DETERMINANTS OF ADHERENCE TO HAEMODIALYSIS AMONG PATIENTS WITH CHRONIC KIDNEY DISEASE AT MBAGATHI AND AVENUE HOSPITALS IN NAIROBI COUNTY, KENYA

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Determinants of Adherence to Haemodialysis among Patients with Chronic Kidney Disease at Mbagathi and Avenue Hospitals in Nairobi County, Kenya

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University

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This thesis has been submitted for examination with approval from us as the university supervisors

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DEDICATION

I dedicate this work to my family for their patience, support and encouragement during the course of my study and to those who endeavor to search for knowledge for the betterment of mankind.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS/ACRONYMS

BDI   Beck's Depression Inventory

CKD   Chronic Kidney Disease

DM   Diabetes Mellitus

ESRD   End Stage Renal Disease

HD   Haemodialysis

HIV   Human Immunodeficiency Virus

HRQOL   Health Related Quality of Life

HTN   Hypertension

JKUAT   Jomo Kenyatta University of Agriculture and Technology

KNDS   Kenya National Diabetes Strategy

NHIF   National Hospital Insurance Fund

SPSS   Statistical Package for Social Sciences

VCT   Voluntary Couselling and Testing

OPERATIONAL DEFINITION OF TERMS

Adherence to haemodialysis   Doing 2-3 sessions of dialysis in a week with each lasting 4-5 hours, not missing scheduled dialysis sessions or rescheduling prescribed dialysis session.

Chronic kidney disease   Term that encompasses all degrees of decreased renal function, from damaged to at risk through mild, moderate and severe chronic kidney failure.

CKD spectrum   Ranges from stage 1 to stage 5 with stage 1 being mild disease and stage 5 being end stage renal disease.

End stage renal stage   Stage 5 of chronic kidney disease.

Determinants   Factors affecting adherence to haemodialysis.

Haemodialysis   Renal replacement therapy for treating chronic kidney disease that is done in two to three sessions in a week and lasts four to five hours long.

Health related quality of life   Subjective assessment of impact of chronic kidney disease and treatment across the physical, physiological, social, somatic domains of functioning and well-being.

Kenya renal association   A professional body for Kenya's nephrologists and renal scientists that promotes and disseminates research that may ultimately improve outcomes for patients with kidney disease.

Ministry of Health   Department of health in Kenya that is tasked with improving, promoting and protecting the health and general well-being of Kenyans.

Non-adherence to haemodialysis Doing fewer than two sessions of dialysis in a week, shortening the number of hours required for dialysis, missing scheduled dialysis sessions and rescheduling prescribed dialysis session.

Patient   A chronic kidney disease patient on maintenance haemodialysis.

Prevalence   Proportion of population with chronic kidney disease in the study period.

Renal transplant   Organ transplant of a kidney to an end stage renal disease patient.

Renal unit   Critical care unit providing outpatient dialysis services for chronic kidney disease patients.

Risk factor   Attribute that increases chances of developing chronic kidney disease.

ABSTRACT

Globally chronic kidney disease (CKD) is on the increase and has become a health concern in many countries. Diabetes mellitus (DM), hypertension (HTN) and Human immunodeficiency virus (HIV) have been associated with an increased prevalence of CKD. Haemodialysis (HD) remains the preferred modality of treatment since it is less expensive when compared to other renal replacement treatment modalities like kidney transplantation. Poor adherence to HD is a common problem in CKD patients and is associated with many factors. Consequently, poor adherence is associated with an increase in morbidity, mortality and poor health related quality of life (HRQOL) in CKD patients. The purpose of this study was to establish the determinants of adherence to HD among patients with CKD at Mbagathi and Avenue hospitals in Nairobi County. An analytical cross-sectional study was carried out at Avenue and Mbagathi hospitals. A total of 37 patients were recruited in the study. Data was collected through a researcher administered modified end stage renal disease adherence questionnaire (ESRD-AQ) and a self-administered Beck's depression inventory (BDI) questionnaire. Data was analyzed using Statistical package for social scientists (SPSS) version 22.0. Descriptive statistics were used to analyze and describe socio-demographic characteristics, adherence to HD, therapy and health system related factors. Fischer's exact test and ordinal logistic regression were computed to determine associations between the independent and the dependent variables. Statistical significance was set at <0.05 at 95% Confidence intervals. The study was approved by Nairobi Hospital Bioethics and Research Committee (NHBRC) and licenced by National Commission for Science Technology and Innovation (NACOSTI). The findings revealed that 51.85% of the participants in Avenue hospital had high adherence to HD while 80% of the participants in Mbagathi hospital had low adherence to HD. In Avenue hospital, presence of cramping (p=0.002) and distance to hospital (p=0.005) were significantly associated with non-adherence to HD. In Mbagathi hospital, distance to hospital (p=0.022) was significantly associated with non-adherence to HD. In conclusion, the study demonstrated that 48.5% of the participants in Avenue hospital and 80% of the participants in Mbagathi hospital were non-adherent to HD treatment. Presence of cramping and distance to hospital were associated with non-adherence to HD. Based on the findings, the study recommends that there is need to educate the patients on the importance of adherence to HD. Nurses should calculate adequate ultrafiltration to prevent cramping. Referring of patients to alternate nearby dialysis facilities is recommended.

CHAPTER ONE

INTRODUCTION

1.1 Background information

Globally chronic kidney disease (CKD) is on the increase and has become a public health concern in many countries because of the increasing number of patients maintained on haemodialysis (HD) (Yuen *et al.,* 2016). Diabetes mellitus (DM), hypertension (HTN) and Human immunodeficiency virus (HIV) have been associated with an increased prevalence of CKD and by 2030, the prevalence of CKD is estimated to be 522 million from 336 million in 2012 (Yusop *et al.,* 2013). CKD was position 27 in 1990 as a leading cause of mortality but moved to position 18 in 2010 as a leading cause of mortality (Jha *et al.,* 2013).

CKD is a spectrum ranging from stage 1 to stage 5 with stage 1 being mild disease and stage 5 being end stage kidney disease (ESRD). CKD requires renal replacement therapy in the form of peritoneal dialysis, HD or renal transplant. Kidney transplants remain the best choice of treatment for kidney failure but due to shortage of kidney donors and resource constraints, kidney transplantation procedure faces a limitation. This makes HD to be the preferred modality of treatment since it is less expensive (Naalweh *et al.,* 2017).

A patient on HD requires two to three sessions in a week with each session being 4-5 hours long. An increase in morbidity and mortality in CKD patients has been associated with poor adherence to HD (Rampsek *et al.,* 2017). Non-adherence to HD occurs when a patient does fewer than two sessions of dialysis in a week, shortens the number of hours required for dialysis, misses scheduled dialysis sessions or reschedules prescribed dialysis session. According to Shariff *et al.* (2015) due to the increase in CKD prevalence, it is necessary to manage the CKD patients on dialysis so as to prevent further deterioration of kidney disease and therefore this makes adherence to prescribed dialysis treatment essential.

Globally, adherence to HD is a challenge in treatment of CKD patients. According to a study done by Chironda *et al.* (2014) in Zimbabwe, 50% of CKD patients were not adherent to the HD treatment regimen, 93% missed at least one HD session, 61% missed scheduled HD sessions and 77% rescheduled the prescribed dialysis sessions more than once. Additionally, a study done by Duong *et al.* (2015) in Vietnam found that adherence to HD was problematic with 50% of CKD patients missing their sessions, 11% requiring extra treatment and 12% shortening their dialysis sessions.

Non-adherence to HD is detrimental and is associated with increased mortalities, admissions and decreased HRQOL, (Chironda *et al.,* 2016). Additionally, missed, rescheduled and shortened HD sessions have been attributed to socio-demographic, health system related, therapy related, psychological related and pathophysiological related factors (Chironda *et al.,* 2016). For instance, Mukakarangwa *et al.* (2018) found that age, religion, education level and income status were significant socio-demographic factors that contribute to non-adherence to HD in Rwanda.

The prevalence of CKD is an issue in Africa. CKD prevalence is at 10.7% in Nigeria (Plattner *et al.,* 2013), 4% in Ghana (Osafo *et al.,* 2012) and 7.5% in Tanzania. According to Stanifer *et al.* (2016) in Africa CKD affects mainly young adults who are in their productive years. Additionally, most of these patients are put on HD treatment and therefore, adherence to treatment is paramount so as to halt progression of the disease (Stanifer *et al.,* 2016).

In Kenya, there is increased prevalence of CKD especially among young people (Cherono *et al.,* 2017). According to MOH, (2017) approximately 4 million Kenyans have CKD and only 10,000 have access to dialysis services. This is as a result of lack of enough HD machines and knowledge deficit on availability of dialysis services. As of 2017, there were 74 dialysis units across the country with each unit averaging 5 dialysis machines. In addition, the level of awareness on CKD is low and hence this has resulted in more complications of CKD in the young population (MOH, 2017).

Furthermore, clinical experience from the two hospitals studied reveals that there is poor adherence to HD treatment regimen. Moreover, the records in these two hospitals reveal cases of frequent hospital visits, admissions as well as mortalities which are attributable to poor adherence to HD treatment regimen.

1.2 Statement of the problem

The burden of CKD in sub-Saharan Africa exceeds that of developed countries, with prevalence estimates ranging between 5% and 17%. In Tanzania, CKD is reported to be present in 7% of the general population, while in urban areas, the prevalence among adults is estimated to be 15%. However, despite this high burden of CKD, awareness about it and its implications is still very low (Stanifer *et al.,* 2015). In Kenya, 4 million people have chronic kidney disease and among these only 10,000 have access to dialysis services. This therefore demonstrates that CKD is a menace in developing countries and lack of access to dialysis services demonstrates the magnitude of the problem that CKD can have on the population.

Even though many CKD patients are put on HD, it requires strict adherence to have the best possible treatment results. Globally, about 50% of individuals with CKD on maintenance HD are not adherent to treatment regimen (Duong *et al.,* 2015).

In Kenya, clinical experience in renal units in both public and private hospitals show that there is poor adherence to HD. Furthermore, there is scanty information on level of and specific determinants of adherence to HD.

In Mbagathi hospital, clinical experience from the nurses reveals that there is poor adherence to HD among the patients on maintenance dialysis. Between the months of February and June 2020, three patients on maintenance dialysis had passed away (Renal unit patient register, 2020). In Avenue Hospital, there is also evidence of poor adherence to HD. Records of the facility indicate that there are increased mortalities and admissions associated with poor adherence to HD (Avenue Hospital Annual Report, 2018). According to the report, in 2018, 2 patients on maintenance HD had died in a span of 4 months and 5 patients had been admitted with complications of poor adherence to HD treatment.

Although levels of and different factors affecting adherence to HD have been established in other parts of the globe, there are no local studies that have been done to establish the level of and the specific determinants of adherence to HD. Therefore, a need existed to establish the level of and factors affecting adherence to HD among patients with end-stage renal disease in these hospitals.

1.3 Justification

Since CKD is on the rise globally, treatment using HD is common. It is therefore important to adhere to renal replacement therapy. Poor adherence is associated with poor patient outcomes and decreased HRQOL. Therefore, this study offers an opportunity to explore the level of adherence to HD in Avenue and Mbagathi hospitals and other model hospitals while providing literature for future studies.

This study hopes to identify the factors affecting adherence to HD. Understanding these factors will make it possible to intervene on them so as to increase adherence levels. This will in turn reduce the incidences of complications associated with poor adherence to dialysis schedule.

In management, this study will assist the managers in the two renal units to come up with better guidelines that will assist in improving adherence to HD. The study also hopes to create awareness among patients about alternative means of health financing.

Finally, there are few local studies on level of and determinants of adherence to HD. This study will therefore act as a reference point for other researchers.

1.4 Research questions

i. What is the level of adherence to HD among patients with CKD at Mbagathi and Avenue Hospitals?
ii. Which socio-demographic factors affect adherence to HD among patients with CKD at Mbagathi and Avenue Hospitals?

iii. What are the therapy related factors affecting adherence to HD among patients with CKD at Mbagathi and Avenue Hospitals?

iv. Which health system related factors influence adherence to HD among patients with CKD at Mbagathi and Avenue Hospitals?

