FACTORS THAT AFFECT ADHERENCE TO MEDICINES AMONG PATIENTS WITH CHRONIC HEART FAILURE AT KENYATTA NATIONAL HOSPITAL

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U56/67570/2013

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October 31, 2015

DECLARATION

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DEDICATION

This work is dedicated to my late dad, Kimani Muthungu, a true servant of God.

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Firstly I thank the Father of Light and Wisdom for giving me a mind that can know and a heart that can love, and for encouraging me throughout my entire journey in pursuit of the truth.

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Lastly I thank my sons Anthony Hakim and Peter, for their unconditional love and for giving my life a meaning and a purpose.

ABBREVIATIONS AND ACRONYMS

ACC- American College of cardiologists

ACE- Angiotensin converting enzyme

ACS- Acute coronary syndrome

ADH- Antidiuretic hormone

AHA- American heart association

ARB- Angiotensin receptor blocker

BASH- Beverage and societal health

CKD- Chronic kidney disease

CVD- Cardiovascular disease

CAD- Coronary artery disease

CF- Cardiac failure

CHARM Trial- Candesartan in **H**eart Failure-**A**ssessment of Reduction in Mo**r**tality and **M**orbidity

CHF- Chronic heart failure

CIBIS- Cardiac insufficiency Bisoprolol study

CONSENSUS- Co-operative North Scandinavian enalapril survival study

CRS- Cardio-renal syndrome

CRAS- Cardial renal anemia syndrome

DCM- Dilated cardiomyopathy

EPHESUS-Eplerenone post-acute myocardial infarction heart failure efficacy and survival study

EPO- Erythropoietin

ESP- Erythropoietin stimulating proteins

ESRD- End stage renal disease.

ESTEEMTrial – **E**fficacy and **S**afety of the Oral Direct **T**hrombin Inhibitor **X**imelagatra

EUROPA- Eu**r**opean trial **on** reduction of cardiac events with **P**erindopril in stable coronary **A**rtery disease investigations

GFR – Glomerular filtration rate

HBI-Home Based interventions

HF- Heart failure

HF-PEF - Heart failure with preserved ejection fraction

HF-REF- Heart failure with reduced ejection fraction

HR- Heart Rate

KNH- Kenyatta National Hospital

LBBB- Left bundle branch block

LVD- Left ventricular dysfunction

LVEF-Left ventricular ejection fraction

LVH- Left ventricular hypertrophy

LVSD- Left ventricular systolic dysfunction

MI- Myocardial infarction

NSAIDs-Non-steroidal anti-inflammatory drugs

NYHA- New York Heart Association

PAD- Peripheral arterial disease

RAAS-Renin Angiotensin Aldosterone System

RALES-Randomized Aldactone Evaluation Study

SBP- Systolic blood pressure

SLE- Systemic lupus erythromatous

STS-Structured telephone support

TM- Telemedicine

DEFINITION OF TERMS

Adherence: The extent to which the patient's behavior, in medication taking, following a diet, and even executing life style changes, corresponds to the recommendation of a healthcare provider

Cardiorenal syndrome: A state of advanced cardiorenal deregulation manifested by one or more of three specific features including heart failure with concomitant and significant renal disease, or worsening renal function.

Chronic Heart Failure: Also called congestive heart failure, heart failure and cardiac failure, is a disorder in which the heart loses its ability to pump blood efficiently throughout the body.

Chronic Kidney Disease (CKD):- Kidney damage existing for ≥3 months defined by structural or functional abnormality of the kidney, with or without a decrease in GFR, detectable by either pathological abnormalities or markers of kidney damage including abnormalities in the composition of blood or urine or abnormalities in an imaging test. The GFR is less than 60ml/min/1.73m².

Compliance: The extent to which the patient follows the healthcare provider's instructions

Therapeutic relationship: a partnership or alliance between the practitioner and patient formed for the purpose of optimizing the patient's medication experience. It is the negotiated agreement between the patient and the healthcare giver with regard to expected adherence to the prescribed regimen of medication and expected outcomes

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ABSTRACT

Background: Heart failure is a major health problem with a prevalence of between 1 and 12% in USA and Europe, and approximately 5.7% in Sub-Saharan Africa. It has emerged as a dominant cardiovascular disease in Africa and has socio-economic relevance owing to its high prevalence, mortality and impact on young economically active individuals. In 1999 chronic heart failure constituted 3.3% of all medical admissions at KNH with rheumatic heart disease reported as the most common cause

Objective: The purpose of the current study was to determine factors that affect adherence to treatment among patients with CHF at KNH

Methodology: This was a cross-sectional study involving patients with CHF aged 18 years and above at KNH. A total of 83 study participants were recruited into the study using a convenient sampling technique. Data with regard to the study were collected by means of an interviewer administered questionnaire to eligible and consenting study participants.

Results: Of the 83 study participants, 51(61.4%) were female showing a slightly higher prevalence of CHF among women than in men**.** The age of the patients ranged from 18 to 80 years with the majority (n= 37, 44.6%), between 21-40 years. Majority (n=58, 68.9%) of the patients considered follow-up, acquiescence to medication (n= 64, 77.1%), dietary restriction (n=59, 72%), regular exercise (n=49 59.0%), smoking cessation (n=59, 71%), and alcohol cessation (n=58, 69.9%) as very important. Fifty three (63.9%) respondents had complied taking their medicines at any time. Diuretics were the most commonly prescribed medicines in treatment of CHF. Majority (n=72, 86.8%) of the study participants were aware of the disease condition they were suffering from. Valvular heart disease was the most common reported comorbidity among patients with CHF and 17 (27.9%) of the 61 patients had VHD, 9(14.8%) had hypertension, 5(8.2%) had anemia, while 4(6.4%) had diabetes mellitus. A relationship was found between sex and some adverse drug reactions using Pearson chi square test through bivariate analysis. Sleep disturbances and nausea occurred more in males than females while headache and drowsiness were more prevalent in females. In all cases the relationships were statistically significant ($p< 0.05$)

Conclusions: Adherence to medicines among patients with CHF is reasonably high at KNH despite the different levels of education. The pharmacologic therapy of CHF was tilted towards use of diuretics and cardiac glycosides. Patients' knowledge level about CHF was generally low and most patients do not understand fully the implications of lifestyle changes requisite in management of CHF. Valvular heart disease was the most common comorbidity. Hyponatremia was the most prevalent electrolyte disturbance and tachycardia, vomiting and rash were the most common adverse drug effects.

CHAPTER ONE: INTRODUCTION

1.1 Background

Chronic heart failure (CHF) is a condition in which the heart is unable to provide adequate blood for the metabolic needs of the body [1].The exact prevalence of CHF is currently not known and is estimated to be between 1% and 12% in USA and Europe. Mann et al estimated a prevalence of 2% and rising while in an earlier study, Mosterd et al estimated the overall prevalence was 3.9% [2, 3]. Tantchou et al in a study to determine occurrence, etiology and challenges in the management of CHF reported an occurrence of 5.7% [4].

Among all admissions at KNH, CHF constituted 3.3% of case and rheumatic heart disease was the commonest cause while inadequate therapy, arrhythmias and respiratory infections are the three major causes of decompensation in patients with cardiac disease [5]. Recent studies indicate that although HF is still predominantly non-ischemic, coronary heart disease has assumed greater prominence in the last 15 years[6].The disease is the leading cause of hospitalization in patients over 65 years and represents a significant clinical and economic burden [7].

There is need for the healthcare professional to be equipped with the knowledge and tools to assure comprehensive care not only addressing the heart failure, but the individual as a whole especially the older patients [7]. The patients also need to be informed of the complexity of the management regimens and the importance of adherence to the management plans.

Heart failure is a clinical condition characterized by shortness of breath and fatigue at rest or with exertion in the presence of underlying structural and/or functional heart disease. This results in diminished ability to increase cardiac output or cardiac work in response to an increase in pre-load [8]. Although the hemodynamic abnormalities may explain the symptoms of HF, they do not adequately explain the disease progression [9]. It has been reported that activation of the sympathetic and the RAAS systems exerts a direct deleterious effect on the heart that is independent of their hemodynamic effects, and interventions targeting these neurohumoral systems favorably alter the natural history of the disease [9].

Other researchers have similarly reported that the interplay between diverse organ systems contributing to HF is mediated by the activation of various counteracting neurohormonal

pathways geared to re-establishing hemodynamic homeostasis. These include the sympathetic nervous system, and the renin angiotensin-aldosterone system (RAAS) and mediate the evolution of HF and have become a way to monitor HF. These multiple neurohumoral factors serve as important HF biomarkers, and have been targeted for more effective and curative HF treatments [10].

Dilated cardiomyopathy (DCM), a common cause of HF is familial in 30-50% of cases. Gene mutations encoding sarcomeric proteins, including Troponin T and B-myosin heavy chain, as well as calcium handling proteins such as phospholamban have been cited in this condition. Elucidation of the molecular mechanisms responsible for these disorders will enhance development of more personalized treatment regimens [10]

1.2 Statement of the problem

Patients fail to adhere to medicines due to several reasons including, adverse effects of drugs, forgetfulness**,** and inadequate communication between the healthcare provider and the patient, emotional factors, occupation, cost of the medications and poor accessibility to prescribed medicines. These barriers to adherence could be the result of complex regimens, failure of the healthcare provider to adequately explain the benefits and adverse effects of the medicines, as well as failure to take into consideration the patient's occupation or the cost of the drugs, and a poor therapeutic relationship between healthcare provider and the patient. Non-adherence to a therapeutic regimen may result in negative outcomes and may be compounded in patients with multiple comorbidities which require multiple drug therapy especially in the elderly [11].

Non-adherence to medications, diet and fluid restriction in management of CHF decreases the efficacy of prescribed treatment and exposes the patient to clinical destabilization, which can lead to increased HF symptoms [12]. The intricate relationship between patient, healthcare provider and the health system is illustrated in Figure 1, below by Osterberg et al 2005 [13].Thus non-adherence may result in: poor clinical outcomes, poor health related quality of life and additional economic burden to the healthcare system. Poorly controlled disease may require additional pharmacotherapy and /or hospitalization.

