medical Training College in Eldoret. The hospital has a bed capacity of 1000 and serves a catchment population of more than 20 million people. The Moi Teaching and referral hospital is also home to the Chandaria Cancer and Chronic Diseases Centre where the patients with cancer and other chronic diseases such as diabetes, hypertension, cardiac diseases, and chronic respiratory conditions are attended to. The institution also has a specialized cardiac care centre that attends to patients with various heart conditions. (Moi Teaching and referral hospital official website).

3.3 Study Population

The target population was persons aged 60 years and above as was determined by the national identity card whenever it was available or confirmed from any present relatives. All adult medical, surgical and gynecological wards were included.

3.4 Eligibility Criteria

3.4.1 Inclusion Criteria

- Persons aged 60 years and above admitted at the adult MTRH wards (Medical including the cardiac care unit, surgical, gynecological and psychiatry wards).

3.4.2 Exclusion Criteria

- Severe chest injuries and burns involving the chest
- Severe illness precluding transfer to cardiac diagnostic unit

3.5 Sampling Procedure

3.5.1 Sample Size Calculation

The prevalence of cardiovascular diseases in persons aged 60 to 79 years is 70 to 75% in the United States (Yazdanyar & Newman, 2009). The projected prevalence of cardiovascular disease used in this study was 70%. There were no studies available from Africa that looked at the composite prevalence of cardiovascular diseases in the elderly prompting the use of a study from the United States of America.

The formula applied to calculate the sample size was the Fisher's formula

$$n = \frac{(Za)^2[p*q]}{d^2}$$

- Where n is the sample size
- P is expected prevalence (70%)
- Type 1 error is 5% (0.05)
- Za- critical value is 1.96
- Type 2 error is 20% (0.20)

- ❖ The power of the study is 80%
- ❖ d – precision set at 0.05

n =<u>322</u>

Adjustment for missing or incomplete data of 5%

n = <u>338</u>

3.5.2 Sampling Technique

Systematic random sampling was used to select the study participants. The K^{th} case was every 3^{rd} patient that met the eligibility criteria and admitted to any of the adult wards. The projected number of persons aged 60 years and above admitted was retrieved from the MTRH records for the same period the previous year (MTRH-Records, 2017). This informed the calculation of the K^{th} case as shown below:

- Total number of elderly patients (Persons above 60 years of age) admitted per month in the medical, surgical and gynecological wards per month averages 170. Over the 6 month study period, the projected total elderly patients will be 1020 (MTRH-Records, 2017).
- Sample size = 338

  K^{th} case = Total/Sample size; 1020/338 = 3.02

  K^{th} case = Every3^{rd}patient admitted in the MTRH wards that meets the eligibility criteria

3.6 Study Period

The study was conducted over a period of 6 months from May 2018 to October 2018.

3.7 Data Collection and Analysis

3.7.1 Data Collection

Data was collected by the principal investigator and trained research assistants by use of:

1. Standardized questionnaires which documented their socio-demographic details and further history including alcohol use, cigarette smoking, family and social history and prior medical history which also captured the current medications they were on. It also documented the physical examination findings. (Appendix C)
2. A 12 lead ECG and standard 2D echo were also done as part of the survey.
3. Diagnostic laboratory tests done: Random blood sugar and lipid profiles.

3.7.2 Data Storage

Data was checked for completeness and accuracy by the investigator. Data was then keyed into a prepared Microsoft Excel ® database. Confidentiality was maintained by excluding any identifiable information from the keyed set. The database was password protected to prevent un-authorized access. Data was backed up in password protected cloud storage to safeguard against unintended data loss. Errors in data entry were assessed using frequencies to identify outliers.

3.7.3 Data Analysis

The data was analyzed using STATA version 15.0®.Descriptive statistics such as measures of central tendency and dispersion were calculated for continuous variables while frequency listings were used for categorical variables. The 95% confidence interval was used to determine the interval estimate for the primary outcomes. Chi square test was used to assess association between categorical variables while

Wilcoxon rank sum test was used for continuous variables. P values less than 0.05 were considered to be statistically significant.

3.8 Study Procedure

Every day, the investigator and trained research assistants (RA) would randomly select participants that met the eligibility criteria systematically from the MTRH central admission register in the casualty and outpatient departments. The RA would then identify the selected elderly patients admitted the previous day in all medical, surgical and gynaecological wards. Self-reported age was confirmed by presentation of individual patient's national identity cards whenever it was available or independently verified by present relatives. After, a detailed description of the study purpose and procedures, potential individuals willing to participate in the study were consented and recruited. They were moved to the ward procedure rooms where clinical history and socio-demographic data was captured using an interviewer administered questionnaire followed by a targeted physical examination which documented the height, weight and body mass index, the pulse and heart rate, the jugular venous pressure and documented presence of oedema. This was followed by measurement of a sitting blood pressure (3 readings one minute apart using a digital automatic devise- OMRON M2 with the average of the last two being recorded).The next procedure was the drawing 2 ml of blood into a plain bottle for determination of random blood sugar and lipid profile. Calorimetric method of assay was used and tests done using a chemistry automated system (COBAS INTEGRA 400 plus). Measured tests were: Total cholesterol, HDLc and Triglycerides. LDLc was automatically derived using the Friedewald Equation

With the help of the nursing staff, these participants were then escorted to the cardiac diagnostic unit where further study procedures were carried out. A standard 12 lead ECG was done using a portable Philips machine and interpreted with the assistance of a cardiologist. The next procedure was a standard echocardiogram which took into account at least five views (parasternal long and short axis, apical four chamber, subcostal and suprasternal views. These images were archived on an external hard disk and reviewed by a cardiologist with interpretations being based on American Society of Echocardiography guidelines.

The patient was then escorted safely back to his/her bed. Abnormal results were shared with the patients' primary doctors and appropriate referral to the MTRH cardiology clinic or urgent consultation with the duty cardiologist was done when findings were perceived serious.

For study participants admitted for any other cause other than cardiopulmonary decompensation, the study procedure was waived for those that had within the last three months gotten a 12 lead ECG done and a 2D-echo done as these are not expected to be significantly altered within three months. The results were adopted for the study. However, for any participants admitted with a cardiopulmonary condition, they still had a study ECG and echocardiogram even if they had a test within three months.

3.9Ethical Consideration

Approval was sought from MTRH/Moi University IREC (Institutional Research and Ethics Committee) before the commencement of the study. Permission was also sought from the Moi Teaching and Referral Hospital. These letters of approval and permission were presented to the various heads in the outpatient clinics and the wards.

Informed consent was sought from the study participants. All the information regarding the study was provided in a language best understood by the participant or a guardian. Participation in the study was voluntary with no inducements offered to the participants. Data collected was de-identified using unique identification codes for each person. Prompt and appropriate intervention for medical emergencies that arose while the patient was with the research team was availed in conjunction with the health staff at the department.

Study results were communicated to the clinician in charge of the participant's treatment and also documented in the participant's health records. Confidentiality was assured and the data collected was available only to the research team for analysis purposes. Data was stored safely and disposed after the statutory duration of time. Privacy of the patients was protected by ensuring the approach during recruitment and during the study was done in a discrete room by the investigator and the assistants at the time of study. No exposure was done without adequate shielding of the area of the examination.

3.10 Dissemination of Results

The results of the study are being disseminated through this written thesis and an oral defense in a forum that shall be convened by the Moi University school of medicine. The results will also be presented in national or international research meetings and published in peer reviewed journals.