1.5 Broad objective of the study

To establish the determinants of adherence to HD among patients with CKD at Mbagathi and Avenue hospitals in Nairobi county.

1.6 Specific objectives

i. To establish the level of adherence to HD among patients with CKD at Mbagathi and Avenue Hospitals.

ii. To determine the socio-demographic factors affecting adherence to HD among patients with CKD at Mbagathi and Avenue Hospitals.

iii. To assess the therapy related factors affecting adherence to HD among patients with CKD at Mbagathi and Avenue Hospitals.

iv. To determine the health system related factors affecting adherence to HD among patients with CKD at Mbagathi and Avenue Hospitals.

1.7 Hypotheses

Ho_1: There is no significant association between socio-demographic factors and adherence to HD.

$H1$: There is a significant association between socio-demographic factors and adherence to HD.

Ho_2: There is no significant association between therapy related factors and adherence to HD.

$H1$: There is a significant association between therapy related factors and adherence to HD.

Ho_3: There is no significant association between health system related factors and adherence to HD.

H1: There is a significant association between health system related factors and adherence to HD.

1.8 Theoretical framework

The theoretical framework that was used in this study was the health belief model. The model was developed by Rosenstock in the1950's so as to comprehend the widespread failure of Tuberculosis screening programmes in the USA (Siddiqui *et al.,* 2016).

The model has been used successfully by Peikani *et al.* (2018) to assess the effect of the model on behaviours preventing peritonitis in patients on peritoneal dialysis. In the study, she found that the designing and implementation of health belief model based education programs for patients on peritoneal dialysis was beneficial in preventing peritonitis and reinforcing adherence. She therefore championed for the use of health belief model in promoting behaviors preventing peritonitis and enhancing adherence.

The model aims to predict belief and attitude about health in a person especially in regard to utilization of health services. The model is applied to understand patient's adherence to medical regime in chronic illnesses. The theory postulates that people's beliefs about health problems, perceived benefits of action and barriers to action and self-efficacy explain engagement or lack of engagement in health promoting behaviour. A stimulus or a cue to action must also be present in order to trigger the health promoting behaviour (Glanz *et al.,* 2015.).

The constructs of health belief model include: 1. Individual perceptions that are explained by perceived susceptibility and perceived seriousness. 2. Modifying variables that include demographic, psychosocial and structural variables. Demographic variables include age, sex, race, ethnicity and education. Psychosocial variables include personality, social class, peer and group pressure. Structural variables include knowledge about a given disease and prior contact with the disease. 3. Likelihood of action that is explained by perceived benefits that increases the

likelihood of taking recommended preventive health action leading to behaviour change (Glanz *et al.,* 2015).

1.8.1 Application of the theory in this study

Glanz *et al.* (2015) states that the health belief model predicts the belief and attitude about health in a person especially in regard to utilization of health services. In this study, utilization of health services equates to the use of HD services. Furthermore, the perceived benefits of action in this study is presented as importance of adhering to HD schedule.

The constructs of health belief model that are borrowed for use in this study include modifying variables and change in behaviour. Modifying variables have been shown to influence the likelihood of engaging in a health seeking behaviour. This makes modifying variables as the independent predictors of the likelihood to engage in a health seeking behaviour. Therefore, the modifying variables in the study include socio demographic, therapy related and health system related factors which act as the independent variables. In this study, behaviour change is adherence to HD by CKD patients. The adherence to HD is thus dependent on the modifying variables making it the dependent variable as shown in the conceptual framework below.

1.9 Conceptual Framework

Independent Variables

Patient related factors

- Age
- Area of residence
- Depression
- Level of education
- Gender
- Employment status
- Income status
- Social support
- Duration of CKD
- Occupation
- Religion

Therapy related factors

- Muscle cramps
- Intradialytic hypotension
- Poor blood flow
- Clotting dialyzer
- Machine malfunction
- Bathroom use
- Restlessness
- Hypertensive emergencies

Health system related factors

- Distance to hospital
- Cost of haemodialysis

Dependent Variable

Adherence to haemodialysis

Figure 1.1: Conceptual framework

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter covers available literature on CKD, HD procedure, level of adherence to HD, and determinants of adherence to HD in other studies. To achieve this, the researcher searched several databases including different university library digital repositories, PubMed, Google Scholar, Hinari, Medscape, Scopus and Cross Ref.

2.2 Chronic kidney disease

2.2.1 Definition

CKD is a term that encompasses all degrees of decreased renal function, from damaged to at risk through mild, moderate and severe chronic kidney failure. Age is a significant risk factor for CKD with prevalence being high in people above 65 years (Mallappallil *et al.,* 2014). CKD is defined as either kidney damage or a decreased glomerular filtration rate (GFR) of less than 60ml/min/1.73m² for at least 3 months (Kidney Disease Outcomes Quality Initiative, 2013).

2.2.2 Staging of CKD

CKD occurs in stages. The different stages form a continuum. According to the kidney diseases improving global outcomes (KDIGO) the stages are classified as follows:

- Stage 1: Kidney damage with normal or increased GFR (>90 mL/min/1.73 m²)
- Stage 2: Mild reduction in GFR (60-89 mL/min/1.73 m²)
- Stage 3a: Moderate reduction in GFR (45-59 mL/min/1.73 m²)
- Stage 3b: Moderate reduction in GFR (30-44 mL/min/1.73 m²)
- Stage 4: Severe reduction in GFR (15-29 mL/min/1.73 m²)
- Stage 5: Kidney failure (GFR < 15 mL/min/1.73 m² or dialysis)

In stages 1 and 2, measurement of only GFR is not enough to confirm diagnosis because these patient's GFR may be normal or borderline. In such cases other kidney damage markers like albumin, urine sediment abnormalities, electrolyte and other abnormalities due to tubular disorders, histologic abnormalities and structural abnormalities should be tested to establish a diagnosis of CKD stage 1 and stage 2. In CKD stage 1-3, patients may be asymptomatic but in stages 4-5, signs and symptoms resulting from low kidney function appear (Kidney Disease Outcomes Quality Initiative KDOQI, 2013).

2.2.3 Signs and symptoms of CKD

In stages 4-5, endocrine and metabolic derangements in water and electrolytes start to manifest (KDIGO, 2013). In these stages, clinical manifestations are classified into: protein energy malnutrition, loss of lean body mass, muscle weakness, peripheral oedema, pulmonary oedema, hypertension, anaemia, pericarditis, encephalopathy, peripheral neuropathy, restless leg syndrome, nausea, vomiting, anorexia, diarrhea, skin manifestations, fatigue, malnutrition, erectile dysfunction, decreased libido, amenorrhoea and decreased platelet function (National Kidney Foundation, 2013).

2.2.4 Pathophysiology

A loss of 50% of the nephrons results in CKD. Nephron is the functional unit of the kidney. In a normally healthy kidney, there are about 750,000-1 million nephrons that contribute to total GFR. In case of renal injury, the kidney has an innate ability to maintain GFR despite progressive destruction of nephrons as the remaining nephrons manifest hyper-filtration and compensatory hypertrophy. This nephron adaptability allows for continued normal clearance of plasma solutes. The plasma solute levels of urea and creatinine start to show measurable increase only after total GFR has decreased by 50%. The hyper-filtration and hypertrophy of residual nephrons although beneficial, has been shown to represent a major cause of progressive renal dysfunction. The increase in capillary pressure damages capillaries and leads to glomerulosclerosis. The glomerulosclerosis leads to development of

lesions that affect the functioning of the kidney and leads to CKD (National Kidney Foundation, 2013).

2.2.5 Risk factors for CKD

Factors that have been identified to be potentially leading to CKD include glomerular hypertension, systemic hypertension, nephrotoxins like non-steroidal anti-inflammatory drugs, intravenous contrast media, aminoglycosides and amphotericin B, decreased perfusion, proteinuria, hyperlipidemia, hyper-phosphatemia with calcium phosphate deposition, smoking and uncontrolled DM (National Kidney Foundation, 2013). According to Thakar *et al.* (2011) there is a strong association between recurrent AKI episodes and DM co-morbidity in developing CKD.

In Africa, HTN is the leading risk factor that predisposes a person to develop CKD with ranges of 4% in Northern Africa, 11% in Eastern Africa, 16% in Central Africa, 16.5% in Western Africa and 12.2% in Southern Africa. Other causes of CKD in Africa are diabetic nephropathy (15%), chronic glomerulonephritis (13%), tubular obstruction (8%), primary glomerular disease (6%), systemic lupus erythromatosus (3%), polycystic kidney disease (3%) and HIV associated nephropathy (2-46%) (Abd *et al.,* 2018).

In Africa, approximately 10 million people are affected by DM and it is estimated that by 2025, 12.7 million people in Africa will be having DM. The prevalence of diabetic nephropathy is estimated to be 15% which has been associated with increased cases of CKD (Abd *et al.,* 2018). In Kenya the prevalence of diabetes is about 3.3%. This figure is projected to rise to 4.5% by 2025 if this trend is not checked (Kenya National Diabetes Survey, 2015). This therefore increases the likelihood of the Kenyan population developing diabetic nephropathy in the future.

2.2.6 Management of CKD

According to the National Kidney Foundation, (2013) early diagnosis and treatment of underlying cause or institution of secondary preventive measures is imperative in

CKD patients. The guidelines for CKD treatment focuses on; delaying or halting the progression of CKD by treating underlying condition if possible, diagnosing and treating the pathologic manifestations of CKD, and timely planning for long-term renal replacement therapy. CKD is associated with many pathologic manifestations. According to National Kidney Foundation, (2013), the pathologic manifestations of CKD are treated as follows:

- Anaemia- treated with erythropoiesis stimulating agents.
- Hyperphosphatemia-treated with dietary phosphate binders and dietary phosphate restriction.
- Hypocalcaemia-treated with calcium supplements with or without calcitrol.
- Hyperparathyroidism-treated with calcitrol or vitamin D analogues or calcimimetics.
- Volume overload-treated with loop diuretics and ultrafiltration.
- Metabolic acidosis- treated with oral alkali supplementation.
- Uraemic manifestations-treated with renal replacement therapy (HD, peritoneal dialysis or renal transplantation).

2.3 Renal replacement therapy (RRT)

Indications for RRT include: volume overload, life-threatening hyperkalemia or refractory metabolic acidosis and removal of toxins (e.g. ethylene glycol). There are different modes of renal replacement therapy that include, peritoneal dialysis, haemodialysis, slow continuous ultrafiltration, continuous veno-venous hemofiltration, continuous veno venous haemodialysis and continuous veno-venous hemodiafitration.

Peritoneal dialysis uses ultrafiltration and diffusion principles. Ultrafiltration allows for exchange of solutes and movement of fluid across the semi-permeable peritoneal membrane. Diffusion allows for exchange of solutes across their concentration gradient between peritoneal capillaries and dialysis solution that is instilled into the peritoneal cavity (Samuel *et al.,* 2020).

According to Alvarez *et al.* (2019), slow continuous ultrafiltration is used to remove excess water from the plasma without electrolyte or acid-base imbalances. Blood passes through the fibres of the HD filter at higher pressures than the surrounding fibres. He further states that in continuous veno-venous hemofiltration, convection is utilized to remove solutes through large fluid volumes via ultrafiltration. Convection moves with the solutes together with the fluid independent of their concentartion gradient.

In continuous veno-venous HD, counter current dialysate flow is used to remove small solutes through diffusion according to the gradient of their concentration. Solute clearance is increased with higher dialysate or blood flow rates. Continuous veno-venous hemodiafitration uses diffusive and convective dialysis. The ultrafiltrate can either be replaced by fluid replacement as in hemofiltration and the counter current dialysate flow (Alvarez *et al.,* 2019).

2.3.1 Haemodialysis

HD is an area of renal and critical care nursing that has developed and continues to develop at a very fast rate. Critical care nurses in this field strive constantly to promote excellence in the application of nursing care and are implementing evidence-based practice. HD depends on diffusion, convection, ultrafiltration and hydrostatic pressure (Thomas *et al.,* 2014).