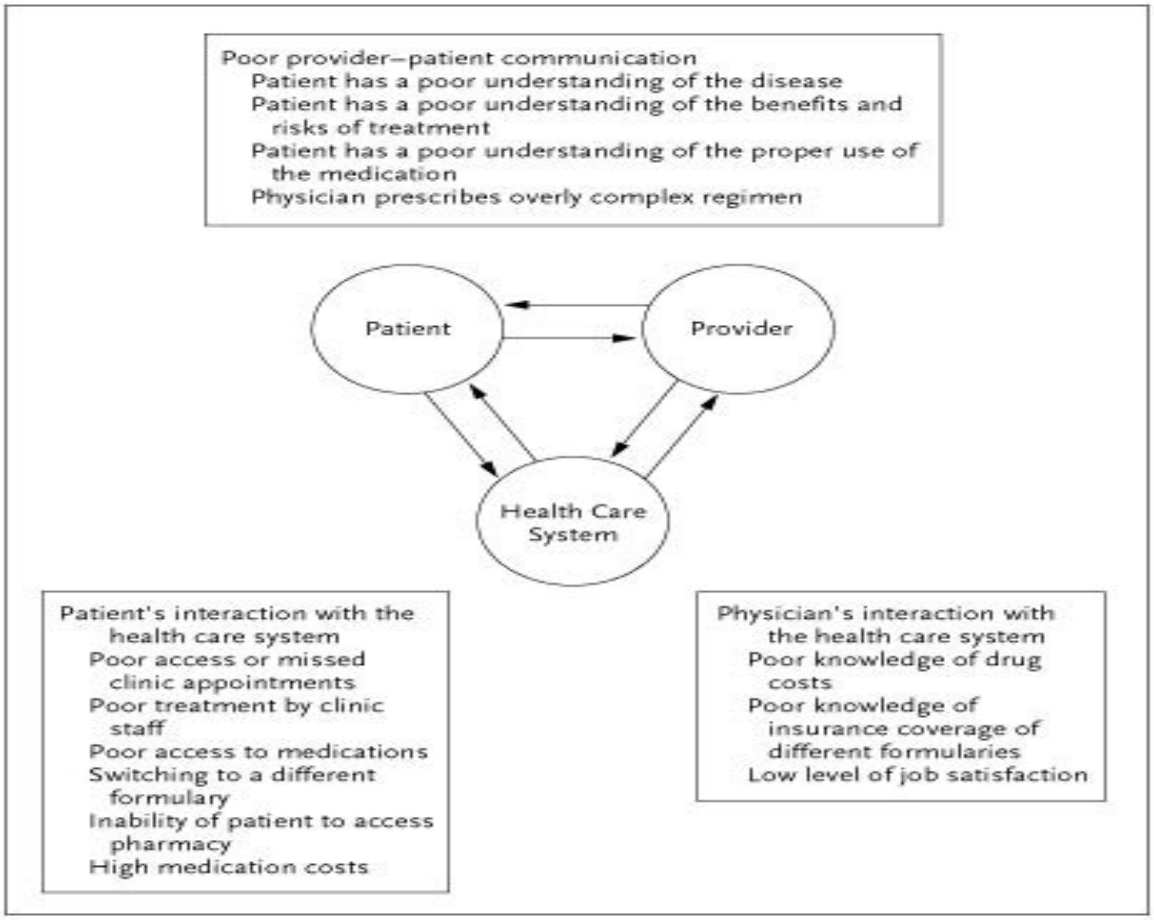


Figure 1: Barriers to adherence: Osterberg et al [13]

Whereas data is available for adherence to treatment of patients with CHF for the developed world, there is paucity of data from local studies conducted in the developing countries

1.3 Justification

The current study will shed light on the level of adherence to treatment regimens used in management of CHF, and reasons for non-adherence which is important because it can lead to increased morbidity, mortality and healthcare costs. It is hoped that the current study will provide data requisite for informed policy decisions and development of treatment guidelines that can help to mitigate morbidity and mortality in CHF patients as well as ameliorate the economic burden occasioned by non-adherence to treatment regimens.

1.4 Objectives

1.4.1 Main Objective

To determine the factors that affect adherence to medication among patients with CHF at KNH

1.4.2 Specific objectives

1. To determine the proportion of patients with CHF who adhere to drugs.
2. To identify the types of drugs used by patients with CHF.
3. To assess the level of patients knowledge about CHF.
4. To identify the comorbidities associated with CHF.
5. To investigate the prevalence and types of adverse drug reaction in patients with CHF.

1.5 Research questions

1. What proportion of patients with CHF adheres to medicines?
2. Which drugs are used by patients with CHF?
3. What is the level of patients' knowledge about CHF?
4. What are the comorbidities associated with CHF?
5. What is the prevalence and types of adverse drug reactions among patients with CHF?

1.6 Significance of the study

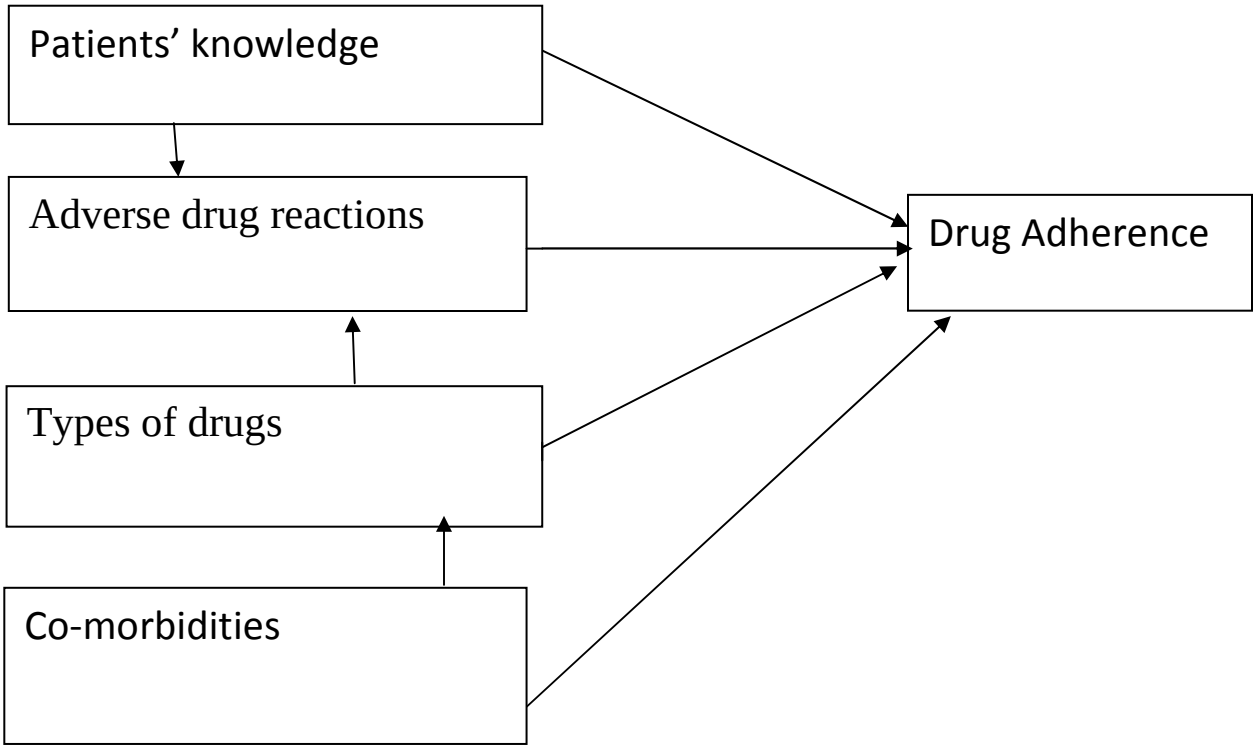
The study will help to identify factors that affect adherence to medications used in the treatment of CHF. This will inform the policy decision making process in the health care system with resultant reduction in morbidity and mortality as well as reduced hospitalization. This is expected ameliorate the economic burden occasioned by CHF. The health care providers and patients with CHF will benefit when the barriers to adherence are identified.

1.7 Limitations

The questionnaires may introduce a prevalence-incidence bias (Neyman bias), and it is difficult to make a causal inference from data gathered from a cross-sectional study [14]. Patients may not willingly volunteer accurate information with respect to their drug taking history, tending rather to proffer information based on what they think the investigator would like to hear.

KNH being a referral hospital has facilities not available in other smaller hospitals in the counties, including availability of medicines, and CHF cases seen at KNH are expected to be severe.

1.8 Conceptual/ Theoretical framework



Predictor variables **Dependent variable**

Figure 2: Conceptual framework

- **Patient's knowledge and drug adherence**

Patients' knowledge of the disease condition and the importance of taking medication as instructed will determine their level of adherence to treatment regimens

- **Patient knowledge and adverse drug reactions**

Patients' knowledge of the disease condition and adverse drug reactions do not have a cause-effect relationship. The frequency and severity of adverse drug reactions directly affect the patients' adherence to treatment regimens and different types of drugs have different adverse reactions. Some drugs have narrow therapeutic windows, while some of the adverse drug effects

such as furosemide are extensions of their therapeutic effects. Comorbidities increase the number and types of drug prescribed further increasing the complexity of already complex pharmacotherapy plans. The additional drugs to treatment increase the complexity of the treatment regimen and adversely affect adherence.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter comprises of various findings on the factors that affect adherence to drugs. Among the issues reviewed include: proportion of patients with CHF who adhere to treatment, types of medicines used in the treatment of CHF, level of patients' knowledge about CHF, comorbidities associated with CHF and the prevalence of adverse drug reactions.

2.2 Proportion of patients who adhere to treatment

Adherence is the extent to which the patients medication taking behavior corresponds with an agreed upon medication regimen [15].This requires both behavior execution and persistence in medication taking. There are four components of medication adherence which are: taking adherence, dosing adherence, timing adherence, and avoiding drug holidays

The prevalence of medication adherence has been estimated to be approximately 50% [15]. Studies have shown that non adherence increases the healthcare costs [16]. For example, it has been shown to increase treatment visits among patients with CHF [17].Methods of dispensing have been shown to have an impact on adherence to medication [18]. Numeracy level was associated with emergency department and hospital recidivism in patients with acute heart failure, with lower numeracy associated with increased recidivism, but further investigations are required to determine whether addressing numeracy may reduce recidivism for patients in acute heart failure [20].