3.11 Recruitment schema for the study

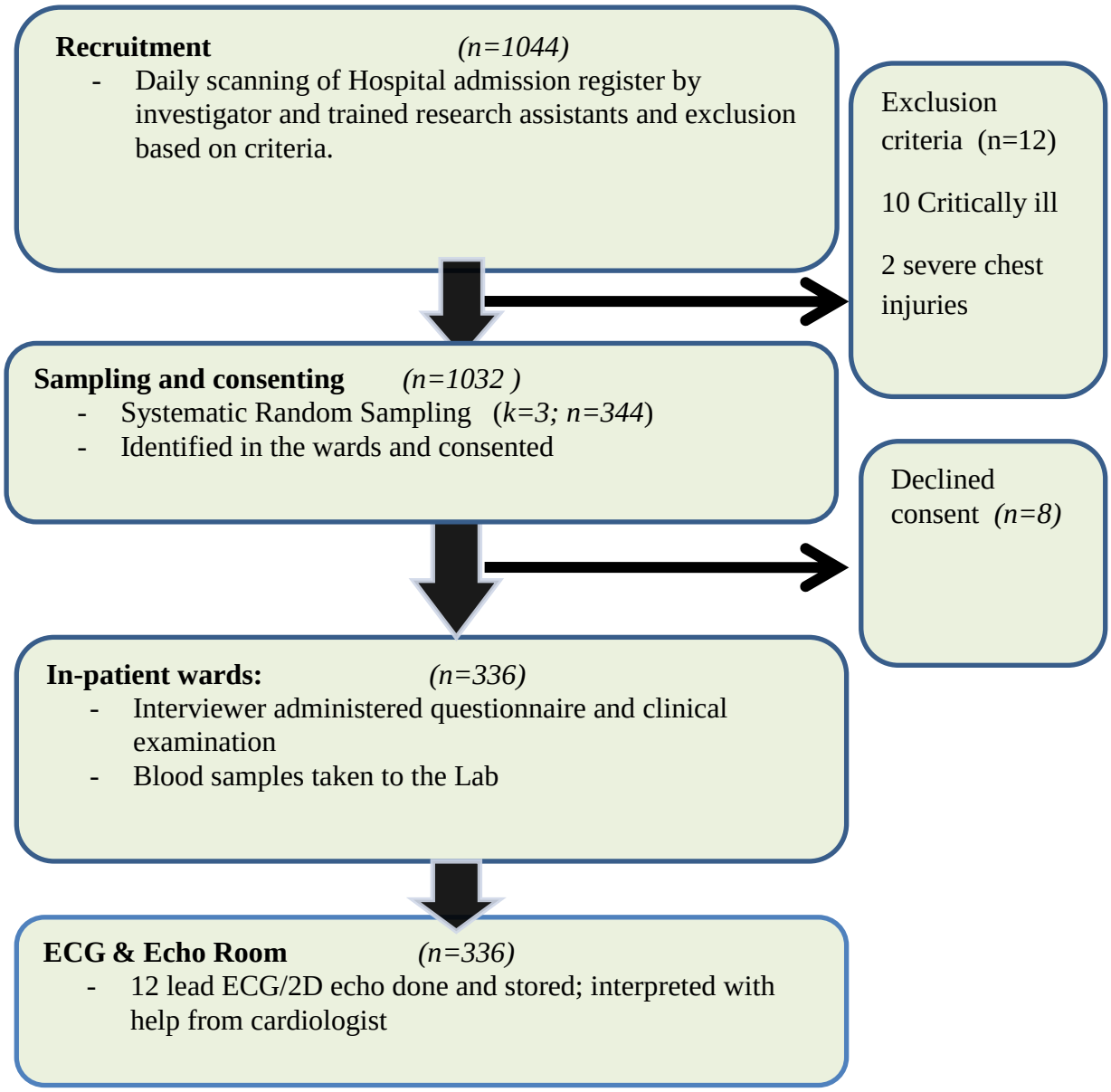

Figure 1: Schema of the recruitment procedure

CHAPTER FOUR

4.0 RESULTS

4.1 Population Description

A total of three hundred and thirty six (336) participants were recruited into the study from May 2018 to October 2018.Two hundred and twenty (220) (65%) were recruited from the medical wards (Male & Female wards and the CCU) and one hundred and sixteen (116) (35%) from all surgical and gynecological units.

4.1.1 Socio-demographic characteristics of the study population

The study population was elderly with a median age of 71; interquartile range (64,78). There was a male predominance in the study with the males being 171 (57%). Half of the population had a history of alcohol use.

The table below shows the socio-demographic characteristics of the study population

Table 1: Socio-demographic characteristics of the study population

Socio-demographic Parameter		**(n=336)**
Age	**Median age – 71; IQR (64, 78)**	
Age Distribution	**Frequency**	**Percentage**
60 – 70 years	164	49%
71 – 80 years	113	34%
81 – 90 years	44	13%
> 90 years	15	4%
Gender		
Male	191	57%
Female	145	43%
Alcohol Use		
No use	168	50%
Use	168	50%

4.1.2 Clinical Characteristics of the study population

Majority of the study population had a normal body mass index (BMI). Sixty three (18.8%) and twenty three (6.8%) were overweight and obese respectively. Fifty five participants (16.3%) had pre-existing heart disease. Out of those that had pre-existing heart disease, 33 (60%) were in acute decompensated failure.

During the study, one participant admitted at the cardiac care unit required urgent intervention due to life threatening ventricular arrhythmia. He had pre-existing cardiac disease.

The table below shows the clinical characteristics of the study population.

Table 2: Clinical characteristics of the study population

Clinical Parameter	**(n=336)**	
Pre-existing Heart Disease	**Frequency**	**Percentage**
Yes	55	16.3%
No	281	83.6%
Acute decompensated Heart Failure	**(n=55)**	
Yes	33	60%
No	22	40%
Cause for admission	**(n=336)**	
Medical conditions (Including heart disease)	220	65%
Surgical conditions	116	35%
BMI	**Median BMI 21.5; IQR (20,25)**	
BMI Distribution	**(n=336)**	
Underweight	19	5.7%
Normal	231	68.8%
Overweight	63	18.8%
Obese	23	6.8%

4.2 Prevalence of Left Ventricular Systolic Dysfunction

A total of 60 participants had left ventricular dysfunction hence the prevalence of left ventricular systolic dysfunction (LVSD) was 17.86 (95% CI: 13.91, 22.38). There was a variation in the distribution of LVSD across the different age groups with highest prevalence being in the 71 – 80year age group.

The figure below shows the age-based proportions of left ventricular systolic dysfunction.