HD uses diffusion to remove solutes. The removal of the solutes is driven by the concentration gradient of solutes across a semi-permeable membrane. Concentration gradient is maintained by countercurrent exchange of blood and dialysis fluid in a dialysis membrane. The two are driven in opposite directions at a ratio of 1:2. Blood moves across the dialysis membrane at a rate of 200-300ml/min whereas the dialysis fluid moves on the other side of the membrane about twice as fast at a rate of 500-800ml/min. Large bore, double lumen catheters or arterio-venous fistulas are used as accesses during HD (Tolwani *et al.,* 2012).

The major advantage of HD is the rapid clearance of small solutes. Within two hours of HD, accumulation of life threatening potassium, lactic acid or nitrogenous wastes

like creatinine and urea are cleared. The disadvantages of HD include, limited removal of inflammatory cytokines and a need to maintain blood flow of 200-300ml/min through dialysis chamber that creates a risk of hypotension that occurs in one third of HD treatments (Tolwani *et al.,* 2012).

2.4 Adherence to HD

Management of CKD involves medication administration, fluid restriction, dietary restriction and dialysis. This comprehensive management helps slow down the disease progression and its complications. However, non-adherence to dialysis among CKD patients ranges from 2-50% globally. Non-adherence to HD leads to serious life threatening complications which include chronic anaemia, brain dysfunction, congestive cardiac failure, leucopenia, thrombocytopenia, sepsis and pulmonary oedema (Griva *et al.,* 2014).

Non-adherence to dialysis has resulted in increased in mortalities worldwide. Additionally, poor adherence to dialysis leads to poor response to medication, unnecessary tests, treatment plan changes, emergency department visits, hospitalizations and decreased HRQOL that eventually increase the cost of medical care (Chironda *et al.,* 2016).

Studies reveal that poor adherence to HD creates an economic burden to the patient and healthcare system. Therefore, the detrimental effect of non-adherence to dialysis needs consideration as it imparts negatively not only to the healthcare system but also to the health related quality of life of CKD patients (Griva *et al.,* 2014).

2.5 Determinants of adherence to HD

Globally, adherence to HD among CKD patients has been associated with different factors. According to a systematic review by Bhengu *et al.,* (2016), social economic, psychological, therapy related, pathophysiological and health system related factors are some of the factors identified as contributing to poor adherence to HD.

2.5.1 Patient related factors

According to Magacho *et al.* (2011), low social economic status is common among CKD patients where majority of the patients are unemployed. Disorders that predispose CKD to progress have been associated with poverty. In addition, poverty worsens the outcomes and adherence to HD in those already with CKD. Statistics show that 60% of people in the lower social economic status are at risk of getting CKD than people of higher social economic status (Vivekanand *et al.,* 2013).

CKD patients have a decreased ability to work and be productive and therefore work ineffectively and are unable to provide for their families (Harilall *et al.,* 2011). Some researches reveal that half of the patients receiving HD are unable to maintain their profession and have to retire early after the commencement of HD. Other studies have also revealed consistent associations between adherence to HD and being unemployed (Vivekanand *et al.,* 2013).

Dialysis is expensive and cost of dialysis has been identified as one of the causes of non-adherence to HD in several studies. In developing countries, access to health care insurance is difficult which makes CKD care expensive and unaffordable. In turn this affects the adherence to HD (Mushi *et al.,* 2015). In low income countries, majority of CKD patients starting dialysis stop treatment within 3 months of initiation of the treatment due to cost constraints (World Kidney Day, 2017). In a systematic review by Mushi *et al.,* 2015, reduction in number of dialysis sessions and eventual cessation of therapy has been associated with limited economic resource of patients in developing countries.

Personal and social life in patients with CKD is affected and support from friends, family and renal health professionals has been found to influence adherence to HD (Clarke *et al.,* 2015). Family support has significant influence on the patient when they are involved in the care of the patient. Treatment of CKD can restrict employment, family life, daily activities and social relationships. Social support improves survival and HRQOL in HD patients. Therefore it is imperative to address all aspects of the patient's experiences since if they are not addressed it can lead to

feelings of isolation which may in turn lead to poor adherence to HD (Clarke *et al.,* 2015). Combes *et al.* (2016) emphasizes that emotional support from family, friends and renal professionals is important to assist CKD patients to make the necessary changes required to cope and adapt. Peer support enhances feelings of validation, hope for the future grows and experiences are normalized. Additionally, peer mentoring improves depression, self-management, self-esteem, social isolation and leads to better adherence to HD and HRQOL (Combes *et al.,* 2016).

Age has been identified in other studies to be a major factor in non-adherence to HD. Younger patients are less adherent as compared to older patients (Mukakarangwa *et al.,* 2018). According to Kutner *et al.* (2013), non-adherence to HD treatment is more prevalent in the male gender.

Level of education has been associated with adherence to HD since low level of education leads to decreased knowledge of disease and treatment modalities (Chironda *et al.,* 2016). Health literacy is low in HD patients and when combined with regimen complexity, it may lead to non-adherence. James *et al.* (2013), confirms that an inadequate level of health literacy makes it hard to follow instructions in HD patients and this makes it hard for them to adhere to HD treatment. Low literacy has been associated with more hospitalizations, increased emergency care use, decreased adherence to treatment plans, diminishing health status and higher mortality rates among ESRD patients (Berkman *et al.,* 2011).

Health belief, culture and religion have an impact on how a patient adheres to HD treatment. In a research in Rwanda, religion was associated with poor adherence to HD among ESRD patients on maintenance dialysis (Mukakarangwa *et al.,* 2018).

According to Chironda *et al.* (2016), interpersonal dynamics of health care workers and patient play a critical role in establishing a variety of patient outcomes including adherence to treatment plans. Researches reveal that renal health professionals who communicate well with their patients and encourage them to be involved in their own care make them be motivated to adhere to HD treatment. Also empathetic communication improves adherence to HD as it fosters understanding of patient's

perspectives. Informed patients are also motivated to adhere to treatment recommendations (Clark *et al.*, 2015).

Psychiatric disorders are common in CKD patients with depression being the most common psychological problem. According to Thomas *et al.* (2014), depression is experienced in 2–10% of the general population but in dialysis patients, it has a prevalence of 20-30%. These findings by Thomas *et al.* (2014) are also supported by Mosleh *et al.* (2020), who found that the prevalence of depression and other depressive conditions in CKD patients was 26.4% in his study in Saudi Arabia.

Depressed patients often have reduced quality of life, impairment of functions, compounded pain, and worse HD treatment adherence (Thomas *et al.*, 2014). In addition, they have more episodes of hospitalization and increased mortality. Additionally, those patients who are depressed have been found to be 3 times more likely to be non-adherent to HD treatment than non-depressed CKD patients.

Diagnosis of depression is managed only in a minority of CKD patients, in spite of the high predominance and poor outcomes related to depression in dialysis (Holley *et al.*, 2013). Holley also asserts that depression can impact upon the patient and his/her partner and family's response to management and participation in advance care planning. Studies reveal that depression is related to decreased adherence to HD treatment. This is also identified by Khalil *et al.* (2011) in his study where he reports that depressive symptoms contributed to non-adherence to fluid and dietary intake among CKD patients.

According to Tsai *et al.* (2015), the likelihood of developing depression in CKD patients is 2-10 times higher than in the general population and it is estimated to be between 20-44%. Furthermore, in his study Tsai *et al.* (2015), found that depression in CKD patients was associated with lower HRQOL, decreased adherence to dialysis prescription, greater medical co-morbidity and decreased survival. According to Chan *et al.* (2014), untreated depression, psychiatric illnesses, pain and gastrointestinal discomfort increased the risk of missing HD treatment. In addition, CKD is associated with biochemical imbalances, physiological changes, disturbances

17

in neurological function, cognitive impairment and additional stressors that lead to depression in CKD patients (Zalai *et al.,* 2012).

According to the American Kidney Fund (2017), CKD patients have many stressors on top of the normal day to day activities which include financial burden that increase the risk of suffering from depression compared to the general public. According to Thomas *et al.* (2014), reduced energy, fatigue, sleep disorders, reduced appetite and difficulties concentrating are physical symptoms that are typical of depression. Holley *et al.* (2013) further states that feelings of sadness or lack of interest in activities are physical symptoms associated with depression in CKD patients which may lead to poor adherence to HD treatment regimen.

Furthermore, phenomenological studies done by the American Kidney Fund (2017), indicate that the common feelings and experiences of CKD patients with depression include: regular pain and difficulty in sleeping, anxiety that their life is in the hands of those who care for them and their disease and unwanted feelings of dependence on health care providers and HD machine. In addition, feelings of powerlessness over the disease, inability to stand up to societal pressures at the expense of their own health care needs and feelings of hopelessness as there is ultimately no cure for kidney disease are common. These feelings and experiences increase the likelihood of missing dialysis since the patients may view the burden of the disease as being too much. Therefore, screening for depression in patients on dialysis is of importance because of the significance it has on the patient outcomes and overall goals of treatment.

According to Zalai *et al.* (2012), other psychological factors like irrational thoughts, alteration in perceptual behaviors, cognitive trickery and utilization of denial as a way of coping have been associated with non-adherence to HD. Zalai *et al.* (*2012)* also reports that disturbance in self-concept may lead to depression that is associated with suicidal ideations and poor self-esteem and is manifested by poor self-hygiene, excessive dependency and decreased adherence to treatment requirements. According to a study done in Zimbabwe by Chironda *et al.* (2014) a patient's perceived physical strength can reduce adherence to HD treatment regimen among

CKD patients. Chironda *et al.* also found that patient beliefs about their physical health influences adherence and adjustment to dialysis treatment.

2.5.2 Therapy related factors

Therapy related factors refer to the side effects of HD. These factors include muscle cramps, bleeding, intradialytic hypotension, poor blood flow, dialyzer issues, machine malfunction, restlessness and hypertensive emergencies. Muscle cramps are common among HD patients and are the leading cause of non-adherence to HD (Lynch *et al.*, 2014). Muscle cramps are associated with the volume of ultrafiltration removed and occur in 10% of HD sessions (Punj *et al.*, 2020).

According to Lynch *et al.* (2014), 17.9% of CKD patients have had early disconnection from HD treatment due to muscle cramps. The cramps usually have their onset towards the end of HD session and sometime precede hypotension. Muscle cramps that are recurrent usually lead to non-adherence to HD treatment and impacts HRQOL (Punj *et al.*, 2020).

Intradialytic hypotension, poor blood flow and clotting dialyzer are other therapy related factors that have been associated with adherence to HD (Benedict *et al.*, 2020). About 10-12% of patients develop intradialytic hypotension (Benedict *et. al.*, 2020). Intradialytic hypotension is a fall in systolic or mean arterial pressure of 20mmHg or greater in combination with symptoms requiring intervention (Flythe *et al.*, 2015).

According to Bhengu *et al.* (2016), being on treatment for an extended period, physical fatigue, bathroom use during dialysis, tiredness, lack of energy, nausea and cramps are some of the therapy related factors that have been associated with poor compliance to HD. Furthermore, Bhengu *et al.*, emphasizes that these symptoms significantly limit performance of activities of daily living.

2.5.3 Health system related factors.

In developing countries, availability, affordability and accessibility of RRT services is not easy. This has led to non-adherence to prescribed treatment (Bhengu *et al.,* 2016). In developed countries, access to RRT services is good but in Africa and other developing nations, access and availability to RRT and especially HD is not easy since some of the patients reside far from existing HD centers. In addition, they have to commute long distances to receive dialysis that results in dialysis inadequacy which consequently leads to non-compliance to treatment regimen (Sayed *et al.*, 2014).

According to Sayed *et al.* (2014), transport problems are the most common cause of absence and late appearance to scheduled HD sessions. According to Thadhani *et al.* (2014), patients who traveled to dialysis centres via a transportation van or who drove more than 17 minutes to a clinic were at an increased risk of missing their HD treatment. On the other hand, patients with private transportation to the dialysis centre had significantly better attendance and outcomes when compared to patients who relied on public transportation. Moreover, patients indicated that they shortened their dialysis treatments because they were worried about missing their ride home. Maciel *et al.* (2015), in his study in Brazil found out that one of the main obstacles for adherence to HD in CKD patients was difficulties with transportation because of long distance from HD centre.