2.3 Management of CHF

The prime objective of treatment of heart failure is to maintain or improve quality of life and survival [20].

2.3.1 Non-pharmacologic management

Patients should be advised to weigh themselves on a regular basis at a specified time during the day to monitor weight gain. Sudden unexpected weight gain of approximately 2kg in 3 days, should be reported to the healthcare provider or the diuretic dose adjusted accordingly [20].Controlling the amount of dietary salt is crucial in heart failure especially in advanced heart failure. Patients with advanced heart failure should be instructed on fluid restriction with or without hyponatremia. A fluid restriction of 1-2L/day is advised in advanced heart failure [20].

Clinical or subclinical malnutrition has been reported in 50% of patients with severe CHF and cardiac cachexia is an important predictor of reduced survival [21]. Smoking should be discouraged and use of smoking cessation aids actively encouraged. High altitude or very hot or humid places should be discouraged. Short air flights are preferable to other means of transport [20]. There is need for more investigation regarding the effects of CHF treatment on sexual activity and couples should be counseled .Self-management with diuretics based on symptoms indicative of fluid retention, should be encouraged.

2.3.2 Pharmacological therapy

ACE-inhibitors are indicated as first line therapy in patients with reduced left ventricular systolic dysfunction. They are also indicated in asymptomatic patients with left ventricular systolic dysfunction to reduce the risk of myocardial infarction and sudden death [20].ACE-inhibitors should be given together with a diuretic in patients with fluid retention. ACE inhibitors reduce both preload by preventing conversion of angiotensin I to angiotensin II, blocking the effects of angiotensin II, and afterload by preventing the formation of aldosterone through reduction of the effects of angiotensin II, and morbidity and mortality by about one third in all patients .

ACE-inhibitors are the only drugs that reduce peripheral resistance (afterload) without causing a reflex activation of the sympathetic nervous system [22]. A study which compared enalapril with placebo in patients with NHYA class IV HF reported that, 25% of the patients in the enalapril group had died after 6 months as compared to 44% in control group [22].Regular monitoring of the renal function is recommended: before, 1-2 weeks after each dose adjustment, and at 3-6 months intervals. In patients with renal insufficiency and/or electrolyte disturbances more frequent assessments should be made and during any hospitalization [20].

Diuretic therapy is essential for the symptomatic management of CHF but has no impact on survival [7]. Diuretics are essential when fluid overload is manifest in pulmonary congestion and peripheral edema. The use of diuretics provides rapid relief of symptoms [24]. For most patients the choice will be loop diuretics [22].

There is overwhelming evidence for the benefit of beta-blockers in the management of CHF [22]. The CIBIS-2 and MERIT-HF trials confirmed the results of earlier underpowered studies which had reported 31% reduction in mortality in moderate to severe (NYHA Class III/IV) heart

failure [25, 26].The reduction in mortality is additive to ACE-inhibition and the survival benefit is largely through decrease in sudden deaths [22]. Patients must be beta-blockaded gradually, starting with low doses (Bisoprolol 1.25 mg/day or carvedilol 3.125 mg b.i.d) coupled with optimization of the dose of other drugs, to prevent decompensation of heart failure [22].

The use of spironolactone has received considerable support from the RALES trial which implies that ACE-inhibitors even at high doses do not effectively suppress hyperaldosteronism in HF [27]. Benefits of spironolactone occur at relatively low doses implying improved potassium and magnesium conservation and reversal of aldosterone induced fibrosis in the myocardium [22].

ARBs can be used as alternatives to ACE inhibitors in symptomatic patients intolerant to ACE-inhibitors to improve mortality and morbidity [28-31]. ARBs can be considered in combination with ACE-inhibitors in patients who remain symptomatic to reduce mortality and hospitalization for HF [28, 32-34].

Cardiac glycosides are indicated in atrial fibrillation (AF) and any degree of symptomatic heart failure [35]. Digoxin has no effect on mortality but reduces hospitalization. It is instructive to note that cardiac glycosides are contraindicated in bradycardia, 2^{nd} and 3^{rd}AV block, sick sinus syndrome, carotid sinus syndrome, Wolff-Parkinson-White syndrome, hypertrophic obstructive cardiomyopathy, hypokalemia and hyperkalemia [20].

In patients intolerant to ACE-inhibitors and ARBs the combination of hydralazine and nitrate can be used. Hydralazine relaxes atrial smooth muscle and reduces peripheral vascular resistance (afterload). Reflex tachycardia limits its usefulness and lupus erythematosus is a risk at doses exceeding 100 mg per day [22].Nitrates dilate the smooth muscle in venous capacitance vessels, increase the volume of the venous vascular bed, reduce ventricular filling pressure, thus decreasing heart wall stretch, and reduce myocardial oxygen demand [22]. Nitrate may be used in treatment of concomitant angina or relief of dyspnea [20]. Nitrates provide benefits in acute ventricular failure sublingually or by intravenous infusion but there is no evidence to support use of oral nitrates in chronic heart failure [20, 22].

2.4 Patients' knowledge about CHF

Patients' education has been shown to be a key component in comprehensive HF management. A study to assess knowledge levels and adherence to self-care and to determine associated factors,

reported a gap between patients receiving and absorbing or retaining information or self-care for CHF supplied by healthcare providers [36].Multivariate analysis indicates that health literacy is independently related to disease knowledge. There is therefore need to improve patients' knowledge of their chronic diseases [37].

Among a cohort of high-risk patients with CHF, home based interventions (HBI) was associated with reduced frequency of unplanned readmissions plus out-of-hospital deaths within 6 months from discharge [38].According to Stewart et al , elderly patients would benefit more from interventions targeting those factors associated with increased hospital use, including compliance and adverse effects of treatment regimen, inadequate follow-up, suboptimal pharmacotherapy and early clinical worsening of disease condition.

Structured telephone support (STS) and telemonitoring (TM) improve outcomes in CHF, although only TM appears to have a substantial impact on reducing mortality [39]. These two should be properly integrated into care pathways and all patients with CHF should have access to enhanced surveillance.

Clarke et al reported that TM in conjunction with nurse home visiting and a specialist unit support can be effective in the clinical management of patients and help to improve their quality of life [40]. Achelrod disagrees with this view and observes that imposing the use of TM on patients and physicians is not likely to be fruitful, and that a successful adaptation requires an analysis of needs and continuous education on both sides [41]. The evidence base for the value of telemed in managing chronic disease is on the whole weak and contradictory.

Self –management programs targeted for patients living with HF decrease overall hospital readmission for HF [41].According to Wootton et al the evidence regarding the value of telemed in managing chronic diseases is on the whole weak and contradictory suggesting the need for more powered research in this area[42]. However current data indicates that self-management programs for patients with heart failure decrease overall hospital readmission [43].

2.5 Comorbidities associated with CHF

Chronic heart failure is associated with various co-morbidities which must be concurrently managed in order to effectively manage heart failure. Women aged 65 to 70 who received

adjuvant anthracycline for the treatment of breast cancer had significantly higher rates of CHF. The difference in rates continued to increase through 10 years follow-up [44].

Ezekowitzet et al observed that in a cohort of community-dwelling patients with CHF, anemia is common and an independent prognostic factor for mortality [45]. Heart failure may cause anemia of chronic disease through cytokine mediated inflammation. The patients with or without anemia had similar survival rate but those with cardio-renal anemia syndrome (CRAS) the outcome was worse compared with patients without anemia and with preserved kidney function [46]. Advanced age, diabetes mellitus, history of MI, low SBP, and complete Left Bundle Branch Block (LBBB) were predictors of mortality in patients with CRAS [46].

Renal failure, Cardiac failure and anemia all interact to cause or worsen each other [47]. Adequate treatment of all three conditions will slow down the progression of both CHF and CKD. Treatment of anemia with Erythropoiesis Stimulating Proteins exerts beneficial effects against CHF and is not associated with higher mortality rate or adverse effects [48]. Renal tubular damage is related to the severity of CHF and may lead to poor outcomes [49]. Renal function is important in the management of CHF because several important medicines including ACE-inhibitors, ARBs, spironolactone and digoxin, may be associated with increased risk of adverse effects in patients with renal insufficiency.

Ho et al observed that the presence of comorbidities is common and results in increased hospital stay in patient with CHF [50]. The comorbidities reported include; atrial fibrillation or flutter, ischemic heart disease, and diabetes mellitus and were found in 27-75% of the patients. They also observed that provision of multidisciplinary care utilizing individualized evidence based recommendations for older patients with CHF and multiple comorbid conditions resulted in higher clinician compliance with clinical guideline recommendations and that inclusion of patient's preference and circumstances in formulating goals for healthcare is of increasing importance particularly for those with multiple conditions.

In a study to assess the impact of peripheral arterial disease (PAD), Keswani and White [51] concluded that patients with HF who are smokers, and those who have had Coronary artery disease and/or diabetes should be screened. Albackr et al reported that Acute Coronary Syndrome (ACS) patients with CHF were older, more likely to have cardiac risk factors, and less likely to be treated adequately on admission [52]. Co-morbidities influence the rate of

prescription of heart failure medication. Beta blockers were prescribed only to 19.1% of patients with a history of asthma or pulmonary disease as compared to 43.2% to patients without pulmonary disease [53].In CHF patients with comorbidities known to contribute to heart failure, such as hyperthyroidism, anemia, atrial fibrillation and valvular heart disease, it is imperative to ensure that these underlying contributing factors are well controlled [54].

2.6 Prevalence of adverse drug reactions in patients with CHF

Dry cough is reported in at least 10% of the patients using ACE-inhibitors. They can also compromise the renal function, although in patients in whom there is reduction in renal perfusion due to worsening heart failure or hypovolemia, renal dysfunction can also occur [54]. ACE-inhibitors should be stopped if serum creatinine increases by 100% from the baseline level, and are contraindicated in bilateral renal artery stenosis and in severe aortic stenosis. Use of ARBs may contribute to the risk of cancer, which supports the use of ACE-inhibitors as first line agents in treatment of CHF [55]

ACE inhibitors are contraindicated in all trimesters of pregnancy due to their teratogenic effects. ACE inhibitors taken during pregnancy have been reported to cause congenital malformations, stillbirths, and neonatal deaths and it has been reported that approximately 50% of newborns exposed to ACE inhibitors are adversely affected [56]. Combination of ACE inhibitors and ARBs in patients with symptomatic LVD may lead to marked increases in adverse effects [57, 63].