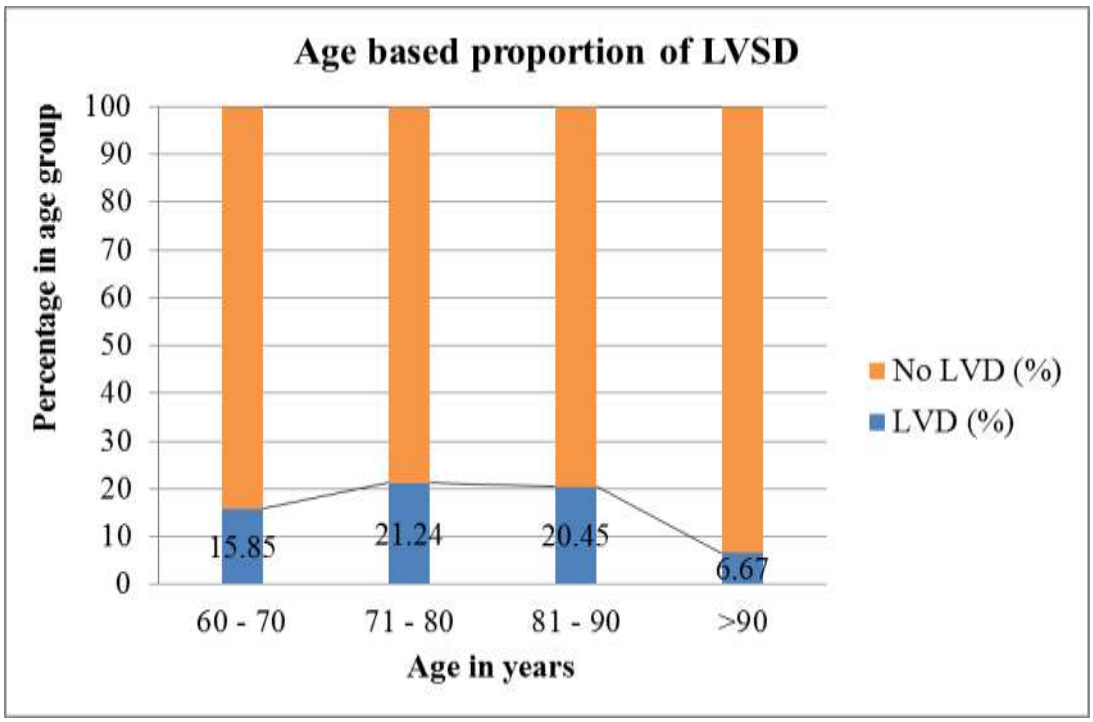

Figure 2: Age based proportion of left ventricular systolic dysfunction

4.3 Prevalence & Characteristics of Pathological Valve Disease

4.3.1 Prevalence of pathological valve disease

A total of 68 participants had pathological valve disease (PVD) hence the prevalence of pathological valve disease was 20.23% (95%CI: 16.62, 25.57). The highest proportion across the age groups was reported in the persons aged above 90 years in which 33.33% had PVD.

The figure below shows the proportion of PVD across the different age groups.

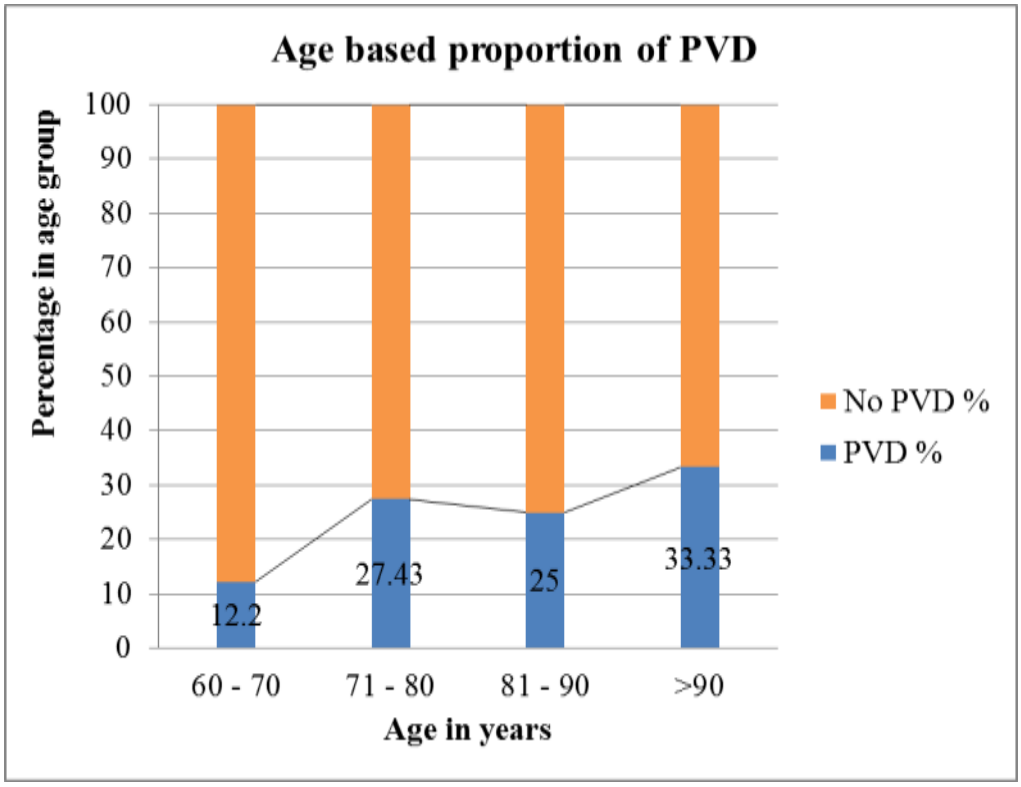

Figure 3: Age based proportion of pathological valve disease.

4.3.2 Characteristics of pathological valve disease

4.3.2.1 Valve involvement in pathological valve disease

The aortic valve involvement was in 57 participants (83%) of the participants while the mitral valve was involved in 5participants (7.4%). Both valves were involved in 6 participants (8.8%) who had rheumatic heart disease.

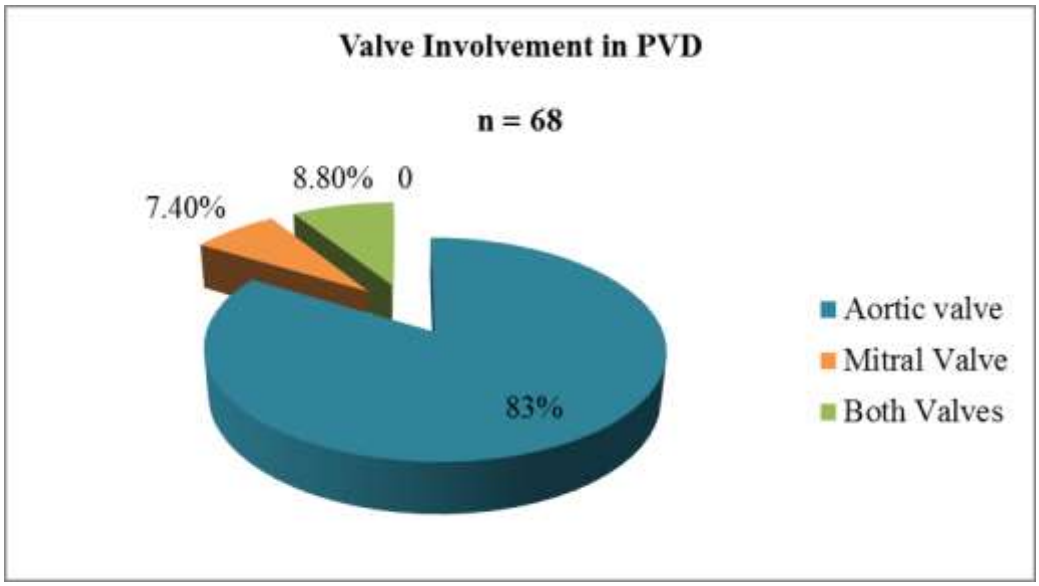

Figure 4: Valve involvement in pathological valve disease

4.3.2.2 Valve involvement with hemodynamic significance

Hemodynamic significance assessed was: stenosis with gradient on doppler, regurgitation and left ventricular dysfunction. Whereas the pooled prevalence of pathological valve disease was 20.23%, only 5 participants (1.49%) had aortic stenosis with significant gradient on doppler. Rheumatic heart disease (RHD) based on the World Heart Federation criteria was only present in 6 participants (1.79%).