According to Kariuki *et al.* (2014), shortage of HD machines, lack of comprehensive national hospital insurance fund funding, high patient burden, delays in being connected to HD machine, and poor handling of problems that arose during dialysis are health system related factors identified as contributing to poor adherence to HD among patients on maintenance HD in Kenyatta National Hospital.

CHAPTER THREE

METHODOLOGY

3.1 Study design

The study utilized an analytical cross-sectional study design. These are studies which measure exposure and outcomes at a single time (Setia *et al.,* 2016). This design was chosen because it enables collection of data at one point in time for measurement of association without influence. Data was collected and analyzed to determine the level of and the factors associated with adherence to HD among out-patients with CKD on maintenance HD at Mbagathi and Avenue hospitals.

3.2 Study area

The study was conducted in Mbagathi and Avenue hospitals. Mbagathi hospital is a level 5 referral hospital situated in Dagoretti Sub-county of Nairobi County. The hospital serves a diverse population both within and outside Nairobi with a bulk of the patients being mostly the urban poor. The hospital was set-up mainly to cater for infectious diseases in the neighboring poor communities of Kibera and Kawangware. It is one of the oldest hospitals in Nairobi County. With the introduction of devolution, the hospital has drastically improved. The hospital has a capacity of 200 beds. It offers maternal health, dental, paediatric, VCT, laboratory, therapeutic inpatient, family planning and renal services. The renal unit of the hospital was opened in 2017 and has a capacity of five beds that serves an average of 6 patients in a day and has a list of 15 CKD patients that are residents of the unit. The renal unit was established to help relief Kenyatta National Hospital of the many patients that sought dialysis services at the referral hospital.

Avenue Hospital is a level 5 referral health facility located in Parklands along first avenue lane in Nairobi County. It serves a diverse population both within and outside Nairobi with most of the clients coming from the lower to middle income classes. It was founded in 1976 and has a capacity of 150 beds. The hospital offers medical, surgical, psychiatric, critical care, renal, paediatric, theatre, radiology, outpatient,

pharmacy, laboratory and ambulance services. The renal unit of the hospital was started in 2017 and has a capacity of 7 beds and 7 HD machines. The unit serves a total of 10-15 patients in a day and has a list of 32 CKD patients that are residents of the unit.

These two hospitals were chosen since they have homogeneous patient populations, have almost the same bed capacity, have renal units that were started at almost the same time, have almost the same number of HD machines and are easily accessible.
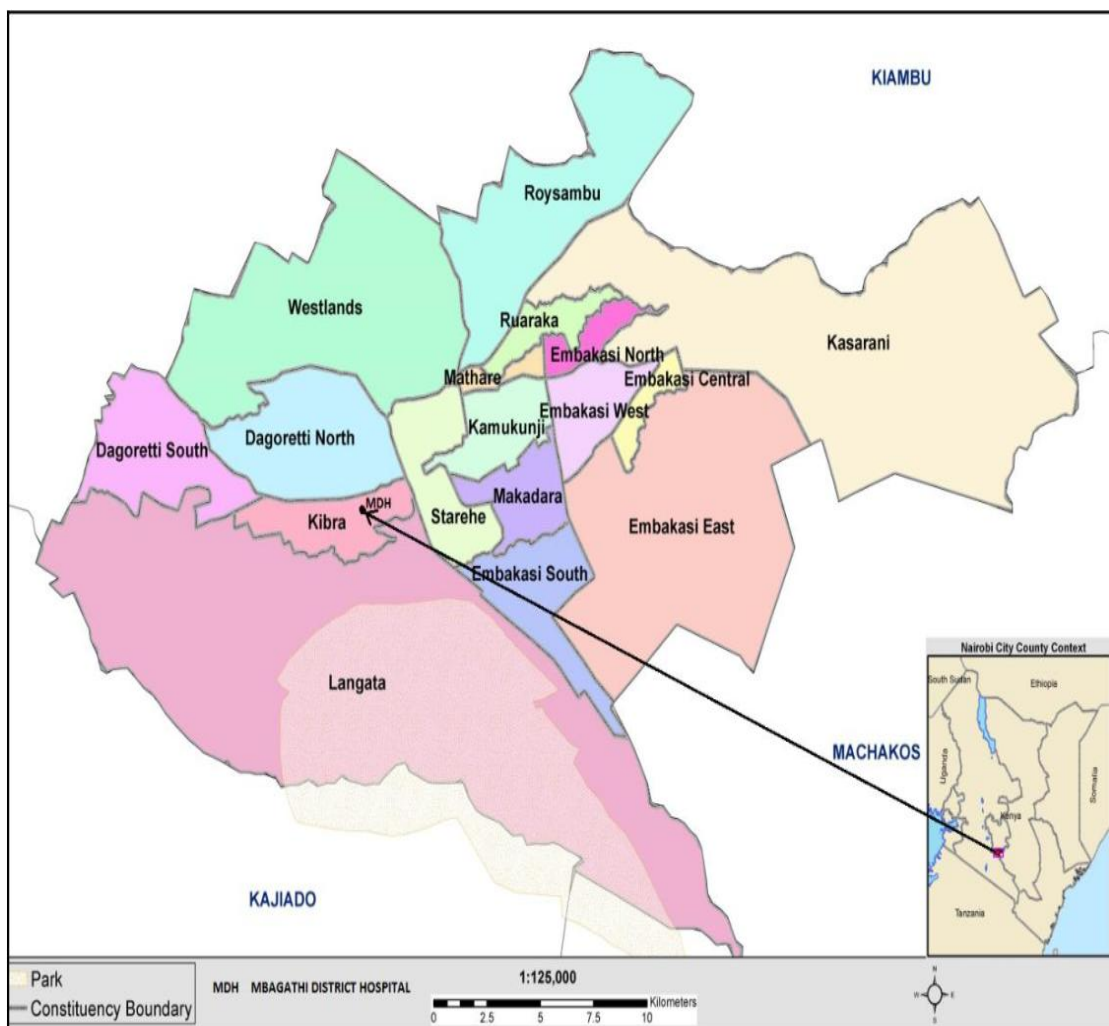
Figure 3.1: Location of Mbagathi Hospital

Figure 3.2: Location of Avenue Hospital.

3.3 Study population and case definition

According Grove *et al.* (2012), a study population is all the elements such as individuals, events or objects that meet the sample criteria for inclusion in a study (target population). In this study, target population consisted of out-patients with CKD on maintenance HD at Mbagathi and Avenue hospitals. Accessible population included the patients attending their HD sessions at the time of the study. Cases were those patients with a GFR of <15ml/min/1.73m².

3.3.1 Sample size determination

The total accessible population of the study was 47 patients as shown in table 3.1 below.

Table 3.1: Total patients on haemodialysis in Avenue and Mbagathi hospitals

Facility	Patients on HD
Mbagathi Hospital	15
Avenue Hospital	32
Total accessible population	47

3.3.2 Sampling method

Sampling is the process of selecting a portion of the population which is an entire aggregate of cases (Grove *et al.,* 2012). According to Polit and Beck, (2013), representativeness is important in research so as to have generalizable results. One of the sampling method that ensures representativeness is census. Therefore, census was used since it gives a total representation of the population and results can be generalized to patients in the two study areas.

3.3.3 Eligibility criteria

Eligibility criteria is used to define population characteristics and consists of inclusion and exclusion criteria (Polit & Beck, 2013). In this study, included were: Outpatient CKD patients who:

- Were on HD.
- Were on HD for more than 3 months.
- Were able to read and write.
- Available at the time of the study.

Excluded were:

- All acute kidney injury patients.

- Critically ill patients who were admitted at the time of the study. Critically ill patients were those patients who were mechanically ventilated.

3.4 Data collection

Data collection tools, method and procedure are important so as to ensure structure, quantifiability, obstructiveness and objectivity (Polit & Beck, 2013). To ensure structure, the data collection tools, method and procedure ensured the gathering of same information from participants in a pre-specified way. The data collection tools also ensured the collection of first hand data from participants thus ensuring objectivity.

3.4.1 Data collection tools

Data was collected using a modified end stage renal disease adherence questionnaire (ESRD-AQ) and Beck's Depression Inventory (BDI). The modified ESRD-AQ was developed by Kim *et al.* (2011). The questionnaire was researcher administered. The questionnaire consisted of four parts. Part one captured the demographic data of the participants and part two gathered information revealing the level of adherence to HD among the participants, part three obtained information revealing therapy related factors affecting adherence to HD and part four captured information revealing health system related factors affecting adherence to HD.

Depression was evaluated using a self-administered Beck's Depression Inventory (BDI) questionnaire. It is a validated tool for depression detection in CKD with sensitivity and specificity of 89% and 88% respectively (Hedayati *et al.,* 2009). Sensitivity is an instrument's ability to identify a case correctly. Specificity is the instrument's ability to identify non-cases correctly. Sensitivity and specificity of 80% or more is acceptable (Trevethan *et al.,* 2017). The BDI has been used to assess depression in CKD patients in numerous studies. The BDI is a 21-item scale that has been validated for depression assessment in HD patients. Scores range from 0-63 and depression is diagnosed if the BDI score is more than or equal to 15. Scores of 15-19 are interpreted as borderline depression, 20-28 as moderate depression and 29-63 as severe depression.

3.4.2 Quality Assurance (reliability and validity of data collection tools)

Validity refers to the degree to which an instrument measures what it is supposed to be measuring. Validity is classified into face validity, construct validity, content validity and criterion related validity (Polit & Beck, 2013). In this study:

- Validity of the data collection tools was ensured through pretesting with 10% of the population.

- Face validity of the ESRD-AQ was ensured through structuring the instrument into four parts. This consisted of parts obtaining data for socio-demographics of the participants, level of adherence to HD, therapy related and health system related factors affecting adherence to HD.

- Content validity was ensured through assessment by experts in nephrology, critical care and medical-surgical nursing to assess whether all contents to be measured are included. The experts had post basic training in nephrology, critical care and medical-surgical nursing.

- Construct validity was ensured by checking items in the data collection instruments against study objectives to ensure all construct under study were measured.

Reliability is the degree of accuracy with which an instrument measures an attribute. The higher the reliability of an instrument, the lower the amount of error in obtained scores. Reliability co-efficient should be least 0.70 to be considered satisfactory. Internal consistency reliability, which refers to the extent to which all the instrument's items are measuring the same attribute, is usually assessed with Cronbach's alpha (Polit & Beck, 2013). In this study:

- Alpha Cronbach was done to test the internal consistency reliability of the modified ESRD-AQ tool. It was found to be 0.741 meaning that the instrument was a reliable measure of adherence to HD. Table 3.2 below summaries this information.

Table 3.2: Reliability statistics

Variable		Cronbach Alpha	No. Of items
Adherence haemodialysis	to	0.741	8

3.4.3 Data collection procedure

Once ethical approval was granted, introduction to the unit in-charges in the two facilities was done. Eligible participants were recruited from the two renal units and since the total accessible population in the two units was 47, a census was done. Introduction to the participants who met the inclusion criteria was done. Study participants were given information on the study purpose and the benefits of the study. The participants were informed that there were no anticipated risks during the study. This helped to facilitate informed consent before participation. The process was repeated for all eligible participants.

Once informed consent was obtained, quantitative data was collected using the researcher administered ESRD-AQ and self-administered BDI questionnaire for assessment of depression. The selected participants were assisted in filling the ESRD-AQ so as to collect relevant data. Once complete, the questionnaires were checked for completeness.

3.5 Data management

3.5.1 Data entry, cleaning and storage

Data was coded and cleaned then entered to SPSS version 22. It was stored under a password protected computer belonging to the investigator. Data backup was done through a secure mailing system and a password protected universal serial bus (USB). This data will be stored safely for a period of up to five years before being destroyed.

3.5.2 Data analysis and presentation

Quantitative data analysis was done using SPSS version 22.0 where stratified analysis was done. Descriptive statistics were done to describe frequencies and percentages of socio-demographic characteristics, adherence to HD, therapy related and health system related factors affecting adherence to HD. In order to measure compliance to HD, a HD scoring system using a likert scale was used. This scoring system had been used by (Mukakarangwa *et al.,* 2018; Chironda *et al.,* 2016).