Digoxin has a low therapeutic index and causes bradycardia which may lead to potentially fatal cardiac arrhythmias. Other side effects include nausea vomiting, confusion and visual disturbances [53]. Digoxin toxicity is more pronounced in the presence of metabolic or electrolyte imbalance and in patients with cardiac ischemia. Use of hydralazine is associated with the risk of causing drug-induced SLE, an uncommon multisystem connective tissue disorder that is more likely to occur in patients who are slow acetylators of hydralazine.

Major side effects noted with loop diuretic include hypokalemia, hypomagnesaemia, and hyponatremia. Bumetanide and torasemide also cause; hyperuricemia, glucose intolerance and acid base disturbance. Thiazides cause hyperuricemia, glucose intolerance and acid-base disturbance [22, 56].

Beta blockers are associated with fatigue, coldness of the extremities, and sleep disturbances. They affect carbohydrate metabolism causing hypoglycemia or hyperglycemia in patients with or without diabetes. They can also interfere with metabolic and autonomic response to hypoglycemia thereby masking symptoms such as tachycardia. Beta blockers, especially when combined with a thiazide diuretic, should be avoided for routine treatment of uncomplicated hypertension in patients with diabetes or in those at high risk of developing diabetes [61].

Potassium sparing diuretics can lead to hyperkalemia. Aldosterone acts at the distal renal tubules enhancing reabsorption of sodium and excretion of potassium. Hence aldosterone antagonists are associated with hyperkalemia [60]. The RALES pilot study reported the risk of developing hyperkalemia with spironolactone as being dose dependent [61].

Sorenson et al noted that patients in HF taking spironolactone resulted in elevated serum potassium [59, 61]. The EPHESUS Trial reported 5.5% serious cases of hyperkalemia (≥6 mmol/L) in patients on Eplererone [61].

The risk factors for developing hyperkalemia include; advanced age, higher dosage of aldosterone antagonists, diabetes-associated hyporeninemic hypoaldosteonism, baseline renal dysfunction, higher baseline serum potassium levels, concomitant medication with ACE inhibitors, ARBs, β- Blockers, Potassium supplements, Potassium sparing diuretics, and NSAIDs [62].The EPHESUS Trial reported a statistically significant renal deterioration in the patients on eplererone as compared to placebo.

Male patients on spironolactone develop gynecomastia as a result of the drug's action at the androgen receptor, increased testosterone metabolism, and increased conversion of testosterone to estradiol [59].

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter describes the research design, target population, study site, eligibility criteria and sampling of study participants, as well as the methods of data collection and analysis.

3.2 Study design

The study design was cross-sectional. Cross-sectional studies are carried out at one point in time or over a short period and are conducted to estimate the prevalence of an outcome of interest in a population or a sub-group. They also allow for assessment of many different variables (outcomes and risk factors) at the same time and are useful for generation of hypotheses for future studies. The purpose of the current study was to descriptively shed light on the factors affecting adherence among patients with CHF attending the cardiology clinic as well as those admitted in KNH with the syndrome.

3.3 Study area

This study was carried out at Kenyatta National Hospital. The hospital conducts a cardiology clinic once a week with approximately 80 patients per clinic day and average of 30 new patients per month. KNH is located in the Upper Hill area of Nairobi, the political and financial capital of Kenya. It is a Teaching and National Referral Hospital, housing both the College of Health Sciences of the University of Nairobi, and Kenya Medical Training College. The bed capacity is 1800 and the institution is a referral facility for patients from all the 47 counties in Kenya. It is equipped with some of the best facilities for a public hospital and its choice as the study site is based on the availability of a sizeable number patients presenting with CHF.

3.4 Study population

The study population was patients aged above 18 years presenting with CHF admitted into Kenyatta National Hospital and those attending the cardiology clinic.

3.5Eligibility criteria

3.5.1 Inclusion criteria

- Patients diagnosed with CHF.
- Male and female above the age of 18 years.

- Patients who consents to be included in the study.

3.5.2 Exclusion criteria

- Uncooperative patients due to dementia or psychosis.
- Patients unable to participate in the study due to their disease condition.

3.6 Sampling

3.6.1 Sample size

This being a cross-sectional descriptive study the sample size was determined by the Fisher and Van Bell formula given below [63].

$$n=\{z^2 p(1-p)\}/d^2$$

z= Standard normal deviate at 95% CI = 1.96

p= Estimated prevalence of HF = 5.7%

(1-p) = 1-0.057= 0.943

d= margin of error, set at 5%=0.05

Therefore the sample size n = {1.96²x0.057 (0.943)}/0.05² =82.59~83

A sample size of 83 shall be used in the study.

*The 5.7% prevalence is based on the prevalence of CHF reported by Tantchou TJC et al [4].

3.6.2 Sampling technique

All research participants who meet the inclusion criteria were recruited into the study using convenient sampling until the required sample size was attained.

3.7 Data collection

The questionnaire {Appendix 1} was administered by the principal investigator and research assistants, to the study participants for purposes of collecting demographic data, responses with respect to adherence, level of knowledge about CHF, types of adverse drug reactions experienced while on treatment for CHF. Patients file records were reviewed to capture clinical data, treatment regimen, change of regimen if any and treatment outcomes, and comorbidities associated with CHF

3.8 Research assistants.

Two research assistants were recruited to assist in the data collection during the study. The minimum qualification was a diploma in clinical medicine. They research assistants were trained on the objectives of the study and on the standard operating procedure for data collection before taking part in the study.

The research assistants obtained a voluntary signed consent from the study participants before administering the questionnaire and reviewed and compiled any relevant data from the patients' files and entered the same into the relevant sections of the questionnaire. The principal investigator perused through all the data collection tools to ensure completeness. He also conducted random quality assurance audits on the data collection process to ensure uniformity and consistency.

3.9 Data analysis

Data was coded to ensure confidentiality, entered into the data base and double checked to ensure accuracy and cleaning. Descriptive data analysis was carried out on all variables using STATA V.12. Bivariate analysis was used to establish the association between each of the predictor variables and the dependent variable, and multivariable regression to establish the association between several variables using a linear regression model.

3.10 Quality Assurance

All study personnel were trained on objectives and relevant procedures. The research assistants were trained and tested on the Standard Operating Procedures on data collection. The data collection tool was pre-tested on 5 research participants at the Kenyatta National Hospital to determine its adequacy. The principal investigator conducted random audits at predetermined intervals and supervised the research assistants to ensure the maintenance of quality. The Data obtained was kept under lock and key accessible only to the principal investigator to ensure security.

3.11 Ethical considerations

Permission was obtained from the Kenyatta National Hospital/University of Nairobi Ethics and Research Committee (KNH/UON-ERC). A copy of the approval letter is herewith attached as

appendix 3. Permission was also sought from the department of internal medicine, and the study registered with the Research Department KNH. All information obtained was treated with confidentiality and only the principal investigator had access to it. All raw data obtained will be kept under lock and key for 2 years by the principal investigator. Two years after completion of the study all raw data kept by the principal investigator shall be destroyed by shredding and incineration.

3.12 Dissemination of results

The final report on the study has been availed to the Medicine Department KNH, KNH Research Department, the CHS/UoN Library, the School of Pharmacy Library, and the Department of Pharmaceutics and Pharmacy Practice (UoN). An extract of the findings has been submitted in the form of a manuscript to a peer reviewed medical/pharmaceutical journal, and shall be presented as a power point presentation in scientific seminars, symposia and conferences.

CHAPTER: FOUR

RESULTS

4.1 Introduction

This chapter describes the results of the study. They include; sociodemographic characteristics, factors that affect adherence to medicines, comorbidities and adverse drug reactions.

4.2 Sociodemographic characteristics

Among 83 study respondents, 51 (61.4%) were females and 32(38.6%) were males (Table 1).

The age of the patients ranged from 18 to 80 years with the majority (n= 37, 44.6%), between 21-40 years which is an important economically active age group. Only 1(1.2%) was below 20 years while 17(20.5%) were above 60 years. Sixty one (73.5%), were married, while 20(24.1%) were single and 2 (2.4%) were separated. Only 17(20.5%) of the study participants had attained tertiary level of education while 30(36.1%) attained a secondary level of education, and an equal number attained primary level of education. Six (7.2%) reported having had informal education.

Characteristic	Frequency(n)	Percentage
Sex		
Male	32	38.6
Female	51	61.4
Age category		
<20 years	2	2.4
21-40 years	37	44.6
41-60 years	27	32.5
>60 years	17	20.5
Marital status		
Single	20	24.1
Married	61	73.5
Separated	2	2.4
Highest level of education		
Informal	6	7.2
Primary	30	36.1
Secondary	30	36.1
Tertiary	17	20.5
Occupation		
Unemployed	28	33.7
Self-employed	38	45.8
Employed (Permanent, Temporary, contract etc.)	13	15.7
Retired	4	4.8
Alcohol consumption		
Takes (or has taken) alcohol	17	20.7
Does not take (and has not taken) alcohol	65	79.3
Smoking status		
Smokes (or has smoked in the past)	13	15.7
Does not smoke (and has not smoked in the past)	70	84.3

Majority (n=38, 45.8%) were self-employed while 4(4.8%) were retired. Seventeen (20.7%) admitted having taken alcohol in their lives. Eight (47.1%) had taken for more than 10 years, 7(41.8%) for 5-10 years and 2(11.8%) for less than 5 years respectively. Thirteen (15.7%) reported having smoked but only 12(14.5%) gave an indication of the duration of time that they had smoked.