The table below gives the details of the hemodynamic significance that was noted with pathological valve disease.

Table 3: Hemodynamic significance in pathological valve disease

Valve Disease	Frequency	Prevalence (%) n =336
Aortic sclerosis with no hemodynamic significance	26	7.7%
Aortic Regurgitation	31	9.23%
Aortic Stenosis	5	1.49%
RHD with MS/MR	6	1.79%

4.4 Prevalence of Cardiac Rhythm Abnormalities

The cardiac rhythms that were identified in the study have been shown in the table below. Atrial fibrillation was present in 46 of the participants (13.7%).

Table 4: Cardiac rhythms identified in the study population

Cardiac Rhythm (n=336)	Frequency	Percentage
Sinus Rhythm	**268**	**79.8%**
Normal Sinus	206	61.3%
Sinus Bradycardia	56	16.7%
Sinus Tachycardia	6	1.8%
Supraventricular Rhythm	**54**	**16.1%**
Atrial Fibrillation	46	13.7%
Atrial Flutter	6	1.8%
MFAT*&Junctional	2	0.6%
Others		
Heart blocks	11	3.3%
Ventricular tachycardia	1	0.3%
Ventricular paced rhythms	2	0.6%

MFAT – Multifocal Atrial Tachycardia

4.5 Traditional Cardiovascular Risk Profile

Hypertension was the most prevalent traditional cardiovascular risk at 44.3%. Ninety one (27.1%) had a significant smoking history. Notably, 52 (15.5%) of the participants had diabetes mellitus. The least common risk factor was a family history of premature cardiac death at 4.5%.

The table below shows the prevalence of the traditional cardiovascular risk factors in the study population.

Table 5: Traditional cardiovascular risk profile of the study population

Risk Factor	**(n = 336)**	
	Frequency	**Percentage**
Hypertension	149	44.3%
Cigarette smoking	91	27.1%
Hyperlipidemia	90	26.8%
Obesity/ Overweight	86	25.6%
Diabetes	52	15.5%
Chronic Kidney disease	18	5.4%
Family History	15	4.5%

4.6 Association between Categorical Variables

Association between LVSD, PVD and AF was tested using Chi square. Only DM and cigarette smoking were significant in LVSD and PVD respectively.

Table 6: Cardiovascular risk factor association with left ventricular systolic dysfunction

Variable	Left ventricular dysfunction		Chi square p-value
	Absent	Present	
	Freq (Row %)	Freq (Row %)	
GENDER			0.797
Female	120 (82.8)	25 (17.2)	
Male	156 (81.7)	35 (18.3)	
BMI Status			0.915
Normal	189 (81.8)	42 (18.2)	
Obese	20 (87)	3 (13)	
Overweight	52 (82.5)	11 (17.5)	
Underweight	15 (78.9)	4 (21.1)	
DM			0.024
No	239 (84.2)	45 (15.8)	
Yes	37 (71.2)	15 (28.8)	
Dyslipidemia			0.73
No	201 (81.7)	45 (18.3)	
Yes	75 (83.3)	15 (16.7)	
HPTN			0.208
No	158 (84.5)	29 (15.5)	
Yes	118 (79.2)	31 (20.8)	
Cigarette Use			0.575
No	203 (82.9)	42 (17.1)	
Yes	73 (80.2)	18 (19.8)	
Alcohol Use			1.000
No	138 (82.1)	30 (17.9)	
Yes	138 (82.1)	30 (17.9)	
Family Hx			0.362
No	265 (82.6)	56 (17.4)	
Yes	11 (73.3)	4 (26.7)	
Chronic kidney dse			0.259
No	263 (82.7)	55 (17.3)	
Yes	13 (72.2)	5 (27.8)	

Table 7: Cardiovascular risk factor association with valvular disease

Variable	Valvular Disease		Chi square p-value
	Absent	Present	
	Freq (Row %)	Freq (Row %)	
GENDER			0.304
Female	111 (76.6)	34 (23.4)	
Male	155 (81.2)	36 (18.8)	
BMI Status			0.394
Normal	177 (76.6)	54 (23.4)	
Obese	20 (87)	3 (13)	
Overweight	53 (84.1)	10 (15.9)	
Underweight	16 (84.2)	3 (15.8)	
DM			0.073
No	220 (77.5)	64 (22.5)	
Yes	46 (88.5)	6 (11.5)	
Dyslipidemia			0.150
No	190 (77.2)	56 (22.8)	
Yes	76 (84.4)	14 (15.6)	
HPTN			0.424
No	151 (80.7)	36 (19.3)	
Yes	115 (77.2)	34 (22.8)	
Cigarette Use			0.033
No	201 (82)	44 (18)	
Yes	65 (71.4)	26 (28.6)	
Alcohol Use			0.591
No	135 (80.4)	33 (19.6)	
Yes	131 (78)	37 (22)	
Family Hx			0.935
No	254 (79.1)	67 (20.9)	
Yes	12 (80)	3 (20)	
Chronic kidney dse			0.655
No	251 (78.9)	67 (21.1)	
Yes	15 (83.3)	3 (16.7)	

Table 8: Cardiovascular risk factor association with atrial fibrillation

	Atrial fibration		
	Absent	Present	Chi square
Variable	Freq (Row %)		P-value
GENDER			0.313
Female	122 (84.1)	23 (15.9)	
Male	168 (88)	23 (12)	
BMI Status			0.583
Normal	198 (85.7)	33 (14.3)	
Obese	21 (91.3)	2 (8.7)	
Overweight	53 (84.1)	10 (15.9)	
Underweight	18 (94.7)	1 (5.3)	
DM			0.071
No	241 (84.9)	43 (15.1)	
Yes	49 (94.2)	3 (5.8)	
Dyslipidemia			0.908
No	212 (86.2)	34 (13.8)	
Yes	78 (86.7)	12 (13.3)	
HPTN			0.25
No	165 (88.2)	22 (11.8)	
Yes	125 (83.9)	24 (16.1)	
Cigarette Use			0.111
No	207 (84.5)	38 (15.5)	
Yes	83 (91.2)	8 (8.8)	
Alcohol Use			0.526
No	143 (85.1)	25 (14.9)	
Yes	147 (87.5)	21 (12.5)	
Family Hx			0.115
No	275 (85.7)	46 (14.3)	
Yes	15 (100)	0 (0)	
CKD			0.302
No	273 (85.8)	45 (14.2)	
Yes	17 (94.4)	1 (5.6)	

CHAPTER FIVE

DISCUSSION

The study population is elderly with a median age of 71. There was a male predominance in the study which was a chance finding given that gender was not a significant factor when subjected to statistical tests with a confidence interval of 95%. However, it is important to note that male gender is an independent non-modifiable risk factor for cardiovascular disease (Andrew & Mohammad, 2013) and this may explain the high prevalence of cardiovascular disease and attendant risk factors seen in this study.

This study showed a prevalence of 17.86% for left ventricular systolic dysfunction (LVSD). This finding is comparable to a study done by Ogah et al in Nigeria where the prevalence of LVSD among hypertensive patients was found to be 18.1%. Notably however, their study population was younger than our study population (56±12.7). Secondly, they only looked at the prevalence in hypertensive patients (Ogah, 2011). Not all our patients were hypertensive. The prevalence of hypertension in our study was 44.3%; slightly less than half of the entire study population.