In the HD scoring system, the responses on adherence level to HD from the modified ESRD-AQ were classified in a likert scale and then scores were calculated to reveal the level of adherence to HD in the form of percentages. A score of more than 80% was classified as high adherence, a score of 70-79% as moderate adherence and a score of below 70% as low adherence. The scoring system for this study had a minimum attainable score of 10 and a maximum attainable score of 34. To get a percentage score, the researcher divided the attained score from HD adherence section by the maximum possible score of 34 and multiplied it by a hundred.

For inferential statistics, Fisher's exact test was used for bivariate analysis to establish relationship between different factors and adherence to HD. Logistic regression was used for factors associated with adherence to HD after bivariate analysis. Data was then presented in terms of tables and pie charts with appropriate descriptions.

3.5.3 Study variables

The dependent variable in the study was adherence to HD while independent variables were socio-demographic, therapy related and health system related factors affecting adherence to HD.

3.6 Ethical considerations

Ethical clearance was sought from Nairobi Hospital Bioethics and Research Committee and the research licenced by National Council of Science Technology

and Innovation. Clearance letters were then obtained from the relevant county authorities. Additionally, permission from Mbagathi and Avenue hospital administrations were obtained. A written consent was obtained from the participants and whoever agreed to participate signed a consent form and was interviewed. Moreover, information provided was treated with utmost confidentiality and this was communicated to the respondents. Assurance was given to the respondents that information given was for study purpose only and no one would be victimized. To prevent risk of transmission of corona virus disease 2019 the following was undertaken:

- Regular washing of hands from one participant to the other.
- Sanitizing the hands of participants before issuing them with the questionnaires.
- Observation of 1.5-meter distance when collecting data from the patients.
- Surgical masks were used throughout while in the renal units.
- Clean gloves were used while touching surfaces or participants in the renal units.

3.7 Study assumptions

- The respondents provided correct information for the questions asked.
- The determinants of adherence to HD among CKD patients in public and private hospitals were not similar.

3.8 Study limitations

- Information bias: trust that everything the participant said was a true reflection of them. To avoid this bias, participants were well informed about the study and requested to provide honest responses.

CHAPTER FOUR

STUDY RESULTS

4.1 Introduction

This chapter reports the study findings based on data obtained from 27 respondents in Avenue Hospital and 10 respondents in Mbagathi County Hospital. The anticipated target population for Mbagathi hospital was 15 but by the time of the study, three participants had died. 2 patients in Mbagathi hospital and 3 patients in Avenue hospital were used to pre-test the study tools. After pretesting, a total of 37 participants were then involved in the study. All the 37 questionnaires distributed were returned giving a 100% response rate. Data was collected through a researcher administered modified ESRD-AQ and a self-administered BDI questionnaire. SPSS version 22 computer software was used to compute all statistical analysis. Presented below are results which include descriptive and inferential statistics. The descriptive statistics are for socio-demographic characteristics of the participants, the level of adherence to HD, health system related and therapy related factors. The inferential statistics are for associations between socio-demographic, therapy related, health system related factors and adherence to HD. The results are arranged based on the study objectives.

4.2 Socio-demographic characteristics

The socio-demographic factors of the participants are summarized in Table 4.1 below. In Avenue, most of the participants 10(37%) were older than 60 years of age with a median age of 52 years. Males accounted for two thirds 18(66.7%) of the participants giving a male to female ratio of 1:2. More than three quarters 21(77.8%) were married. Slightly more than half 14(51.9%) of the participants were educated up-to college/university level. Eleven (40.1%) of the participants earned a monthly income of between KES 25,000-50,000. Majority of the participants 12(44.4%) had their CKD caused by HTN. Close to half (48.1%) of the participants were depressed.

In Mbagathi hospital, majority of the participants were aged between 41-50 years with a median age of 44 years. Close to three quarters 7(70%) were females. More than three quarters 8(80%) were either self or formally employed. Eight (80%) of the participants were living in high density areas. Nine (90%) used public transport when coming for HD. Half (50%) of the participants were having CKD for a period of between 1-2 years. More than half (80%) of the participant's CKD was caused by hypertension. Cumulatively, close to half (40%) of the participants had depression.

Table 4.1: Socio-demographic characteristics of the participants

	Avenue hospital		Mbagathi hospital	
	Frequency(n)	Percent (%)	Frequency(n)	Percent (%)
Age				
18-30	1	3.7	0	0
31-40	1	3.7	3	30
41-50	9	33.3	5	50
51-60	6	22.2	1	10
>60	10	37	1	10
Total	**27**	**100**	**10**	**100**
Age range: 29-82 years			**Age range: 31-79 years**	
Median age: 52 years			**Median age: 44 years**	
Gender				
Male	18	66.7	3	30
Female	9	33.3	7	70
Total	**27**	**100**	**10**	**100**
Marital status				
Married	21	77.8	8	80
Single	1	3.7	0	0
Divorced	1	3.7	0	0
Separated	2	7.4	1	10

	Avenue hospital		Mbagathi hospital	
	Frequency(n)	Percent (%)	Frequency(n)	Percent (%)
Widowed	2	7.4	1	10
Total	**27**	**100**	**10**	**100**
Level of education				
Primary	6	22.2	3	30
Secondary	7	25.9	7	70
College/university	14	51.9	0	0
Total	**27**	**100**	**10**	**100**
Religion				
Christian	24	88.9	9	90
Muslim	2	7.4	1	10
Others (Hindu)	1	3.7	0	0
Total	**27**	**100**	**10**	**100**
Employment status				
Self employed	12	44.4	7	70
Skilled worker	3	11.1	0	0
Unemployed	9	33.3	1	10
Employed	3	11.1	2	20
Total	**27**	**100**	**10**	**100**
Monthly income				
KES 0-10,000	2	7.4	2	20
KES 10,001-25,000	1	3.7	4	40
KES 25,001-50,000	11	40.7	2	20
KES 50,001-100,000	10	37	1	10
KES 100,001-200,000	1	3.7	0	0
KES > 200,000	2	7.4	0	0
Total	**27**	**100**	**10**	**100**
Area of residence				
Low density	7	25.9	0	0

	Avenue hospital		Mbagathi hospital	
	Frequency(n)	Percent (%)	Frequency(n)	Percent (%)
Medium density	13	48.1	2	20
High density	7	25.9	8	80
Total	**27**	**100**	**10**	**100**
Mode of transport				
Public transport	8	29.6	9	90
Taxi	10	37	1	10
Private car	9	33.3	0	0
Total	**27**	**100**	**10**	**100**
Duration of CKD				
Between 3 months-1 year	10	37	4	40
Between 1 year-2 years	10	37	5	50
Between 2 years-3 years	5	18.5	1	10
Between 3 years-5 years	1	3.7	0	0
➤ **5 years**	1	3.7	0	0
Total	**27**	**100**	**10**	**100**
Cause of CKD				
Hypertension	12	44.4	8	80
Diabetes mellitus	3	11.1	2	20
Diabetes mellitus and hypertension	10	37	0	0
HIV	2	7.5	0	0
Total	**27**	**100**	**10**	**100**
Depression				
Ups and down that are normal	8	29.6	0	0
Mild mood disturbances	6	22.2	6	60
Borderline clinical depression	9	33.3	1	10
Moderate depression	2	7.4	2	20
Severe depression	1	3.7	1	10
Extreme depression	1	3.7	0	0
Total	**27**	**100**	**10**	**100**

4.3 Adherence to different aspects of HD

Table 4. 2 shows adherence to different aspects of HD amongst the participants. In Avenue hospital, more than three quarters 22(81.5%) received HD for 2 days or less in a week. All the participants 27(100%) had their HD session lasting 4 hours. Close to three quarters 17(63%) agreed that the HD schedule was convenient to them. Slightly more than half 14(51.9%) had not missed a HD session. Ten (37%) had their dialysis session shortened. Close to half 10(37%) had rescheduled one HD session.

In Mbagathi, all 10(100%) participants received HD for 2 days. All the participants 10(100%) had their HD session lasting 4 hours. More than three quarters (80%) agreed that the HD schedule was convenient to them. All 10(100%) participants had missed a HD session. Only three (30%) of the participants had their dialysis session shortened. Half (50%) of the participants had rescheduled a HD session.

Table 4.2: Adherence to different aspects of HD among the participants

	Avenue hospital		Mbagathi hospital	
	(n)	(%)	(n)	(%)
Days receiving HD				
2 days or less	22	81.5	10	100
3 days	5	18.5	0	0
Total	27	100	10	100
Hours treated for each HD				
4 hours	27	100	10	100
Total	27	100	10	100
Convenience of HD schedule				
Yes	17	63	8	80
No because I have to come to dialysis center early	4	14.8	0	0
No because I have to come to dialysis center late	1	3.7	0	0

	Avenue hospital		Mbagathi hospital	
No because of my work schedule	5	18.5	2	20
Total	27	100	10	100
Last time to be told about importance of not missing dialysis sessions				
Never	5	18.5	0	0
More than a month ago	15	55.6	1	10
One month ago	2	7.4	5	50
Last week	3	11.1	2	20
This week	2	7.4	2	20
Total	27	100	10	100
Last time to be told about importance of staying for the entire HD session				
Every haemodialysis treatment	3	11.1	3	30
Every week	4	14.8	2	20
Every month	5	18.5	4	40
Every 2-3 months	3	11.1	0	0
Irregularly	6	22.2	0	0
Never	6	22.2	1	10
Total	27	100	10	100
Importance of following HD schedule				
Not important	1	3.7	0	0
Moderately important	7	25.9	4	40
Very important	16	59.3	6	60
Highly important	3	11.1	0	0
Total	27	100	10	100
Difficulty of staying for the entire HD session				
Moderate difficulty	14	51.9	3	30
Little difficulty	5	18.5	2	20
No difficulty	8	29.6	5	50

	Avenue hospital		Mbagathi hospital	
Total	27	100	10	100
Number of missed sessions				
Missed more than 3	1	3.7	2	20
Missed 3	2	7.4	3	30
Missed 2	4	14.8	3	30
Missed 1	6	22.2	2	20
Missed none	14	51.9	0	0
Total	27	100	10	100
Number of shortened session (s)				
Three or more	4	14.8	2	20
Two	7	25.9	3	30
One	10	37	2	20
None	6	22.2	3	30
Total	27	100	10	100
Number of rescheduled sessions				
Three or more	4	14.8	0	0
Two	7	25.9	1	10
One	10	37	4	40
None	6	22.2	5	50
Total	27	100	10	100

Key: n=frequency %=percentage

4.4 Adherence scores to HD

Tables 4.3 and 4.4 below show adherence to HD scores among the participants. The total adherence to HD score was 34 and the minimum expected adherence to HD score was 10. The maximum adherence score obtained in Avenue hospital was 32(94%) and the minimum adherence score was 19(55.88%). In Mbagathi hospital the maximum adherence score obtained was 25(73.5%) and the minimum adherence score was 17(52.9%).

36

The researcher adopted an adherence scale to measure the level of adherence to HD among the participants. The scale used was adopted from Chironda *et al.,* (2016) and Mukakarangwa *et al.,* (2018). According to the scale a score more than 80% was identified as high adherence, 70-79% as moderate adherence and less than 70% as low adherence.

Based on the scale, in Avenue hospital, slightly more than half 14(51.85%) of the participants had a high adherence score of above 80%, 10(37.04%) participants had a moderate adherence score of between 70-79% and three (11.11%) had a low adherence score of below 70%. In Mbagathi hospital, two (20%) participants had a moderate adherence score of between 70-79% and more than three quarters (80%) had a low adherence score of below 70%.