4.3: The proportion of patients with CHF that adhere to drugs

4.3.1: Indicators of adherence to management protocol

Patients were requested to report on their adherence to management protocol through several questions on the various indicators of adherence; these included follow-up with appointments, medication compliance, dietary restrictions, regular exercise, smoking cessation and alcohol cessation (Table 2).Majority (n=58, 68.9%) of the patients considered follow-up, acquiescence to medication (n= 64, 77.1%), dietary restriction (n=59, 72%), regular exercise (n=49,59.0%), smoking cessation (n=59,71.0%), and alcohol cessation(n=58,69.9%) as very important. Between 0-1.2% considered these indicators as not important.

Table 2: Indicators of adherence to management protocol

Indicator	Not important n (%)	Not very important n(%)	Important n(%)	Very important n(%)
Follow up	1 (1.2%)	2 (2.4%)	22(26.5%)	58 (68.9%)
Medication	0 (0%)	1(1.2%)	18 (21.7%)	64(77.1%)
Diet restrictions	1(1.2%)	3(3.7%)	19(23.2%)	59(72.0%)
Regular exercise	2(2.4%)	10(12.1%)	22(26.5%)	49(59.0%)
Smoking cessation	0 (0%)	2 (2.4%)	22(26.5%)	59 (71.0)
Alcohol cessation	1(1.4%)	1(1.2%)	23(27.7%)	58 (69.9%)

4.3.2: Non-adherence to medicines

Majority (n=53, 63.9%) of study participants reported having not failed to comply in taking their medicines at any time, with 28(33.7%) reporting having failed to take their medicine rarely, while 1(1.2%) reported having failed to take his medicines most of the time (Table 3). Seventeen (60.7%) of the respondents failed to take their medicine due to forgetfulness while 6(21.4 %) was because the instructions were too complicated.

Table 3: Non-adherence to medicines

Characteristic	Frequency (n)	Percentage (%)
Failure to take medicines		
Most of the time	1	1.2
Half the time	1	1.2
Rarely	28	33.7
None of the time	53	63.9
Reasons for failing to take medicines		
Side effects	1	3.6
Frequency of dosing	1	3.6
Medicines not working	1	3.6
Forgetfulness	17	60.7
Instructions are too complicated	6	21.4
Too many drugs	2	7.1

4.3.3 Accessibility to medicines

Forty one (49.4%) of the study participants did not find it difficult to obtain medicines prescribe for them, while 5(6.0%) found it very easy, 22(26.5%) found it easy, 13(15.7%) found it difficult, and only (2)2.4% found it very difficult (Table 4).

Table 4: Accessibility of prescribed medicines in treatment of CHF

Accessibility	Frequency(n)	Percentage (%)
Very easy	5	6.0
Easy	22	26.5
Not difficult	41	49.4
Difficult	13	15.7
Very difficult	2	2.4
Healthcare provider communication to patient		
Communication received	63	75.9
Communication not received	20	24.1

Sixty three (75.9%) of the study participants had also been informed by the healthcare provider as to why they were taking the prescribed medicines, while 20 (24.1%) denied having received such a communication.

4.4: Types of drugs prescribed for patients with CHF at KNH

Seventy five (90.4%) of the study participant were on a diuretic, while 45(54.2%) were on a β-adrenergic receptor antagonist, and 40(48.2%) were on a cardiac glycoside (Table 6). The most commonly prescribed drug combinations were, a diuretic + ACE inhibitor + β-blocker+ cardiac glycoside (n=15, 19.0%), a diuretic +ARB+ cardiac glycoside (n=9, 11.4%), a diuretic + ACE inhibitor + β-blocker (n=9, 11.4%) and a diuretic + cardiac glycoside (n=9, 11.4%) (Table 5).

Table 5: Types of drugs and combinations prescribed

Type of drug	**Frequency (n)**	**Percentage (%)**
Diuretic	75	90.4
ACE Inhibitor	32	38.6
Angiotensin Receptor Blocker	11	13.3
β- Adrenergic receptor antagonist	45	54.2
Cardiac glycoside	40	48.2
Hydralazine	8	9.6
Combinations of drugs prescribed		
Combination		
Diuretic + ACEi +β- blocker + Cardiac glycoside	15	19.0
Diuretic	9	11.4
Diuretic +ACEi + β-blocker +	9	11.4
Diuretic + ARB + Cardiac glycoside	9	11.4
Diuretic + Cardiac glycoside	9	11.4
Diuretic + β-blocker + Cardiac glycoside	7	8.9
Diuretic + ARB + β-blocker + Cardiac glycoside	5	6.3
Diuretic + Hydralazine	3	3.8
Diuretic + ACEi + β-blocker + Hydralazine	2	2.5
ARB + β-blocker	2	2.5
Diuretic + ARB + β-blocker	2	2.5
Diuretic + β-blocker	2	2.5
Other combinations	5	6.3

4.5: Patients level of knowledge about CHF

Majority (n=72, 86.8%) of the study participants were aware of the disease condition they were suffering from, while 11(13.2%) were not aware (Table 6). Sixty five (85.5%) had suffered from the condition for less than 5 years, and 4(5.3%) for more than 10 years (Table 6).

Table 6: Patients' level of knowledge about CHF

Awareness of disease condition	Frequency(n)	Percentage
Aware	72	86.8
Not aware	11	13.2
Duration of disease condition		
<5 years	65	85.5
5-10 years	7	9.2
>10 years	4	5.3
Hospitalization for CHF		
Admitted	51	61.4
Not admitted	32	38.6
Frequency of hospitalization		
Once	18	35.3
Twice	18	35.3
Thrice	5	9.8
Four times	4	7.8
Five times	3	5.9
Six times	1	2.0
Seven times	2	3.9

Communication about possible outcomes regarding CHF	Frequency(n)	Percentage
Advised	40	48.2
Not advised	43	51.8
Communication regarding requisite lifestyle changes		
Advised	56	67.5
Not advised	27	32.5
Patients' understanding as regarding lifestyle changes		
Don't understand	7	8.4
Don't understand very well	6	7.2
Understand a little	29	34.9
Understand most things	27	32.5
Fully understands	14	16.8
Patients reaction on unexpected weight gain		
Consult a doctor	63	75.9
Increase diuretic dose	2	2.4
Decrease fluid intake	2	2.4
Do nothing	16	19.3

Fifty one (61.4%) had been admitted to a hospital for the condition, while 32(38.6%) had not. Of those who have been admitted to hospital, 18(35.8%) have been admitted once, and 2(3.9%) have been admitted seven times. While 40(48.2%) participants had been advised on the expected outcome of their condition 43(51.8%) were not aware of the outcome. Fifty six (67.5%) had been advised on lifestyle changes requisite to ensure that symptoms of CHF did not get worse while 27(32.5%)) denied receiving such advice .Twenty nine (34.9%) of the study participants

understood a little regarding the lifestyle changes requisite to ensure that symptoms of CHF do not get worse.

4.6: Comorbidities associated with CHF

Valvular heart disease (VHD) presents as the most common comorbidity in patients with CHF (Table7).

Table 7: Comorbidities associated with CHF

Comorbidity	**Frequency(n)**	**Percentage (%)**
Valvular Heart Disease (VHD)	17	27.9
Hypertension (HTN)	9	14.8
Anemia	5	8.2
Diabetes Mellitus (DM)	4	6.6
DM + HTN	3	4.9
CKD + Anemia	3	4.9
Anemia + HTN	3	4.9
Chronic Kidney Disease (CKD)	2	3.3
Ulcers	2	3.3
CKD + Retroviral Disease (RVD)	2	3.3
Others	11	17.9

Duration of comorbidities			
Comorbidities	**<5 yrs**	**5-10yrs**	**>10yrs**
Valvular Heart Disease	9(10.8%)		3(3.6%)
Hypertension	7(8. 4%)		
Anemia	5(6.0%)		
Diabetes Mellitus	5(6.0%)	1(1.2%)	1(1.2%)
DM + HTN	3(3.6%)	1(1.2%)	
CKD	3(3.6%)		
Anemia + HTN	2(2.4%)		
CKD + Anemia	1(1.2%)		
Ulcers	1(1.2%)		
Ischemic heart disease	1(1.2%)		
IHD + VHD	1(1.2%)		
VHD + Anemia	1(1.2%)		
VDH + PH	1(1.2%)		
DCM	1(1.2%)		
DM + Afib +VHD +HTN			1(1.2%)
Hyperthyroidism			1(1.2%)
Breast Cancer			1(1.2%)

Seventeen (27.9%) of the 61 patients with reported comorbidities had VHD, 9(14.8%) had hypertension, 5(8.2%) had anemia, while 4(6.4%) had diabetes mellitus (Table 7). There were 11(17.9%) patients with other comorbidities which included; ulcers, ischemic heart disease

(IHD), hyperthyroidism, IHD + VHD, VHD + pulmonary hypertension (PH), DM +Atrial Fibrillation +VHD +HTN, dilated cardiomyopathy (DCM), and restrictive cardiomyopathy (RC). Nine (10.8%) had suffered VHD for less than 5 years, as had 7(8.4%) from HTN, 5(6.0%) from anemia and 5(6.0%) from DM. Three (3.6%) of the study participants had suffered VHD for more than 10 years, as had 1(1.2%) from DM.

4.7: Prevalence of adverse drug reactions used in the treatment of CHF

The prevalence of side effects is shown in Table 8 below

Table 8: Prevalence of adverse drug reactions

Adverse drug reaction	Frequency(n)	Percentage (%)
Sleep disturbances	23	27.1
Dizziness	15	18.1
Headache	36	43.4
Drowsiness	34	41.0
Visual Disturbances	19	22.9
Cough	18	21.7
Bronchospasm	8	9.6
Shortness of breath	12	14.5
Bradycardia	41	49.4
Syncope	14	16.9
Tachycardia	56	67.5
Nausea	22	26.5
Vomiting	48	57.8
Renal Dysfunction	39	47.0
Menstrual irregularities	27	32.5
Hypokalemia	7	8.4
Hyperkalemia	16	19.3
Hyponatremia	35	45.5
Rash	54	65.1
Fatigue	37	44.6
Anemia	20	26.3
Dry skin	23	27.7
Dry Mouth	24	30.0

Fifty six (67.5%) of the study participants experienced tachycardia, while 54(65.1%) skin rash and 48(57.8%) vomiting during the course of treatment for CHF. Others experienced various adverse drug reactions as shown above.