Boonman et al in Netherlands studied the prevalence of LVSD in diabetic patients who were aged 60 years and above. They found a prevalence of 25.8% which was higher than the one we found (Boonman-deWinter, 2012).However, only 15.4% of our patients had diabetes mellitus. It is important to note that diabetes mellitus was the only risk factor that had significant association with LVSD in this study. Heart failure with reduced ejection fraction is frequently associated with diabetes mellitus. Type 2 Diabetes Mellitus (T2DM) patients with LVSD and heart failure with reduced ejection fraction have a higher risk of mortality (Bouthoorn, 2018). In a systematic

review of 17 studies on T2DM patients with an age range of 50.1 ± 6.3 to 71.5 ± 7.5, the pooled prevalence of LVSD was higher in hospital populations (13 studies, n = 5835, 18% [95% CI 17–19%]), than in the general population (4 studies, n = 1707, 2% [95% CI 2–3%]).Our study is a hospital based study and may have a higher prevalence than in the general population.

In our study we found that there was a rise in prevalence of LVSD with age. This finding tallies with other studies that have looked at ventricular dysfunction in the elderly. The Metaanalysis Global Group In Chronic Heart Failure (MAGGIC) found that 50 – 60% of elderly patients had diastolic dysfunction. This study also found that systolic dysfunction was associated with a higher mortality. However, mortality was 30% lower in patients that had heart failure with preserved ejection fraction(MAGGIC, 2012). Our study looked at systolic failure that had been found to have a worse prognosis. Bleumink et al found that the prevalence of heart failure increased with age. In this study, incidence rate increased with age from 1.4/1000 person-years in those aged 55-59 to 47.4/1000 person-years in those aged ≥ 90 (Bleumink, 2004).In our study, the prevalence of heart failure also increased with age.

Degenerative valve disease has been described to occur with age with the most common valve affected being the aortic valve. Aortic valve sclerosis without stenosis is common in elderly patients(Freeman, 2005). In this study, we found the prevalence of pathological valve disease to be 20.23%, with the aortic valve involvement in 83% of the participants. Similarly in the cardiovascular health study, aortic valve sclerosis was present in 29% of participants aged 65 years and above (CHS, 1991). In contrast, another study with a higher mean age of 82 found a prevalence of 42% (Aronow, 1999). Looking at aortic stenosis found among those that had aortic sclerosis, the

prevalence of 1.49% in our studywas lower than that found in both these studies. This is also lower than the prevalence reported in other studies done in Norway and the USA. The prevalence was 2.8% in person aged 75 years and older in the USA study (Thaden, 2014) and average prevalence being 0.2% in the 50-59 year cohort, 1.3% in the 60-69 year cohort, 3.9% in the 70-79 year cohort and 9.8% in the 80-89 year cohort(Eveborn, 2013). A lower prevalence of aortic valve stenosis has been reported in the black population than in Caucasians in the United Statesin a study done by Nkomo et al(Nkomo, 2006). It is not clear whether there is a genetic component that makes the black race less likely to get aortic stenosis.Our study population was of the black race.

The prevalence of aortic stenosis also increases with age. Strizke et al found that the prevalence rose from 7% in persons aged 35 to 44 years to 65% in those aged 75 to 84 years (Stritzke, 2009). This was similar to the findings in our study where the prevalence rose from 12.2% in the 60 to 70 age group to 33.33% in those above 90 years.

High atherosclerotic risk associated even with asymptomatic cases makes the finding of a prevalence of pathological valve disease of 20.23% significant. Degenerative valvular disease bears the same pathogenetic mechanisms as atherosclerosis and is an independent marker of increased risk of cardiovascular and all cause mortality. It has also been found to be associated with higher incidences of non-fatal myocardial infarctions(Nightingale, 2005).

Importantly, rheumatic heart disease (RHD) was not found to contribute significantly to pathological valve disease in this study. Globally, RHD is the most common cause of aortic stenosis and usually involves both the aortic valve and the mitral

valve(Gaasch, 2020). RHD is most prevalent in Sub-Saharan Africa with a high estimated mortality (Zühlke, 2013). This finding could be attributed to the fact that our study population was elderly with a median age of 71. There has been a high risk of premature death associated with RHD in Sub- Saharan Africa(Andrew & Mohammad, 2013).

In analysis of associations between cardiovascular risk factors and pathological valve disease, cigarette smoking was the only factor found to be significant with a p-value of 0.033. Cigarette smoking has been identified as one of the risk factors for rapid progression from sclerosis to stenosis (Palta, 2000). Other factors such as dyslipidemia, advancing age, diabetes, chronic kidney disease and hypertension were not found to be significantly associated with pathological valve disease in our study. However,valvular sclerosis has been reported to be more prevalent in patients with hypertension, electrocardiographic evidence of left ventricular hypertrophy and in those with end-stage kidney disease on maintenance dialysis(Olsen, 2005).

Majority of the participants were in normal sinus rhythm. The other sinus rhythms identified were sinus tachycardia and bradycardia. The commonest abnormal rhythm found was atrial fibrillation (AF). This agrees with previous reports on AF being the commonest arrhythmia in elderly persons(Kumar, 2020). AF is a concern due to the risk of cardio-embolic events and decrease in cardiac output with resultant hypo-perfusion. Also, AF is associated with a higher risk of mortality(Stambler & Ngunga, 2015).

The prevalence of AF in our study was 13.7%. This was high in comparison to other studies done in Sub- Saharan Africa.A study done in Tanzania by Dewhurst et al found a prevalence of 0.7% in persons aged 70 years and above. This was a

community based survey and reported what they called a strikingly low prevalence of AF among elderly persons in Tanzania(Dewhurst, 2012). The fact that our study was a hospital based study while this was a community based one could account for the difference in findings as persons visiting a hospital are more likely to be unwell. Secondly, 16.3% of our participants had pre-existing heart disease. Stambler and Ngunga in a review of the epidemiology of atrial fibrillation in Africa reported that the prevalence of AF in Sub- Saharan Africa is low but is expected to increase. They attributed the low prevalence to diagnostic challenges and poor access to healthcare. They projected that as diagnostic abilities improve and as more patients are able to seek better healthcare, the prevalence would rise(Stambler & Ngunga, 2015). In addition, the prevalence of AF in a South African study by Sliwa et al across all age groups found a prevalence of 4.6%(Sliwa K. , 2008) and a retrospective chart review of a cardiology hospital in Ivory Coast found a prevalence of 5.5% in the patients admitted there(Coulibaly, 2010).

Non-valvular AF (NVAF) is commonly found in elderly patients than valvular atrial fibrillation (VAF). This was the same finding in our study. A study done in Nairobi, Kenya by Shavadia et al found that NVAF predominated VAF in their study population with hypertension and diabetes being the most common co-morbidities. In their study, they noted that RHD was rare. The mean age of their study population was 67 ± 17 years(Shavadia & Yonga, 2013). The SIGNAL study done in Moi Teaching and Referral Hospital that looked at 150 participants with atrial fibrillation found that those that had NVAF were more likely to have co-morbid hypertension. Diabetes was not a common co-morbidity in their study. The participants with NVAF were 30 years older than those with VAF (68 vs 38 years, $P < .001$)(Bloomfield GS, 2015). Notably, RHD was not common in our study population either with only 6

participants (1.79%) found to have RHD. The common co-morbidity co-existing with AF in our study was hypertension with 52.2% being hypertensive. Age ≥ 75years was also found to be present in 63% of the participants that had AF. Just as in the SIGNAL study, diabetes was not a common co-morbidity in our study.