Table 4.3: Adherence to HD scores among the participants of Avenue Hospital

Adherence to HD out of 34	Adherence score in percentage	Level of adherence according to scale	Frequency (n)	Percentage frequency (%)
19	55.9	Low	1	3.7
22	64.7	Low	1	3.7
23	67.6	Low	1	3.7
24	70.6	Moderate	3	11.1
25	73.5	Moderate	4	14.8
26	76.5	Moderate	2	7.4
27	79.4	Moderate	1	3.7
28	82.4	High	4	14.8
29	85.3	High	4	14.8
30	88.2	High	1	3.7
31	91.2	High	1	3.7
32	94	High	4	14.8
Total			**27**	**100.0**

Table 4.4: Adherence to HD scores among the participants of Mbagathi hospital

Adherence to HD out of 34	Adherence score in percentage	Level of adherence according to scale	Frequency (n)	Percentage frequency (%)
18	52.9	Low	1	10
19	55.9	Low	4	40
20	58.8	Low	1	10
21	61.8	Low	2	20
24	70.6	Moderate	1	10
25	73.5	Moderate	1	10

4.5 Descriptive statistics of health system related factors

Distance to hospital and cost of HD were the variables used by the researcher to determine if they influence adherence to HD. In table 4.5, 19(70.3%) of the participants in Avenue hospital and 8(80%) in Mbagathi hospital reported that distance to hospital influenced adherence to HD. For cost of dialysis, 25(92.6%) participants in Avenue hospital and nine (90%) in Mbagathi hospital reported that cost of dialysis did not influence adherence to HD.

Table 4.5: Descriptive statistics of health system related factors

		Avenue hospital		Mbagathi hospital	
		Frequency (n)	Percent (%)	Frequency (n)	Percent (%)
Distance to hospital					
Yes		19	70.3	8	80
No		8	29.6	2	20
Total		**27**	**100**		
Cost of HD					
Yes		2	7.4	1	10
No		25	92.6	9	90
Total		**27**	**100**		

4.6 Descriptive statistics of therapy related factors

Presence of cramping, poor blood flow, restlessness, clotting dialyzer, hypotension and machine malfunction were the therapy related variables used by the researcher to determine if they influence adherence to HD. In table 4.6 below, 18(66.6%) of the participants in Avenue hospital and 6(60%) in Mbagathi hospital reported that presence of cramping influenced adherence to HD.

Table 4.6: Descriptive statistics of therapy related factors

	Avenue hospital		Mbagathi hospital	
	Frequency(n)	Percentage (%)	Frequency (n)	Percentage (%)
Cramping				
Yes	18	66.6	6	60
No	9	33.3	4	40
Poor blood flow				
Yes	1	3.7	1	10
No	26	96.3	9	90
Restlessness				
Yes	4	14.8	3	30
No	23	85.2	7	70
Clotting dialyzer				
Yes	1	3.7	0	0
No	26	96.3	0	0
Hypotension				
Yes	1	3.7	0	0
No	26	96.3	0	0
Machine malfunction				
Yes	2	7.4	1	10
No	25	92.6	9	90

4.6.1 Reasons for shortening dialysis treatment

Therapy related factors were also assessed by asking the main reason for shortening dialysis treatment. As shown in figure 4.1, in Avenue hospital, more than half (55%) reported that cramping was the main reason for shortening their dialysis treatment. The other reasons were restlessness (20%), machine malfunction (10%), clotting dialyzer (5%), poor blood flow (5%) and intradialytic hypotension (5%).

In Mbagathi hospital, more than half (60%) reported that cramping was the main reason for shortening HD treatment, three (30%) indicated that machine malfunction was the main reason, and one (10%) attributed HD shortening to poor blood flow (See figure 4.2).
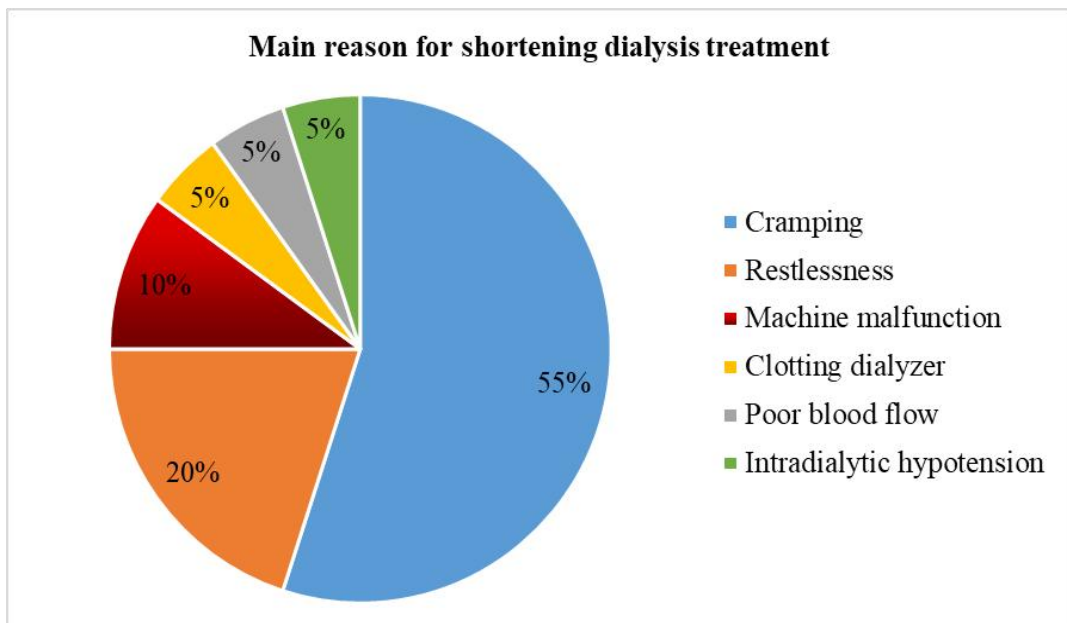
Figure 4.1: Reasons for shortening dialysis treatment in Avenue Hospital

Main reason for shortening dialysis treatment

- Cramping
- Poor blood flow
- Machine malfunction

60% — 30% — 10%
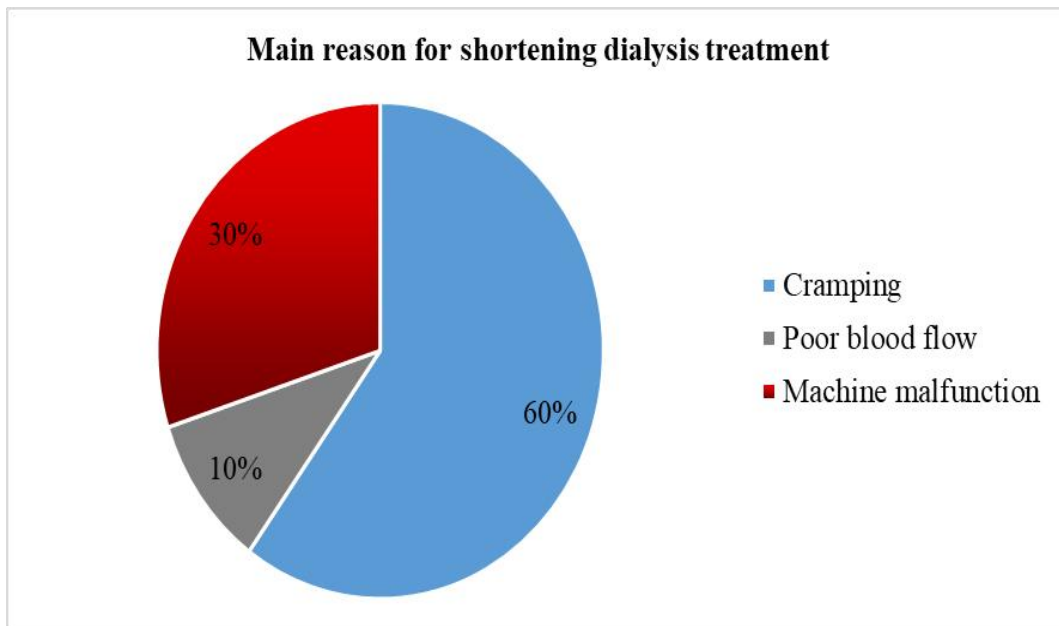
Figure 4.2: Reasons for shortening dialysis treatment in Mbagathi Hospital

4.7 Association between socio-demographic factors and adherence to HD in Avenue hospital

Table 4.7 below shows that the socio-demographic factors assessed which included age (p=0.259), area of residence (p=0.364), depression (p=0.559), duration of CKD (p=0.569), gender (p=0.429), marital status (p=0.750), employment status (p=0.502), religion (p=0.861), mode of transport (p=0.091), level of education (p=0.413) and monthly income (p=0.851) were not significantly associated with adherence to HD.

Table 4.7: Association between socio-demographic factors and adherence to HD in Avenue hospital

Variable	Cross tab			(χ2)	P-value
	High	**Moderate**	**Low**		
Age					
18-30 years	1 (6.7)	0 (0)	0 (0)		
31-40 years	0 (0)	1 (11.1)	0 (0)		
41-50 years	6 (40)	3 (33.3)	0 (0)		
51-60 years	4 (26.7)	0 (0)	2 (66.7)		
➢ **60 years**	4 (26.7)	5 (55.6)	1 (33.3)	10.414	0.170
Gender					
Male	10 (71.4)	7 (70)	1 (33.3)		
Female	4 (28.6)	3 (30)	2 (66.7)	1.719	0.535
Marital status					
Married	10 (71.4)	8 (80)	3 (100)		
Single	0 (0)	1 (10)	0 (0)		
Divorced	1 (7.1)	0 (0)	0 (0)		
Separated	1 (7.1)	1 (10)	0 (0)		
Widowed	2 (14.3)	0 (0)	0 (0)	6.211	0.855
Level of education					
Primary	2 (14.3)	3 (30)	1 (33.3)		
Secondary	3 (21.4)	4 (40)	0 (0)		
College/University	9 (64.3)	3 (30)	2 (66.7)	4.013	0.397
Religion					
Christian	12 (85.7)	9 (90)	3 (100)		
Muslim	1 (7.1)	1 (10)	0 (0)		
Others (Hindu)	1 (7.1)	0 (0)	0 (0)	2.338	1.000
Employment Status					
Self employed	8(57.1)	2 (22.2)	2 (66.7)		
Skilled worker	2 (14.3)	1 (11.1)	0 (0)		

Variable	Cross tab			(χ2)	P-value
	High	**Moderate**	**Low**		
Unemployed	3 (21.4)	4 (44.4)	1 (33.3)		
Employed	1 (7.1)	2 (22.2)	0 (0)	5.456	0.514
Monthly Income					
KES. 0-10,000	1 (6.7)	1 (10)	0 (0)		
KES. 10,001-25,000	0 (0)	1 (10)	0 (0)		
KES. 25,001-50,000	6 (40)	4 (40)	1 (50)		
KES. 50,001-100,000	6 (40)	3 (30)	1 (50)		
KES. 100,001-200,000	0 (00	1 (10)	0 (0)		
KES. > 200,000	2 (13.3)	0 (0)	0 (00	8.336	0.864
Area of residence					
Low density	2 (66.7)	4 (40)	3 (21.4)		
Medium density	8 (57.1)	4 (40)	1 (33.3)		
High density	0 (0)	2 (20)	3 (21.4)	3.618	0.510
Mode of transport					
Public transport	3 (21.4)	5 (50)	0 (0)		
Taxi	5 35.7)	2 (20)	3 (100)		
Private car	6 (42.9)	3 (30)	0 (0)	6.140	0.139
Duration of CKD					
Between 3 months-1 year	3 (21.4)	5 (50)	2 (66.7)		
Between 1-2 years	6 (42.9)	3 (30)	1 (33.3)		
Between 2-3 years	4 (28.6)	1 (10)	0 (0)		
Between 3-5 years	0 (6)	1 (10)	0 (0)		
➢ **5 years**	1 (7.1)	0 (0)	0 (0)	7.439	0.609
Depression					
Ups and down that are normal	6 (42.9)	2 (20)	0 (0)		
Mild mood disturbances	2 (14.3)	2 (20)	2 (66.7)		
Borderline clinical depression	3 (21.4)	5 (50)	1 (33.3)		
Moderate depression	1 (7.1)	1 (10)	0 (0)		
Severe depression	1 (7.1)	0 (0)	0 (0)		
Extreme depression	1 (7.1)	0 (0)	0 (0)	9.371	0.588

4.8 Association between socio-demographic factors and adherence to HD in Mbagathi hospital

Table 4.8 below shows that among the socio-demographic factors assessed, there was none that was significantly associated with adherence to HD.