4.8: Serum levels of blood urea, creatinine and electrolytes

Urea levels for the majority (n=50, 60.2%) of the study participants were within normal limits, while 12(14.5%) had elevated levels and 1(1.2%) had low levels. Ten (12.0%) had elevated levels of serum creatinine, 2(2.4%), low levels and 56(67.5%) had normal levels (Table 9).

Majority (n=43, 51.8%) of the participants were hyponatremic, 2(2.4%) hypernatremic and 27(32.5%) had sodium levels within normal limits. Eleven (13.3%) had elevated levels of potassium and 5(6.0%) had low levels.

Table 9: Serum levels of blood urea, creatinine and electrolytes

Parameter	**1=Elevated**	**2=Normal**	**3=Low**
Urea	12 (14.5%)	50(60.2%)	1(1.2%)
Serum Creatinine	10(12.0%)	56(67.5%)	2(2.4%)
Na^+	2(2.4%)	27(32.5%)	43(51.8%)
K^+	11(13.3%)	56(67.5%)	5(6.0%)

4.9 Association between sex and adverse drug reactions

A relationship was found between sex and some adverse drug reactions using Pearson chi square test through bivariate analysis (Table 10)

Table 10: Relationship between sex and adverse drug reactions

Adverse drug reaction	**Males (n, %)**	**Females (n, %)**	**P-value**
Sleep disturbances			
Yes	13(15.7%)	10(12%)	0.037
No	19(22.9%)	41(49.4%	
Headache			
Yes	9(10.8%)	27(32.5%)	0.026
No	23(27.7%)	24(28.9%)	
Drowsiness			
Yes	6(7.2%)	28(33.7%)	0.001
No	26(31.3%)	23(27.7%)	
Nausea			
Yes	13(15.7%)	9(10.8%)	0.021
No	19(22.9%)	42(50.6%)	

Sleep disturbances and nausea occurred more in males than females while headache and drowsiness were more prevalent in females. In all cases the relationships were statistically significant ($p < 0.05$). Among the side effects explored less than half of the patients experienced them.

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter we discuss the finding of our study, draw conclusions thereon and make recommendations for both policy and further research**.**

5.2 Discussion

The prevalence of CHF slightly higher among women than males which disagrees with an earlier study by Ongeng'o et al which reported a male female ratio of 1:1 without a difference in age groups [6]. Majority of the study participants were between 21-40 years, which is an important economically active age group [4]. This shows an earlier onset of CHF compared to Caucasian populations probably due to the fact that a major cause of CHF in the Kenyan population is still rheumatic heart disease [5, 6].

Adherence has been defined as the extent to which the patient's medication taking behavior corresponds with an agreed upon medication regimen [15]. This entails taking the correct medicine, the correct dose, at the right time, and avoiding missing a dose for more than a specified period of time. The six indicators of adherence assessed, included follow-up on appointments, acquiescence to medication, dietary restrictions, recommended regular exercise, smoking cessation and alcohol cessation. Majority of the study participant reported that they considered all the six indicators to be very important. Sixty nine percent of the study participants reported not failing to take their prescribed medicines at any time which is higher compared with adherence rate reported by Riegel et al [15]. Forgetfulness was the reason given by the majority of the participants for failing to take their medicines with a few stating that they found the instructions too complicated.

Accessibility to medicine is an important determinant of adherence and it is imperative to ensure that medicines are accessible to those who need them. Our study revealed that majority of the study participants did not find it difficult to access medicines prescribed for them with some patients reporting that it was very easy to obtain their medicines. On adherence increases the cost of healthcare [16]. This could be due to poor communication between the healthcare provider and the patient. This communication must include the reason the patient shall be taking the

prescribed medicines. In our study we found that 79.5% of the participants had been informed by the healthcare provider as to why they were taking the prescribed medicines.

Majority of the patients diagnosed with CHF at KNH were on a diuretic or a combination of diuretics. The most frequently prescribed diuretics were frusemide alone or frusemide in combination with an aldosterone receptor antagonist, invariably spironolactone. The other commonly used drugs in the treatment of CHF at KNH included beta adrenergic receptor antagonists, and cardiac glycosides. The most commonly prescribed combinations at KNH include; diuretic + ACE inhibitor +beta-blocker +cardiac glycoside, diuretic+ ARB +cardiac glycoside, diuretic +ACE inhibitor +cardiac glycoside, and diuretic +cardiac glycoside. ACE inhibitors are indicated as first line therapy in patients with left ventricular systolic dysfunction with a reduced ejection fraction because they reduce both preload and afterload (peripheral resistance) without causing a reflex sympathetic activation [20, 22]. ARBs are indicated in patients who cannot tolerate ACE inhibitors [28-31] and Cardiac glycosides are indicated in any degree of symptomatic HF [35].Diuretics are essential in symptomatic management of CHF especially in the presence of pulmonary congestion and pulmonary edema, when. The diuretics of choice are the loop diuretics [22]. Beta-blockers are central in management of CHF

Studies have shown that patients' education is a key component in comprehensive HF management. There is however a gap between patients receiving and absorbing or retaining information on self-care [36]. Other studies indicate that health literacy is independently related to disease knowledge, which underscores the need to improve patients' knowledge of their chronic diseases [37].

Majority of the study participants were aware of the condition they suffer from, with the majority having suffered from the condition for less than five years. A small proportion had suffered for more than ten years and some had been hospitalized for more than seven times. The level of understanding of CHF was generally low with only about one third of the participants reporting that the understood most things in respect of the lifestyle changes requisite to ensure that symptoms of CHF did not get worse.

Telemonitoring (TM) and structured telephone support (STS) have been used to improve outcomes in CHF and self-management programs have been shown to decrease readmission for HF [39,45], but there is still need for continuous education of both healthcare providers and patients [39,41,45].Effective communication is essential in management of chronic diseases and there is need for continuous education of both the health care providers and patients with respect to adherence and self-care in the comprehensive management of CHF.

Valvular heart disease was the most common comorbidity among CHF patients at KNH followed by hypertension, anemia and diabetes mellitus. Other comorbidities noted included, ulcers, ischemic heart disease, hyperthyroidism, dilated cardiomyopathy and restrictive cardiomyopathy. This does not fully concur with results of a study carried out by Ongeng'o et al which reported that major causes/comorbidities of HF are cardiomyopathy, hypertension, diabetes valvular heart disease and myocardial infarction [5]. Ho et al [50] observed that the presence of comorbidities is common and results in increased hospital stay in patient with CHF [50]. Anemia was found to be a common and independent prognostic factor for mortality, while other studies reported that renal failure, heart failure and anemia cause or worsen each other [45, 47]

The most common adverse drug effects reported in our study are tachycardia, skin rash, vomiting, bradycardia, renal dysfunction and hyponatremia. ACE inhibitors cause cough and are associated with compromising the renal function and should be withdrawn when serum creatinine increases by 100% and but ARBs contribute to the risk of cancer, which supports the use of ACE inhibitors as first line therapy for CHF [54,55]

Loop diuretics cause hypokalemia, hypomagnesemia and hyponatremia, while potassium sparing diuretics are associated with hyperkalemia, and digoxin which has a low therapeutic index causes bradycardia, nausea and vomiting [22, 53, 56, 60]. On their part beta-blockers cause fatigue and sleep disturbances and affect carbohydrate metabolism and may cause hypoglycemia and hyperglycemia in patients with or without diabetes [59].

5.3 Conclusions.

1. Adherence to medicines among patients with CHF is reasonably high at KNH despite the different levels of education.

2. The pharmacologic therapy of CHF is tilted towards use of diuretics and cardiac glycosides.

3. The level of patients' knowledge about CHF is generally low and most patients do not understand fully the implications of lifestyle changes requisite in management of CHF.

4. Valvular heart disease is the most common comorbidity.

5. Hyponatremia was the most prevalent electrolyte disturbance.

6. Tachycardia, vomiting and rash were the most common adverse drug effects.

5.4 Recommendations

5.4.1 Recommendations for policy and practice.

1. Continuous education of both the healthcare provider and the patient should be done to build a strong therapeutic relationship. This will improve adherence to medicines, improve the patient's quality of life and ameliorate the economic burden to the healthcare system by reducing morbidity and mortality.

2. Sodium level should be regularly monitored to reduce the prevalence of hyponatremia through appropriate correction of the abnormality.

5.4.2 Recommendation for further research

Further research to assess the relationship between hyponatremia and the progression of CHF in the Kenyan population should be done.

REFERENCES

1. Whang W. *Encyclopedia of Behavioral Medicine* 2013; pp 485-486
2. Mann DL 2008. HF and Cor Pulmonale (Chapter 27) in Fauci AS, Braunwald, Kasper DL, et al (Editors) *Harrison's principles of internal medicine* 17th Edition NY : McGraw Hill
3. Mosterd A, Hoes AW, De Bruhe MC *et al*. Prevalence of HF and LV Dysfunction in the general population, The Rotterdam Study. *European Heart Journal* 1998 1239 447-455
4. Tantchou TJC, Ambasa JC, Kingue S*et al*. Occurrence, etiology and challenges in the management of CHF in Sub-Saharan Africa: Experiences in Shison, Cameroon. *Pan African Medical Journal* 2011; 8(1)
5. Oyoo GO, Ogola EN Clinical and socio-demographic aspects of CHF patients at KNH, Nairobi, Kenya. *E A M J* 1999; 76(1); 23-27
6. Ogeng'o J, Gitonga PM, Olabu BO, and Ogeng'o NM. Patterns of HF in adult Kenyan population. *Int J Cardiovasc Res* 2014;3:6
7. Azad N, and Lemay G. Management of CHF in the older population. *J Geriat cardiol* 2014 Dec; 11(4) : 329-337
8. Katz AM, Konstan MA. *Heart Failure: Pathophysiology, Molecular Biology and Clinical Management*. Lippincott, Williams and Wilkins 2009
9. Packer M, The neurohumoral hypothesis: A theory to explain the mechanisms of disease progression in heart failure. *J Am Coll Cardiol* 1992; 20(1):245-54
10. Buglioni A, Burnett JC. Pathophysiology and the cardiorenal connection in heart failure. Circulating hormones: biomarkers or mediators. *Clinica Chimica Acta* 2015;443:3-8
11. Braunwald E. Development of therapeutics for Heart Failure. The management of Heart Failure: The past, the present and the future. *Circulation: Heart Failure* 2008: 58-62
12. Hughes CM. Medication non-adherence in the elderly. *Drugs & Aging* 2004; 21(12): 793-811
13. Osterberg L, Blaschke T. Adherence to medication. *N Engl J Med* 2005; 353:487-497
14. Lewis KA. Study design III: Cross-sectional studies. *Evidence –Based Dentistry* 2006; 7:24-24
15. Riegel B, Lee CS, Ratcliffe SJ *et al*. Predictions of objectively measured medicine non-adherence in adults with heart failure. *Circulation: Heart Failure* 2012;5:430-436
16. Bagchi A, Esposito D, Kim M *et al*. Utilization of, and adherence to drug therapy among Medicaid beneficiaries with congestive heart failure. *Clinical Therapeutics* 2007;29(8):1771-1783