Traditional cardiovascular risk factors were also looked at in this study. Hypertension was the most prevalent risk factor being present in 44.3% of our study population. This compares with what was noted in the Kenya STEPS survey that found the overall prevalence of hypertension to be 24% with the highest being among those aged 60 – 69 years at 53%(Kenya Ministry of Health NCD Division; KNBS; WHO, 2015). Our study population was elderly with a median age of 71. A study carried out by Mathenge et al in Nakuru Kenya on persons aged 50 years and above found a high prevalence of hypertension of50.1%. The prevalence was higher in persons hailing from urban areas than those from the rural (Mathenge, 2010). A systematic analysis done by Adeloye and Basquill looking at the pooled prevalence of hypertension and pooled awareness in Africa in persons 15 years or older, they found that the pooled prevalence of hypertension was 19.7% in 1990, 27.4% in 2000 and 30.8% in 2010 with a pooled awareness rate among those with hypertension of 16.9%, 29.2% and 33.7%, respectively. They noted that not only was the prevalence rising in Africa but the awareness was low(Adeloye & Basquill, 2014). Our finding of a high prevalence of hypertension ties in with the projections made in these studies.

Cigarette smoking was the second most prevalent risk factor in our study with a prevalence of 27.08%. This compares with what was found in the Kenya STEPS survey where 21.6% of the respondents were smoking. The highest smoking risk was found in person aged 60 -69 years(Kenya Ministry of Health NCD Division; KNBS; WHO, 2015). It however is higher than what was reported in Tanzania the STEPS

survey that found a prevalence of 14.1%(Mayige & Kagaruki, 2012). Our study also found a high prevalence of hyperlipidemia which compares with what was found in the Tanzania STEPS survey of 2012 that had a prevalence of 26%. However, there is a significant contrast with what the Kenyan STEPS survey that had a prevalence of hyperlipidemia of 10.1%. This difference could be attributed to the fact that the Kenyan study only measured the total cholesterol by a point of care method of assessment. Our study used a calorimetric method of assessment and also looked at all the lipid profile parameters. Secondly, this was the prevalence in a younger age group of 18 to 69 years. Mathenge et al found a prevalence of hyperlipidemia in Nakuru,Kenya in participants aged 50 years and above to be 21.1% which though slightly lower than what our study found is almost comparable(Mathenge, 2010).

Overweight and obesity are increasing in Africa with the change in lifestyles with adoption of more sedentary lifestyles and unhealthy diets. The Kenya STEPS survey found that 27.8% of Kenyans were either obese or overweight. The Tanzania STEPS survey also found a similar prevalence of 26%. These findings are comparable to our study where we found that 25.6% of our study population was either obese or overweight. Mkuu et al studied obesity and overweight in Kenyan women and found that the prevalence of obesity was 9.1% and overweight was 20.5% with a pooled prevalence of 29.6%. They found that those who were in urban areas and from a high socioeconomic status had a higher prevalence than those from the rural areas. With more urbanization in Kenya, the rates of obesity and overweight are likely to increase and they concluded that there is need to develop targeted intervention strategies(Mkuu, 2018).

Globally, CVD affects 32.2% of all persons with T2DM and is one of the drivers of mortality in diabetes mellitus accounting for half of all deaths(Einarson, 2018). The

prevalence of diabetes in our study was high at 15.48%. The national prevalence of diabetes as at 2010 was estimated to be 3.3% though it is has been said that it is likely an underestimation as it is based on regional projections and about 60% of persons with diabetes present to health facilities with non-specific symptoms at the point of diagnosis(Kenya Ministry of Public Health and Sanitation, 2010). The prevalence of diabetes in the Kenya STEPS survey was found to be 3.1% in the general population but this figure rose to 7% in those aged 60 – 69 years. The prevalence in our study was 15.48%.Our study population was older with a median age of 71 but with persons as old as 90years. It was also hospital based and was being conducted among persons admitted and may explain the significantly higher prevalence seen in our study. The national prevalence of diabetes in the USA as at 2018 was 10.5% in the general population and 26.8% in persons aged 65years and older(American Diabetes Association, 2018). The global prevalence of diabetes is 9.3% with a higher prevalence among high-income countries (10.4%) and middle-income countries (9.5%) compared to low-income countries (4.0%) (Saeedi, 2019).

Chronic kidney disease (CKD) is a known cardiovascular risk factor with CVD being a major cause of mortality in end stage renal disease. They are predisposed to premature mortality(Subbiah, 2016). The prevalence of previously diagnosed chronic kidney disease in this study was 5.36%. The prevalence of CKD in the USA is 11% but much higher in the elderly aged 60years and aboveat 39.4%(Mallappallil, 2014). A systematic review of the burden of CKD in Africa found that CKD is a major public health problem mainly attributed to high risk conditions such as diabetes, hypertension and HIV(ElHafeez, 2018). Our prevalence was low because these were persons previously diagnosed to have CKD. We did not assess for kidney failure in this study thus we could have underestimated the actual prevalence.

The prevalence of family history of premature cardiac disease was low in our study at 4.46%. This finding could be due to inadequate diagnosis of premature cardiac disease or sudden cardiac death in our set up making unlikely that the history will be reported by the participants and relatives. Health seeking behavior, inadequate access to proper diagnostics in Sub- Saharan Africa has made diagnosis difficult (Stambler & Ngunga, 2015).

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

There was a high prevalence of cardiovascular diseases and their associated risk factors in elderly population admitted at MTRH; most being asymptomatic.

6.2 Recommendations

We recommend routine screening and management of cardiovascular disease and risk factors in admitted elderly patients. A follow up study to evaluate cardiovascular outcomes in the elderly population is also recommended given the high cardiovascular risk profile witnessed.

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APPENDICES

APPENDIX A: CONSENT FORM (English)

STUDY TITLE: PREVALENCE AND RISK PROFILE OF CARDIOVASCULAR DISEASES AMONG ELDERLY PATIENTS ADMITTED AT MOI TEACHING AND REFERRAL HOSPITAL, ELDORET

Name of Principal Investigator(s): Dr. Naomi A. Gudu

Moi University, Eldoret School of Medicine

This form has been designed to be read and filled by the participants of this study

This Informed Consent Form has two parts:

- Information Sheet – to provide an explanation of the study and its purpose.
- Certificate of Consent – to append your signature if you agree to participate.

Part I: Information Sheet

Introduction:

You are being requested to be included as a participant in this study. The information given below will provide a brief explanation about the study scope and purpose. Questions and clarifications are welcome. In the event you agree to participate in this study, a copy of the signed form will be issued to you.

Participation in this study is voluntary and will not alter the quality of services offered to you. You are free to drop out of the study at any time during the study or after and one is free to request any information given to be destroyed and hence not to be used in the study. In case there is any new pertinent information regarding the study and its effect to you, you shall be notified.

Purpose of the study:

The purpose of the study is to determine the prevalence of certain cardiovascular diseases (heart and blood vessel disease) among the elderly admitted at MTRH.

Type of Research Project/Intervention:

There will be a questionnaire administered to you, then you will be examined at the bed side. Thereafter, tests that check the condition of the heart and blood vessels will be done on you. You will also have tests that check your blood sugar and your cholesterol levels. The results of all these tests will be communicated to you and to the clinician in charge of your care and will be stored in your confidential file that has all your hospital records.

Why have I been identified to Participate in this study?

You have been selected because you are above the age of 60 years.

How long will the study last?

The study will last for 6 months but your input will only be required at this sitting.

What will happen to me during the study?