Table 4.8: Association between socio-demographic factors and adherence to HD in Mbagathi hospital

Variable	Cross tabulation results		Fischer's exact test	P-value
	Low	Moderate		
Age				
31-40 years	3 (30)	0 (0)		
41-50 years	4 (40)	1(10)		
51-60 years	1 (10)	0 (0)		
➢ **60 years**	0 (0)	1 (10)	3.973	0.444
Gender				
Male	2 (20)	1 (10)		
Female	6 (60)	1 (10)	0.476	1.000
Marital status				
Married	7(70)	1(10)		
Single	0(0)	0 (0)		
Divorced	0 (0)	0 (0)		
Separated	1 (10)	0 (0)		
Widowed	0 (0)	1 (10)	3.667	0.378
Level of education				
Primary	2 (20)	1 (10)		
Secondary	6 (60)	1 (10)	0.476	1.000
Religion				
Christian	7 (70)	2 (20)		
Muslim	1 (10)	0 (0)	0.278	1.000
Employment Status				

Variable	Cross tabulation results		Fischer's exact test	P-value
	Low	**Moderate**		
Skilled worker	0 (0)	0 (0)		
Unemployed	3 (30)	0 (0)		
Employed	1 (10)	0 (0)	1.599	0.600
Monthly Income				
KES. 0-15,000	5 (50)	1 (10)		
KES. 15,001-25,000	1 (10)	0 (0)		
KES. 25,001-50,000	2 (20)	0 (0)		
KES. 50,001-100,000	0 (0)	1 (10)	3.832	0.400
Area of residence				
Medium density	2 (20)	0 (0)		
High density	6 (60)	2 (20)	0.625	1.000
Mode of transport				
Public transport	8 (80)	1 (10)		
Taxi	0 (0)	1 (10)	4.444	0.200
Duration of CKD				
Between 3 months-1 year	2 (20)	1 (10)		
Between 1-2 years	5 (50)	1 (10)		
Between 2-3 years	1 (10)	0 (0)	1.234	1.000
Depression				
Mild mood disturbances	5 (50)	1 (10)		
Borderline clinical depression	1 (10)	0 (0)		
Moderate depression	0 (0)	1 (10)		
Severe depression	1 (10)	0 (0)	4.977	0.133

4.9 Association between health system related factors and adherence to HD in Avenue hospital

There was a significant association between adherence to HD and the distance to hospital (p=0.005). Table 4.9 below shows that close to half (42.9%) of the participants with high adherence to HD, all 10(100%) the participants with moderate adherence to HD and all (100%) the participants with low adherence to HD agreed that distance to hospital was likely to lead to non-adherence to HD. Concerning cost of HD (p=0.125), there was no significant association with adherence to HD.

Table 4.9: Association between health system related factors and adherence to HD in Avenue Hospital

Variable	Cross tabulation results			Fischer's exact test	P-value
	High	Moderate	Low		
Distance to hospital					
Yes	6 (42.9)	10 (100)	3 (100)		
No	8 (57.1)	0 (0)	0 (0)	9.927	**0.005**
Cost of HD					
Yes	0 (0)	1 (10)	1 (33.3)		
No	14 (100)	9 (90)	2 (66.7)	2.211	0.335

4.10 Association between health system related factors and adherence to HD in Mbagathi hospital

There was a significant association between adherence to HD and the distance to hospital (p=0.022). Table 4.10 below shows that all 8(100%) participants with low adherence to HD agreed that distance to hospital was likely to lead to non-adherence to HD. Concerning cost of HD (p=0.598), there was no significant association between cost of dialysis and adherence to HD.

Table 4.10: Association between health system related factors and adherence to HD in Mbagathi hospital

Variable	Cross tabulation results		Fischer's	P-value
	Low	Moderate	exact test	
Distance to hospital				
Yes	8 (80)	0 (0)		
No	0 (0)	2 (20)	10.000	**0.022**
Cost of HD				
Yes	1 (10)	0 (0)		
No	7 (70)	2 (20)	0.278	1.000

4.11 Association between therapy related factors and adherence to HD in Avenue hospital

Table 4.11 presents the associations between therapy related factors and adherence to HD. Among the factors examined, only a single factor namely presence of cramping was related to adherence to HD (p=<0.001). Out of the respondents who reported presence of cramping to be more likely to affect adherence to HD, more than three quarters 14(77.8%) had high adherence to HD, three (16.7%) had moderate adherence to HD and one (5.6%) had low adherence to HD. Other variables which included poor blood flow (p=0.470), restlessness (p=0.691), clotting dialyzer (p=0.414), intradialytic hypotension (p=0.617) and machine malfunction (p=0.125) were not significantly associated with adherence to HD.

Table 4.11: Association between therapy related factors and adherence to HD in Avenue Hospital

Variable	Cross tabulation results			Fischer's exact test	P-value
	High	**Moderate**	**Low**		
Cramping					
Yes	14 (77.8)	3 (16.7)	1 (5.6)		
No	0 (0)	7 (75)	2 (25)	14.204	<0.001
Poor blood flow					
Yes	0 (0)	0 (0)	1 (100)		
No	15 (53.8)	8 (7.7)	3 (38.5)	3.933	0.148
Restlessness					
Yes	2 (50)	2 (50)	0 (0)		
No	12 (52.2)	8 (34.8)	3 (13)	0.630	1.000
Clotting dialyzer					
Yes	0 (0)	1 (100)	0 (0)		
No	14 (53.8)	9 (34.6)	3 (11.5)	2.233	0.481
Intradialytic hypotension					
Yes	1 (100)	0 (0)	0 (0)		
No	13 (50)	10 (38.5)	3 (11.5)	1.561	1.000
Machine malfunction					
Yes	0 (0)	1 (50)	1 (50)		
No	14 (56)	9 (36)	2 (8)	3.858	0.094

4.12 Association between therapy related factors and adherence to HD in Mbagathi hospital

Table 4.12 presents the associations between therapy related factors and adherence to HD in Mbagathi hospital. Among the factors examined there was none that was significantly associated with adherence to HD. Out of the respondents involved in the study who reported presence of cramping to be more likely to affect adherence to HD, half (50%) had low adherence to HD and one (10%) had moderate adherence to HD. Seven (70%) of the participants who reported poor blood flow to be less likely to affect adherence to HD had low adherence to HD and two (20%) had moderate adherence to HD. Out of the respondents involved in the study, who reported machine malfunction to be less likely to affect adherence to HD, more than half (90%) had low adherence to HD and one (10%) had moderate adherence to HD. Six (60%) of the participants who reported restlessness to be less likely to affect adherence to HD had low adherence to HD and one (20%) had moderate adherence to HD.

Table 4.12: Association between therapy related factors and adherence to HD in Mbagathi hospital

Variable	Cross tabulation results		Fischer's exact test	P-value
	Low	**Moderate**		
Cramping				
Yes	5 (50)	1 (10)		
No	3 (30)	1 (10)	0.476	1.000
Poor blood flow				
Yes	1 (10)	0 (0)		
No	7 (70)	2 (20)	1.000	1.000
Restlessness				
Yes	2 (20)	1 (10)		
No	6 (60)	1 (10)	1.000	1.000
Machine malfunction				
Yes	1 (10)	0 (0)		
No	9 (90)	0 (0)	1.000	1.000

4.13 Logistic regression analysis for factors associated with adherence to HD

Table 4.13 displays results of the multivariate analysis testing factors associated with adherence to HD among CKD patients. The statistical significance for the ordinal model was $p < 0.05$. Cramping (P=0.003, OR=0.027, 95% CI 0.002-0.301) was found to be a statistically significant negative predictor of adherence to HD. Therefore, this implies that if cramping is 2.7% likely to affect adherence to HD if it occurs. Distance to hospital (P=0.477, OR =0.525, 95% CI 0.089-3.100) was found to be a confounding factor.

Table 4.13: Logistic regression of factors associated with adherence to HD

Variable	B	Std. Err	Wald	Df	AOR	95% interval	confidence	P-value
						Lower	Upper	
Distance to hospital	-0.645	0.907	0.507	1	0.525	0.089	3.100	0.477
Cramping	-3.597	1.223	8.659	1	0.027	0.002	0.301	**0.003**

B=estimate, Std. Err=standard error, Df=degree of freedom, AOR=adjusted odds ratio, P-value=significance

CHAPTER FIVE

DISCUSSION, CONCLUSSION AND RECOMMENDATIONS

5.1. Discussion

5.1.1 Introduction

The purpose of this study was to determine the level of and factors affecting adherence to HD. This chapter consists of discussions on adherence to HD, social demographic, therapy related and health system related factors association with adherence to HD in the two study areas.

5.1.2 Adherence to HD

In regards to adherence to HD, three (11.11%) of the participants in Avenue hospital and eight (80%) of the participants in Mbagathi hospital had low adherence to HD. This is in agreement with what is in literature by Griva *et al.* (2014) in Singapore that 2-50% of patients on maintenance HD are not adherent to HD. This is also confirmed by Duong *et al.* (2015) in Vietnam where 42% of the participants in his study had missed their HD sessions and 12% had shortened their sessions.

In Avenue hospital, slightly less than half (48.1%) of the participants were not adherent to HD, 48.1% had missed a session, 77.1% had shortened a session and 77.7% had rescheduled a session. In Mbagathi hospital, 80% had low adherence to HD, 100% had missed a session, 70% had shortened a session and 50 % had rescheduled a session. These findings are partially similar to findings by Chironda *et al.* (2014) in Zimbabwe where 50% of the respondents were not adherent to HD, 93% had missed one session, 61% missed a scheduled session and 77% had rescheduled a prescribed session. These results differ considerably when compared to developed countries. The percentage of skipping dialysis session was 0.3 in France, 0.9 in Germany, 8.8 in Italy, 6.6 in Spain, 12.6 in United Kingdom, 0 in Sweden, 0 in Japan and 2.3 in United Stated of America. In this study, the percentage of shortening HD session is 77.7 in Avenue hospital and 70 in Mbagathi hospital which

is attributed to cramping, restlessness, machine malfunction, clotting dialyzer, poor blood flow and intradialytic hypotension.

Decreased adherence to HD is a big concern in most developing countries like Kenya. It has been associated with poor treatment outcomes and poor quality of life and this becomes a burden for healthcare institutions in Kenya (Kariuki *et al.,* 2014).

5.1.3 Socio-demographic factors and adherence to HD.

Although patient related factors like age and religion have been found to have a significant association with adherence to HD by Mohamedi *et al.* (2022), in this study none of the patient related factors were significantly associated with adherence to HD after bivariate analysis in both hospitals. However, cross tabulation results show that close to three quarters (71.4%) of those who were married had high adherence to HD in Avenue hospital.

The cross tabulation results also show that more than half (64.3%) of those with college/university education had high adherence to HD in Avenue hospital and two (20%) of those with secondary level education in Mbagathi hospital had moderate adherence to HD. These findings are similar to findings by Smith *et al.* (2010) in Scotland which showed that low level of education leads to decreased knowledge of the disease and treatment modalities which increases chances of being non-adherent to HD. This has also been confirmed by James *et al.* (2013) in England where his study findings showed that inadequate levels of health literacy makes it hard to follow instructions in HD patients and this makes it hard for them to adhere to HD treatment.

Cross tabulation results also reveal that Christians were more adherent to HD in both Avenue and Mbagathi hospitals. This can be attributed to peer support that is associated with religious affiliation that may positively influence the thinking of an individual with CKD and encourage them to be more adherent to HD (Combes *et al.,* 2016).

5.1.4 Therapy related factors and adherence to HD

The results of this study showed that there was a significant association between presence of cramping and adherence to HD in Avenue hospital. The study revealed that presence of cramping during HD is more likely to affect adherence to HD. This finding could be attributed to the volume of ultrafiltration removed during an HD session. This is in agreement with findings by Punj *et al.* (2020) in United States of America that muscle cramps are associated with the volume of ultrafiltration removed and are likely to result in early disconnection from HD treatment. He also concluded that muscle cramps that are recurrent usually lead to non-adherence to HD treatment and impacts HRQOL.