17. Hope CJ, Wu J, Tu W *et al*. Association of medication adherence, knowledge and skills with emergency department visits by adults ≥ 50 years with CHF. *American Journal of Health System Pharmacy*. Oct 1 2004; 61(19):2043-2049

18. Bell SJ, Johnell K *et al*. Multidose drug dispensing and optimizing drug use in older patients. *Age and Aging* 2003;42:556-558

19. McNaughton CD, Collins SP, Kripalan S *et al*. Low numeracy is associated with increased odds of 30 day emergency department and hospital recidivism for patients with acute heart failure. *Circulation: Heart Failure* 2013; (6):40-46

20. Swedberg K, Cleland J, Dargie H *et al*. Guidelines for the diagnosis and treatment of chronic heart failure of the European Society of Cardiologists. *European Heart Journal* 2005; 26:1115-1140

21. Anker SD, Ponikowski P, Varney S *et al*. Wasting as independent risk factor for mortality and morbidity in chronic heart failure. *Lancet* 1997; 349:1050-1053

22. Bennett PN, and Brown MJ. *Clinical Pharmacology*. Tenth Edition. Churchill Livingstone 2008 : 420-425, 465-468

23. The CONSENSUS Trial study group. Effects of enalapril on mortality in severe congestive heart failure. Results of the Co-operative North Scandinavian Enalapril Survival Study (CONSENSUS). *N Engl J Med* 1987;316: 1429-1435

24. Bayliss J, Norell M, Canepa-Anson R *et al*. Untreated heart failure: clinical and neurohumoral effects of introducing diuretics. *Br Heart J* 1987; 57:17-22

25. CIBIS II Investigators and Committees. The Cardiac Insufficiency Bisoprolol Study II (CIBIS II): A randomized trial. *Lancet* 1999; 353:9-13

26. MERIT-HF Study Group. Effect of metoprolol CR/XL in chronic heart failure. Metoprolol CR/XL Randomized Intervention Trial in Congestive Heart Failure (MERIT-HF). *Lancet* 1999;353:2001-2007

27. Pitt B, Zannad F, Remme WJ *et al*. The effect of spironolactone on morbidity and mortality in patients with severe heart failure. Randomized Aldactone Evaluation Study Investigators. *N Engl J Med* 1999; 341:709-711

28. Granger CB, McMurray JJ, Yusuf S *et al*. Effects of candesartan in patients with chronic heart failure and reduced left ventricular systolic function intolerant to angiotensin converting enzyme inhibitors. The CHARM-Alternative trial. *Lancet* 2003; 362:772-776

29. Pfeffer MA, Swedberg K, Granger CB *et al*. Effects of candesartan on mortality and morbidity in patients with chronic heart failure and reduced left ventricular systolic dysfunction intolerant to angiotensin converting enzyme inhibitors. The CHARM-Overall program. *Lancet* 2003; 362:759-766

30. Maggioni AP, Anand I, Gottlieb SO *et al*. Effects of valsartan on morbidity and mortality in patients with heart failure not receiving angiotensin converting enzyme inhibitors. *J Am Coll Cardiol* 2002; 40:1414-1421

31. Cohn JN, Tognoni G. A randomized trial of the angiotensin-receptor blocker valsatan in chronic heart failure. *N Engl J Med* 2003; 345:1667-1675

32. Pfeffer MA, McMurray JJ, Velazquez EJ *et al*. Valsartan, captopril, or both in myocardial infarction complicated by heart failure, left ventricular dysfunction, or both. *N Engl J Med* 2003; 349:1893-1906

33. McMurray JJ, Ostergren J, Swedberg K *et al.* Effects of candesartan in patients with chronic heart failure and reduced left ventricular systolic function taking angiotensin converting enzyme inhibitors: The CHARM-Added trial. *Lancet* 2003; 362:767-771

34. Jong P, Demers C, McKelvie RS *et al.* Angiotensin receptor blockers in heart failure: Meta-analysis of randomized controlled trials. *J Am Coll Cardiol* 2002; 39:463-470

35. Coletta AP, Cleland JG, Freemantle N *et al*. Clinical trials update from European Society of Cardiology: CHARM, BASH, EUROPA and ESTEEM. *Eur J Heart Fail* 2003; 5:697-704

36. Ni H, Nauman D, Burgess D *et al.* Factors influencing knowledge of and adherence to self-care among patients with heart failure. *Arch Intern Med* 1999; 159(14): 1613-1619

37. Gazmararian JA, Williams MV, Peel J *et al*. Health literacy and knowledge of chronic diseases. *Patient education and counselling* 2003; 51(3):267-275

38. Stewart S, Pearson S, Horowitz JD. Effects of a home based intervention among patients with CHF discharged from acute hospital care. *Arch Intern Med* 1998; 158(10): 1076-1077

39. Inglis SC, Clark RA, McAlister FA *et al*. Which components of heart failure programs are effective? A systematic review and meta-analysis of the structured telephone support (STS) and telemonitoring (TM) as the primary component in 8323 patients. *European Journal of Heart Failure* 2011; 13(9):1028-1040

40. Clarke M, Shah A, Sharma U. Systematic review of studies on telemonitoring of paints with chronic heart failure. A meta-analysis. *J telemed Telecare* 2011; 17:17-24

41. Achelrod D, Policy expectation of reality of telemedicine- A critical analysis of healthcare outcomes, costs and acceptance. *J Telemed Telecare* June 2014; 20(4):102-200

42. Wootton R. Twenty years of telemed in chronic disease management- an evidence synthesis. *J Telemed Telecare* 2012; 18(4): 211-220

43. Jovicic A, Holroyd-Leduc JM, Straus SE. Effects of self –management intervention outcomes of patients with heart failure: A systematic review of RCTs. *BMC Cardiovascular disorders* 2006; 6:43

44. Pinder MC, Duan Z, Goodwin JS *et al*. Chronic heart failure in women treated with adjuvant anthracycline chemotherapy for breast cancer. *J C O* 2007; 25(25):3808-3815

45. Ezekowitz JA, McAlister FA, Armstrong PW. Anemia is common in heart failure and is associated with poor outcomes. *Circulation* 2003; 107:223-225

46. Larina VN, Bart Bla, Raspopova TN *et al*. Chronic heart failure and concomitant diseases in elderly patients: Anemia and cardiorenal anemia syndrome. *Kardiologia* 2014; 54(5):22-23

47. Siverberg DS, Wexler D, Schwartz D *et al*. The interaction between heart failure and other heart diseases, renal failure, and anemia. *Seminars in Nephrology* 2005 Jul 25(4):295-305

48. Zhou S, Zhuang Y, Zhao W. Protective role of ESP (erythropoiesis stimulating proteins) in chronic heart failure with anemia. *Exp Ther Med* 2014 Sep 8(3):363-370

49. Otaki Y, Watanabe T, Shiahido T *et al*. The impact of renal tubular damage as assessed by urinary β□-microglobulin – creatinine ratio, on cardiac prognosis in patients with chronic heart failure. *Circ Heart Fail* 2013 Jul; 6(4):662-668

50. Ho TH, Gaughey GE and Shakib S. Guidelines compliance in chronic heart failure with multiple comorbid diseases: Evaluation of an individualized multidisciplinary model of care. *PloS One* 2014; 9(4): e93129

51. Keswani AN, White CJ. The impact of peripheral arterial disease on patients with chronic heart failure. *Heart Failure Clinics* 2014 Apr; 10(2):327-333

52. Albackr HB, Alhabib KF, Alfaleh H *et al*. Prevalence and prognosis of chronic heart failure in Saudi patients admitted with acute coronary syndrome. *Coronary Artery Disease*. 2013;24(7):596-601

53. Komadja M, Follath F, Swedberg K *et al*. The Euro Heart Failure Survey program-a survey on the quality of care among patients with heart failure in Europe. *European Heart Journal* 2003; 24(5);464-474

54. Walker R, Whittlesea C. *Clinical Pharmacy and Therapeutics* 5th Edition Churchill Livingstone 2012 : 333-353

55. Sipahi I, Debanne SM, Rowland DY *et al*. Angiotensin-receptor blockade and risk of cancer: meta-analysis of randomized controlled trials. *Lancet* Oncol 2010; 11:627-636

56. British National Formulary 2012; 63: 88,100

57. McDonagh TA, Gardner RS, Clark AL, Dargie HJ. *Oxford Textbook of Heart Failure*. South Asian Edition. Oxford University Press 2011: 385-446

58. The Randomized Aldactone Evaluation study (RALES). *Am J Cardiol* 1996;78(8);902-7

59. Svensson M, Gustafsson F, Galatius S, *et al*. Hyperkalemia and impaired renal function in patients taking spironolactone for congestive heart failure: retrospective study. *BMJ* 2003; 327 (7424): 1141-2

60. Pitt B, Remme W, Zannad F, *et al*. Eplererone, a selective aldosterone blocker, in patients with left ventricular dysfunction after myocardial infarction. *N Engl J Med* 2003; 348(14): 1309-21

61. Pitt B, Zannad F, Remme W, *et al*. The effect of spironolactone on morbidity and mortality in patients with severe heart failure. Randomized Aldactone Evaluation Study Investigators. *N Engl J Med* 1999; 341(10): 709-17.