We are asking you to help us learn more about heart and blood vessel conditions in elderly persons. If you accept, you will be asked certain questions being derived from a pre-determined questionnaire. You will also have certain tests that check the condition of your heart and blood vessels and your blood sugar and cholesterol levels. The results will be communicated to you and to the clinician in charge of your care and kept in your file. Information gathered shall be kept confidential and your identity will not be written on any of the research forms nor revealed to anyone. The only risks involved in participating in this study are the psychological risks of fearing the tests.

We will ask you questions concerning your past medical history, any medication that you are taking currently or have taken in the recent past. We will also ask questions concerning your family.

Benefits to taking part in the study

a) The possible benefits to you from this study are the free testing for diseases of the heart and blood vessels and the free blood sugar and cholesterol tests. Should we come across a new diagnosis in you, we will refer you to proper care.

b) There are no financial benefits or gifts offered on participation.

c) The possible benefits to society may include identification of the magnitude of heart and blood vessel disease in the elderly and knowledge on how to intervene.

Contacts:

In case of any question or clarifications please contact – Dr. Naomi Gudu – 0721291959 – principle investigator

You may contact Institutional Review Ethics Committee (IREC) 053 33471 Ext.3008. IREC is a group of people that review studies for safety and to protect the rights of study participants.

Privacy and confidentiality of information:

All reasonable efforts will be made to keep your protected information (private and confidential. Protected Informationis information that is, or has been, collected or maintained and can be linked back to you. Using or sharing ("disclosure") of such information must follow National privacy guidelines. By signing the consent document for this study, you are giving permission ("authorization") for the uses and disclosures of your personal information. A decision to take part in this research means that you agree to let the research team use and share your Protected Information as described below.

As part of the study, Dr. Naomi Gudu and her study team may share the results of your information provided in the questionnaire. These may be study or non-study related. They may also share portions of your medical record, with the groups named below:

- The National Bioethics. Committee,
- The Institutional Review and Ethics Committee,
- The supervisors of this study.

The study results will be retained in your research record for at least six years after the study is completed. At that time, the research information not already in your medical record will be disposed by incineration. Any research information entered into your medical record will be kept indefinitely.

Unless otherwise indicated, this permission to use or share your Personal Information does not have an expiration date. If you decide to withdraw your permission, we ask that you contact Dr. Naomi Gudu in writing and let her know that you are withdrawing your permission. The mailing address is P. O. BOX 4606, ELDORET.

At that time, we will stop further collection of any information about you. However, the health information collected before this withdrawal may continue to be used for the purposes of reporting and research quality.

Your treatment, payment or enrollment in any health plans or eligibility for benefits will not be affected if you decide not to take part. You will receive a copy of this form after it is signed.

Part II: Consent of Subject:

I have read or have had read to me the description of the research study. The investigator or his/her representative has explained the study to me and has answered all of the questions I have at this time. I have been told of the potential risks, discomforts and side effects as well as the possible benefits (if any) of the study. I freely volunteer to take part in this study.

_____ _____ _____

Participant's parent Signature of parent or Guardian Date & Time

_____ _____ _____

Name of Representative/Witness Relationship to Subject Date and Time

_____ _____ _____

Name of person Obtaining Consent Signature of person Obtaining Consent Date and Time

_____ _____ _____

Printed name of Investigator Signature of Investigator Date and time

Appendix B: Consent Form - (Kiswahili)
FOMU YA IDHINI:

KICHWA: PREVALENCE AND RISK PROFILE OF CARDIOVASCULAR DISEASES AMONG ELDERLY PATIENTS ADMITTED AT MOI TEACHING AND REFERRAL HOSPITAL, ELDORET

MTAFITI MKUU: Dr. Naomi Gudu

Moi university, Eldoret School of Medicine

Fomuhiiimetayarishwakwaniayakusomwanakujazwanawahusikawautafitihuu.

Fomuhiiinasehemumbili:

- Sehemuyamaelezo.
- Sehemuyamakubalianonasahihi.

Sehemu 1: Maelezo:

Unaombwakutoaruhusakuhusikakatikautafitihuu.Maelezoyafuatayoyatawezakufafanuaminaajiliyautafitihuu.Unaruhusiwakuulizaswali au maelezozaidikwaufafanuzizaidi. Iwapoutakubalikuhusishwakatikautafitihuuutakabidhiwananakalayafomuhii.

Kuhusishwakwakokatikautafitihuunikwahiari.

Unawezakusitishakuhusishwakatikautafitihuukwawakatiwowote.

Hudumayaafyaunayopatahaitabadilishwakwavyovyote vile.

Ikiwakutakuwanaugunduziwowoteunaowezakukufaidi au kukudhurukatikautafitihuu, basitutawasilianawekukufahamisha.

Madhumuniyautafitihuu:

Utafitihuuunafanywakwaminaajiliyakutambuawazeezaidiyamiakasitiniwanaouguana magonjwayamoyonayamishipayadamu.

Ainayautafiti:

Katikautafitihuu, utaulizwamaswalinamajibuyakokuandikwakatikafomuyamaswalikishautafanyiwavipimovyaafyayamoyonayamishipayadamu. Piautapimiwakiwango cha sukarinamafutakwadamu. Utaelezwamatokeoyahivivipimo. Yule daktariambayeanakushugulikiakiafyapiaataelezwa.

Matokeohayayatawekwakwenyerekodizakozahospitali.

Sababuyakuchaguliwakwako:

Umechaguliwakwasababuunaumriwamiakasitininazaidi.

Mdawautafitihuu

Utafitihuuutaendeshwakwamudawamiezisita. Utahitajikakwenyeutafitihuukwaleotu.

Katikamdawautafiti

Katikamudahuu,
utaulizwaamaswalinakufanyiwavipimovyamoyonamishipayadamunayakiwango cha sukarinamafutakwadamu.
Habarizotezitakazopatikanakatikautafitihuuhazitafichuajina au chochotekinachowezakufanyautambulikekwanjiayoyote.
Hakutakuwanafaidayamojakwamojayakushirikikatikautafitihuubalinamatokeoyavipimovyamoyonamishipayadamu.
Kushirikikatikautafitihuunikwahiarinaunauhuruwakusitishaushirikikwautafitihuukwa wakatiwowotenakuondoka.
Hatariyakuhusikakwautafitihuuniuogawakufanyiwavipimovyamoyonamishipayadam.
Maswalitutakayokuulizayatahusikanaafyayako,
madawaambayounatumiakwasasaamaulitumiahapoawali.
Tutakuulizamaswalikuhusukulazwahospitalininamswadawakulazwa.
Wekasahihi au alamayoyoteyakuonyeshakwambaumekubalikuhusikakatikautafitihuu.

Manufaayakuhusishwakatikautafitihuu:

a) Vipimovyaburevyamoyonamishipayadamunavyakiwango cha sukarinamafutakwadamu.
   Kukipatikanaugonjwawowoteutaonyeshwakilinikiyakufuatiliwailiupatematibabu.
b) Hakunamalipoyoyote.
c) Jamiiyetukwajumlaitafaidikakutokananahabariitakayopatikanakatikautafitihu.

Mawasiliano:

Ikiwaungependakuwasilianamtafitimkuu au IREC,
wasilianaokupitiasimenambarizaozikiwa:
Dr. Naomi Gudu – 0721291959 – mtafitimkuu
Unawezakuwasilianashirika la Institutional Review Ethics Committee (IREC) 053 33471
Ext.3008ambalolinateteanakuhakikishahakizamhusikayeyotekatikautafitihuuhazijadhulumiwa.

Usiriwahabarizinazopokelewa:

Habarizozoteutakazotoakatikautafitihuuzitawekwakwausirimkubwa.