62. Sørensen AM, Christensen S, Jonassen TE, Andersen D, Petersen JS. Teratogenic effects of ACE-inhibitors and angiotensin II receptor antagonists. *Ugeskrift for Laeger* (in Danish) 1998; 160 (10): 1460–4.

63. Bullo M, Tschumi S, Bucher BS, Bianchetti MG, Simonetti GD. "Pregnancy Outcome Following Exposure to Angiotensin-Converting Enzyme Inhibitors or Angiotensin Receptor Antagonists: A Systematic Review". *Hypertension*2012; 60 (2): 444–50.

64. Le CT, *Introduction to Biostatistics*, Willey Inter-science, 2003

APPENDICES

APPENDIX 1: CONSENT FORM *Version 1, June 2015*

Factors that affect adherence to medicines among patients with chronic heart failure at Kenyatta National Hospital

Introduction

My name is Dr Lawrence Mirie KIMANI, an MPharm (Clinical Pharmacy) student from the University of Nairobi. I am conducting a study on "The factors that affect adherence to medicines among patients with Congestive Heart Failure at Kenyatta National Hospital." The information obtained from the study will be used by KNH and the Ministry of Health and health care providers to improve adherence to medicines

Procedure

Participation in this study is entirely voluntary and will require you to answer some questions about yourself, your life style and your experience with the medicines you have taken in the past or are currently taking for treatment. You may ask any question related to the study at any time, and you are also free not to answer any question you feel uncomfortable answering and you may stop participating in the study at any time without any consequences to you. Participation will take approximately 10 minute of your time.

Benefits and rewards

Your participation in this study will help us learn how to improve adherence to medicines which is of benefit to patients and healthcare providers as well as the health care system. There will be no reward for participating in the study.

Version 1, June 2015

Confidentiality

Your name will not be recorded in the questionnaire and all information provided will be treated with utmost confidentiality. All data collected in this study will be maintained under lock and key for the duration of the study and after, only accessible to the principal investigator.

Contact information.

If you have any questions please do not hesitate to contact Dr Lawrence M KIMANI on 0722 786 942, Dr P N KARIMI (School of Pharmacy, University of Nairobi) on 0722 436 019 or KNH/UoN Ethical Review Committee Secretariat 0n 254 020726 300-9.

Participant's consent.

The information regarding my participation in the study has been explained to me, and I have been given a chance to ask questions which have been answered to my satisfaction. My participation in this study is entirely voluntary. I understand that all information given to the interviewer shall be treated with utmost confidentiality and that I am free to withdraw from the study at any time.

Initials…….

Signature…….Date……..

APPENDIX 2: QUESTIONNAIRE ***Version 1, June 2015***

Factors that affect adherence to medicines among patients with chronic heart failure at Kenyatta National Hospital

Code Number……

Section 1: Baseline data

1. Date of birth Day……..Month……Year…….. (Age in years…….)

2. Sex {Please tick one} 1= Male () 2=Female ()

3. Marital status {Please tick one} 1=Single () 2=Married () 3=Separated ()

4. Highest level of education attained {Please tick one}

1=Informal	
2=Primary level	
3=Secondary level	
4=Tertiary Level	

5Occupation

1=Unemployed	
2=Self Employed	
3= Employed (Permanent, temporary, contract)	
4=Retired	

6. County of permanent residence……

7. Do you take alcohol? 1=Yes 2=No

8. If yes, how long have you taken alcohol? …… (Years)

9. Do you smoke? 1=Yes 2=No

10. If yes, how many years have you smoked? …… (Years)

11. Do you suffer from any other illnesses? 1= Yes 2= No

12. If yes, which ones? ……..

	Disease	
13	**Diabetes**	**1**
14	**Hypertension**	**2**
15	**Chronic Kidney Disease**	**3**
16	**Diabetes + Hypertension**	**4**
17	**Diabetes + Chronic Kidney Disease**	**5**
18	**Hypertension + Chronic Kidney Disease**	**6**
19	**Diabetes + Hypertension + Chronic Kidney Disease**	**7**

20. How long have you suffered from these other illnesses

	Disease	Years
21	**Diabetes**	
22	**Hypertension**	
23	**Chronic Kidney Disease**	
24	**Diabetes + Hypertension**	
25	**Diabetes + Chronic Kidney Disease**	
26	**Hypertension + Chronic Kidney Disease**	
27	**Diabetes + Hypertension + Chronic Kidney Disease**	

Section 2: Adherence to medications

As regards your condition what importance do you attach to the following?

		1=No importance	2=Not very important	3=Important	4=Very important
28	Follow up				
29	Medication				
30	Diet				
31	Exercise				
32	Smoking cessation				
33	Alcohol cessation				

34. How often do you miss taking your medicines?

1=All the time

2=Most of the time

3=Half the time

4=Rarely

5=None of the time

35. What are your reasons for missing your medications? {Please tick one or more}

1=Side effects

2=Frequency of dosing

3= Medicines not working

4=Forgetfulness

5=Instruction are too complicated

6= Medicines are too expensive

7= Too many drugs

8=Other……..

36. How difficult is it to obtain the medications prescribed for you?

5=Very difficult 4=Difficult 3= Not difficult 2=Easy 1= Very easy

37. Did the healthcare provider explain to you why you are taking the medicines?

1=Yes 2=No

Section 3: Types of drugs prescribed for patients with CHF

	Class	**Specific drug**	**1= yes**	**2=no**
38	**Diuretics**			
39	**ACE-Inhibitors**			
40	**Angiotensin Type 1 Receptor Blockers (ARBs)**			
41	**β-Adrenergic receptor antagonists**			
42	**Digoxin**			
43	**Nitrates**			

44	**Hydralazine**			

Section 4: Patients level of knowledge about CHF

45. Are you aware of the illness you are suffering from? 1=Yes 0=No

46. If yes what is the condition?.....

47. When is the first time you were diagnosed with this condition? …….years

	Years	
48	**1-2**	**1**
49	**2-3**	**2**
50	**3-4**	**3**
51	**4-5**	**4**

52. Have you been admitted to a hospital for this condition before? 1=Yes 2=No

53. How many times have you been admitted to a hospital for this condition? …….

54. Have you been advised about the possible outcomes of your illness? 1=Yes 2=No

55. Have you been advised as regards lifestyle changes that you need to make? 1=Yes 2=No

56. How well do you understand the things you can do to ensure that your heart failure symptoms do not get worse i.e. weighing yourself regularly, restricting salt intake, restricting fluid intake.

1=I don't understand

2=I don't understand very well

3=I understand a little

4=I understand most of the things

5=I fully understand

57. What do you do if find that you have added weight?

1=Consult a doctor

2=Increase my diuretic dose

3=Decrease fluid intake

4=Nothing

Section 5: Comorbidities associated with CHF

	Disease	**Present**	**abs**	**Date diagnosed**	**Duration of illness**
57	Breast cancer				
58	CKD				
59	Anemia				
60	Diabetes Mellitus				
61	Ischemic Heart Disease				
62	Atrial Fibrillation or Flutter				
63	Peripheral Artery Disease				
64	Acute Coronary Syndrome				
65	valvular Heart Disease				
66	Hyperthyroidism				
67	. Others (specify)				

Section 6: Prevalence and types of adverse drug reactions

	System	**Adverse Drug Reaction**	**1=Yes**	**2=No**
68	CNS	Sleep disturbances		
69		Confusion		
70		Dizziness		
71		Headache		
72		drowsiness		
73		Visual disturbances		
74		Nightmares		
75		Depression		
76	Respiratory System	Cough		

77		Bronchospasm		
78		Shortness of breath.		
79	Cardiovascular System	Cardiac arrhythmias		
80		Bradycardia		
81		Hypovolemia		
82		Symptomatic hypotension		
83		Syncope		
84		Tachycardia		
85		Heart block		
86		Intermittent claudication		
87		Raynaud's phenomena		
88	Hepatic System	Hepatic failure		
		Adverse drug reaction	**1=Yes**	**2=No**
89	GIT	Nausea		
90		Vomiting		
91		Diarrhea		
92	Renal System	Renal dysfunction		
93		Renal failure		
94	Reproductive System	Impotence		
95		Gynecomastia		
96		menstrual irregularities		
97	Acid Base and Electrolyte	Acid base balance		

98	Balance	Hypokalemia		
99		Hyperkalemia		
100		Hypomagnesemia		
101		Hyponatremia		
102	Endocrine System	Hyperglycemia		
103		Hypoglycemia		
104	Immune system	Rash		
105		Angioedema		
106		Inflammatory related pain		
107		Drug-induced SLE		
108	Neuromuscular system	Fatigue		
109		Muscle or bone pain		
110	Blood	Low WBC count		
111		Low Hemoglobin		
112		Low Hematocrit		
113	Others	Possibility of oncogenesis		
114		Dry skin		
115		Dry mouth and eyes		

Laboratory results

	Parameter	**Reading**	**Elevated=1**	**Normal=2**	**Low=3**	**Reference range**
116	Urea					
117	Serum Creatinine					
118	Na^{+}					
119	K^{+}					
120	Mg^{++}					

121	Ca^{++}					

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22nd September 2015

Dr. Lawrence Mirie Kimani
U56/67570/2013
Dept.of Pharmaceutics and Pharmacy Practice
School of Pharmacy
University of Nairobi

Dear Dr.Kimani

RESEARCH PROPOSAL: FACTORS THAT AFFECT ADHERENCE TO MEDICINES AMONG PATIENTS WITH CHRONIC HEART FAILURE AT KENYATTA NATIONAL HOSPITAL (P422/06/2015)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above proposal. The approval periods are 22nd September 2015 – 21st September 2016.

This approval is subject to compliance with the following requirements:

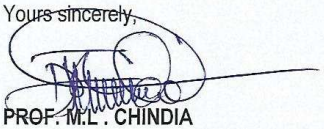
a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
c) Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
g) Submission of an *executive summary* report within 90 days upon completion of the study.
This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website **http://www.erc.uonbi.ac.ke**

KENYATTA NATIONAL HOSPITAL APPROVED 22 SEP 2015

Protect to discover

Yours sincerely,



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