Habarizotezutakazopatikanakatikautafitihuuhazitafichuajina au chochotekinachowezakufanyawewekutambulikakwanjiayoyote.

Habarihiyoitawezatukutolewakwawasimamizi, shirika la IREC nashirika la National Bioethics Committee.

KutolewakwahabarihiyoitafuatasheriailiyowekwanaNational privacy guidelines.

Kuwekasahihikatikafomuhiiinatukabidhiruhusakutumiahabariunazotupatiakwajinsitul uoielezahapa.

Ugunduziwautafitihuu, utawekwakwamudawamiakasita. Baadayamudahuu, habarihiyoitawezwakuchomwakwausiri.

Habariiliyokatikamaktabayahospitaliinayohusumatibabunaugonjwawamtotozitaendele akuwekwakatikamaktabahiyo, kwamudausiojulikana.

Ikiwautaamuakujitoakatikautafitihuu, tafadhaliwasilianamtafitimkuu Dr. Naomi Gudukwasanduku la posta 4606 eldoret.

Tutasitishakuchukuahabarizaidikwako.Habariutakayokuwaumetupatiaitatumikakweny eutafitihuu.

Hudumayamatibabukwakohaitasitishwaamakubadilishwahatausipohusikakatikautafiti huu.

Sehemu 2: Makubaliano:

Mimi nimewezakusomanakuelewasehemuyamaelezoyautafitihuu.mtafitimkuu au msaidizi wake amenielezakinagaubaganakujibumaswaliyanguyote.

Nimeelezewamanufaanahatarizitakkazokuwakatikautafitihuu.

Nimejitoleakwahiarikuhusishwakatikautafitihuu.

_____	_____	_____
Jinayamzazi au msimamizi wake	Uhusianonamtoto	Sahihi. Tarehenasaa
_____	_____	_____
Jina la anayechukuaidhini	Sahihiyake TarehenaSaa	
_____	_____	_____
Mtafitimkuu	Sahihiyake TarehenaSaa	

Appendix C: Initial Encounter Questionnaire

Questionnaire No_____

Date of Interview_____

1.0 Demographic Information

Case ID:

_____

Date of Birth: _____ Age:

_____ ☐ ☐

Gender: Male Female *(Tick as applies)*

Residence

_____

Occupation:

_____

2.0 Clinical Data

Weight

_____

Height

_____

Body Mass Index

_____

Blood Pressure at 0, 1, 2 min

_____

Pulse rate

_____

Heart rate

_____

Jugular Venous Pressure

_____

Bilateral ankle edema

_____

3.0 Symptomatology for Cardiovascular Disease (Indicate Yes or no against the symptom and duration of symptom in months)

Intermittent claudication _____ Duration _____

Typical angina chest pain _____ Duration _____

Paroxysmal Nocturnal Dyspnoea _____Duration _____

Nocturnal cough _____ Duration _____

Dyspnoea on exertion _____ Duration _____

Unilateral weakness _____ Duration _____

4.0 Past Medical Data

History of stroke/TIA (Year Diagnosed) _____

History of heart failure (Year Diagnosed) _____

History of vascular disease (Year Diagnosed)_____

History of Hypertension (Year Diagnosed) _____

History of diabetes (Year Diagnosed) _____

Medication History

Drug	Duration on Drug	Adherence *(Percentage)*
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Percentage adherence = Doses taken for one week / Prescribed doses per week (Self reported)

5.0 Social Data

Alcohol Use Yes ☐ No ☐

Cigarette smoking Yes ☐ No ☐

If Yes, how many years?

_____

Family history of sudden cardiac death Yes ☐ No ☐

If yes, give details

_____

_____

_____

_____

5.0 ECG Findings

_____

_____

_____

_____

_____

_____

6.0 Echocardiography Findings

_____

_____

_____

_____

_____

_____

_____

7.0 Laboratory Findings

RBS_____

Lipid profiles

Appendix D: Budget of the Study

ITEM	**UNIT COST (KSH)**	**QUANTITY**	**TOTAL COST (KSH)**
2D Echo	1000	336	336,000
ECG	700	336	235,200
Random blood sugar	100	336	33,600
Lipid profile	1000	336	336,000
Research assistants	20,000 per month	6	120,000
Stationery	-	-	20,000
Data Management &Analysis	-	-	40,000
TOTAL			**1,120,800**

Appendix E: Timeframe of the Study

RESEARCH ACTIVITY	**START**	**COMPLETE**
Departmental approval	June 2017	June 2017
Proposal writing	July 2017	August 2017
IREC approval	August 2017	November 2017
Preparation for data collection	January 2018	April 2018
Data collection	May 2018	October 2018
Data entry and Interim analysis	November 2018	December 2018
Complete Data analysis	January 2019	March 2019
Thesis writing	May 2019	June 2019
Departmental Thesis defense	October 2019	
School Thesis Defense	December 2020	

Appendix F: IREC Approval

INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471/2/3

MOI UNIVERSITY
COLLEGE OF HEALTH SCIENCES
P.O. BOX 4606
ELDORET

Reference: IREC/2017/177
Approval Number: 0002092

29th March, 2018

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
29 MAR 2018
APPROVED
P. O. Box 4606 - 30100 ELDORET

Dr. Naomi Gudu,
Moi University,
School of Medicine,
P.O Box 460630100,
ELDORET-KENYA.

Dear Dr. Gudu,

RE: FORMAL APPROVAL

The Institutional Research and Ethics Committee has reviewed your research proposal titled:-

"Burden of Cardiovascular Disease among All Cause Admitted Elderly Patients at Moi Teaching and Referral Hospital, Eldoret".

Your proposal has been granted a Formal Approval Number: ***FAN: IREC 2092*** on 29th March, 2018. You are therefore permitted to begin your investigations.

Note that this approval is for 1 year; it will thus expire on 28th March, 2019. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date.

You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.

Sincerely,

DR. S. NYABERA
DEPUTY-CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc CEO - MTRH Dean - SOP Dean - SOM
Principal - CHS Dean - SON Dean - SOD

Appendix H:Hospital Approval (MTRH)

An ISO 9001:2015 Certified Hospital

MOI TEACHING AND REFERRAL HOSPITAL

Telephone: (+254)053-2033471/2/3/4
Mobile: 722-201277/0722-209795/0734-600461/0734-683361
Fax: 053-2061749
Email: ceo@mtrh.go.ke/directorsofficemtrh@gmail.com

Nandi Road
P.O. Box 3 – 30100
ELDORET, KENYA

Ref: ELD/MTRH/R&P/10/2/V.2/2010

5th April, 2018

Dr. Naomi Gudu,
Moi University,
School of Medicine,
P.O. Box 4606-30100,
ELDORET-KENYA.

APPROVAL TO CONDUCT RESEARCH AT MTRH

Upon obtaining approval from the Institutional Research and Ethics Committee (IREC) to conduct your research proposal titled:-

"Burden of Cardiovascular Disease among All Cause Admitted Elderly Patients at Moi Teaching and Referral Hospital, Eldoret".

You are hereby permitted to commence your investigation at Moi Teaching and Referral Hospital.

DR. WILSON K. ARUASA, *MBS*
CHIEF EXECUTIVE OFFICER
MOI TEACHING AND REFERRAL HOSPITAL

cc - DCEO, (CS)
- Director of Nursing Services (DNS)
- HOD, HRISM

All correspondence should be addressed to the Chief Executive Officer
Visit our Website: www.mtrh.go.ke
A WORLD CLASS TEACHING AND REFERRAL HOSPITAL