Although poor blood flow, clotting dialyzer, intradialytic hypotension and machine malfunction have been found to have a direct statistical significant relationship with adherence to HD (Benedict *et al., 2*020; Kariuki *et al.,* 2014), the results of this study indicate that they were not significantly associated with adherence to HD in both hospitals.

5.1.5 Health system related factors and adherence to HD

Among the health system related factors examined in this study, distance to hospital was significantly associated with adherence to HD in the two hospitals. This is in agreement with findings by Maciel *et al.* (2015) in Brazil which showed that availability of renal replacement therapy and especially HD is not easy since some of the patients reside far from existing HD centres and have to commute long distance to receive dialysis that leads to HD inadequacy. This results in consequent non-compliance with treatment regimen. The results of this study correspond to findings by Sayed *et al.* (2014) in Egypt where he found that transport problems are the most common cause of absenteeism and late appearances for scheduled HD sessions.

Although cost of dialysis has been found to have a direct influence on adherence to HD by Mukakarangwa *et al.* (2018), in this study, the results indicate that there was no significant association between cost of HD and adherence to HD. This is

attributed to that fact that most of the participants had national hospital insurance fund cover which caters for most of dialysis related logistics.

5.2 Conclusion

From the results therefore it can be concluded that:

- Most of the patients had moderate to poor adherence to maintenance HD in Avenue and Mbagathi hospitals.
- On socio-demographic factors, there was no significant association with adherence to HD in the two facilities.
- On health system related factors, there was significant association between distance to hospital and adherence to HD.
- On therapy related factors, presence of HD-associated muscular cramping contributed to poor adherence to HD.
- Therefore, the research findings found significant relationship between some therapy related and health system related factors and adherence to HD. Thus the null hypotheses that there is no significant relationship between therapy related and health system related factors and adherence to HD are rejected. The alternative hypotheses are therefore upheld.

5.3 Recommendations

From the results, the following recommendations are made:

- Renal nurses should educate the patients on the importance of adhering to prescribed HD regimen.
- Social workers and nurse managers should refer some patients to alternate dialysis centres as necessary.
- Renal nurses should properly calculate ultrafiltration volumes to reduce cases of HD related cramping and also they should closely monitor for cramping during dialysis.

- The government should consider having national hospital insurance fund cover for other forms of renal replacement therapy e.g. peritoneal dialysis which has less side effects like cramps and transport issues so as to boost adherence to HD.

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APPENDICES

Appendix I: Participant information sheet

Study title: Determinants of adherence to haemodialysis among chronic kidney disease patients at Mbagathi Hospital and Avenue Hospital in Nairobi County.

Investigator: Gabriel Njuguna Kilonzo

> Phone Number 0713570813
>
> School of Nursing
>
> Jomo Kenyatta University of Agriculture and Technology (JKUAT)
>
> P.O BOX 6200 Nairobi

Introduction: I am a nursing student at JKUAT, pursuing a degree of Master of Science in Nursing (Critical Care Nursing). I am conducting a study to establish level of to haemodialysis and determinants of adherence to haemodialysis among chronic kidney disease patients at Mbagathi and Avenue Hospitals. I invite you to participate in this study and the following information is important to help you make an informed decision about participation.

Purpose: The purpose of this study is to establish the level of and determinants of adherence to haemodialysis among chronic kidney disease patients at Mbagathi Hospital and Avenue Hospitals. I am conducting this study in partial fulfilment of the requirements for the award of degree of Master of Science in Nursing (Critical Care Nursing) of Jomo Kenyatta University of Agriculture and Technology.

Benefits of the study: The information you give me will help in establishing the level of and determinants of adherence to haemodialysis among chronic kidney disease patients in public and private hospitals in Nairobi County. Thiswill help in creation of solutions to prevent the non-adherence to haemodialysis. The findings

will be presented to the hospitals management and other key policy makers to help restructure the environment to offer better care for chronic kidney disease patients.

Risks: There are no social and economic risks involved. However approximately 30 minutes of your time will be needed to answer the questions.

Participation: Participation in this study is voluntary. Confidentiality will be maintained and results will only be used for its intended purpose. Refusal to participate or withdraw from the study will not result in any penalty or consequences. You are free to ask questions or seek clarification at any point of the study.

Compensation: There is no monetary compensation for participating in the study.

For more information or clarification, you can contact my supervisors:

1. Dr. Mutisya Kyalo

PhD, MScN, BScN, CEN

Senior Lecturer, School of Nursing

Jomo Kenyatta University of Agriculture and Technology

Email address amutisya@jkuat.ac.ke or Cell phone number 0721484869

OR

2. Joan Shisoka

MScN, BScN

Lecturer, School of Nursing

Jomo Kenyatta University of Agriculture and Technology

Email address joanshisoka@jkuat.ac.ke or Cell phone number 0722310257

Kiambatanisho 1: Karatasi ya habari kwa mshiriki

Jina la utafiti: Mambo yanayosababisha kutozingatia matibabu ya haemodialysis katika wagonjwa wa figo katika hospitali za Mbagathi na Avenue.

Mchunguzi: Gabriel Njuguna Kilonzo

  Simu ya rununu 0713570813

  Shule ya Uuguzi

  Chuo Kikuu cha JKUAT

  Anwani 6200 Nairobi

Utangulizi: Kwa majina naitwa Gabriel Njuguna Kilonzo na mimi ni mwanafunzi katika chuo kikuu cha Jomo Kenyatta University of Agriculture and Technology ambako nafanya shahada ya Uuguzi (Critical Care) na nafanya utafiti kuhusu mambo yanayosababisha kutozingatia matibabu ya haemodialysis katika wagonjwa wa figo katika hospitali za Mbagathi na Avenue.

Kusudi ya utafiti: Kusudi ya utafiti huu ni kueza kujua ngazi tofauti za uzingatiaji wa haemodialysis katika hospitali za Mbagathi na Avenue na kueza kulinganisha sababu zinazofanya wagonjwa wa dialysis kutofuatilia maagizo katika hospitali hizi mbili. Nafanya huu utafiti ili nieze kupata shahada ya Uuguzi ya chuo kikuu cha Jomo Kenyatta.

Faida ya utafiti huu: Habari utakayo nipa katika utafiti huu itasaidia kupata suluhu jinsi ya vile tunaeza kuzuia kutozingatia matibabu ya haemodialysis. Matokeo ya huu utafiti yatapatiwa wasimamizi wa hospitali na washika dau wengine katika afya ili kueza kusaidia kupeana huduma bora zaidi kwa wagonjwa wa dialysis.

Ushiriki: Ushiriki katika utafiti huu ni kwa hiari. Usiri utaimarishwa na Matokeo yatatumika kwa kusudi ya utafiti huu. Kukataa kushiriki kwa utafiti huu hakutakuwa

na adhabu yoyote. Uko huru kuuliza maswali yoyote ili kupata ufafanuzi katika hatua yoyote ya utafiti huu.

Fidia: Hakuna fedha zozote kama fidia kwa kushiriki katika huu utafiti.

Kwa maelezo zaidi unaeza wasiliana na wasimamizi wangu:

1. Daktari Mutisya Kyalo

  PhD, MScN, BScN, CEN

Mhadhiri Mkuu, Shule ya Uuguzi

Jomo Kenyatta University of Agriculture and Technology

Barua pepe; amutisya@jkuat.ac.ke au simu ya rununu 0721484869

AU

2. Joan Shisoka

MScN, BScN

Mhadhiri, Shule ya Uuguzi

Jomo Kenyatta University of Agriculture and Technology

Barua pepe: joan.shisoka@jkuat.ac.ke au simu ya rununu 0722310257

Appendix II: Participant informed consent form

I (participant number) ………………… agree to participate in this study having been explained its purpose, benefits and risks. I also understand that my participation in this study is voluntary and the decision to participate or not to participate will not affect my stay at this facility in any way whatsoever. I have also been reassured that my personal details and the information I will relay will be kept confidential. I confirm that all my concerns about my participation in the study have been adequately addressed by the investigator and the investigator has asked me questions to ascertain my comprehension of the information provided.

Participants sign………………………

Date …………………….

I confirm that I have clearly explained the content of the study to the participant and he/she has voluntarily agreed to participate without coercion.

Investigators sign…………………….

Date……………………….

Kiambatanisho 2: Taarifa ya ridhaa kwa mshiriki

Mimi (numbari ya mshiriki) ………………. Nakubali kushiri katika utafiti huu na nimeelezwa kusudi, faida na hatari ya utafiti huu. Naelewa ya kwamba Ushiriki katika utafiti huu ni kwa hiari na uamuzi wa kushiri au kutokushiriki hakutaathiri kukaa kwa hospitali hii. Nimehakikishiwa ya kwamba maelezo ya kibinafsi na habari nitakayopeana itawekwa kwa Usiri. Nadhibitisha ya kwamba wasiwasi kuhusu kushiriki kwenye utafiti huu umeshighulikiwa na mchunguzi na mchunguzi ameniuliza maswali kujua ufahamu wa habari zilizotolewa.

Sahihi ya mshiriki ………………………..

Tarehe ……………………..

Nadhibitisha ya kwamba nimeeleza maudhui ya utafiti kwa mshiriki na amekubali kushiriki kwa utafiti huu kwa hiari bila kulazimishwa.

Sahihi ya Mchunguzi …………………………

Tarehe ………………………….

Appendix III: Modified ESRD questionnaire

Part 1: Demographic data of CKD patients

1. What is your age?

☐ 8-30 year ☐ 31-40 years ☐ 41-50 years ☐ 51-60 years ☐ Greater than 60 years

2. What is your sex?

☐ Male ☐ Female

3. What is your marital status?

☐ Married ☐ Single ☐ Divorced ☐ Separated ☐ Widowed

4. What is your level of Education?

☐ Primary school ☐ Secondary school ☐ College or University

5. What is your religion?

☐ Christian ☐ Muslim ☐ Other

6. What is your occupation?

☐ Self-employed ☐ Skilled worker ☐ Unemployed

7. What is your monthly family income?

☐ Zero ☐ KES.25 000 to 50000 ☐ KES 50 000 to 100 000
☐ 100000 to 200 000 ☐ >200000 KES

8. Area of residence?

☐ Low density ☐ Medium density ☐ High density   ☐ Communal or rural

9. What is your mode of transport from and to the hospital?

☐ Public transport   ☐Taxi   ☐ Private car

10. Distance from the hospital

☐ 0 to 10km   ☐11- 20km   ☐21- 30 km   ☐31 to 40km ☐Greater than 40km

11. What are the available support systems?

☐NHIF   ☐Private medical insurance ☐Family support ☐Medical aid and family
support

12. What is the duration of CKD?

☐Between 3 months to 1 year

☐Between 1 year to 2 years

☐Between 2 years to 3 years

☐Between 3 years to 5 years

☐More than 5 years

13. What was the cause of your CKD?

☐ Hypertension   ☐ Diabetes mellitus   ☐ Glomerulonephritis

☐ Diabetes and hypertension   ☐ HIV

Part 2:   Adherence to haemodialysis

1. How many days a week do you receive hemodialysis treatment?

☐ 2 days or less (1)

☐ 3 days (2)

☐ 4 days (3)

☐ More than 4 days (4)

2. How many hours are you treated for each hemodialysis?

☐ 3 hours (1)

☐ 4 hours (2)

☐ 5 hours (3)

☐ More than 5 hours (4)

3. Is your dialysis schedule convenient for you?

☐ Yes (1)

☐ No because I have to come to the dialysis center early (2)

☐ No because I have to come to the dialysis center too late (3)

☐ No because of my work schedule (4)

4. When was the last time a health-care worker talked to you about the importance of not missing dialysis sessions?

☐ Never (1)

☐ More than a month ago (2)

☐ One month ago (3)

☐ Last week (4)

5. How often does a medical professional talk to you about the importance of staying for the entire dialysis time during your dialysis treatment?

☐ Every haemodialysis treatment (1)

☐ Every week (2)

☐ Every month (3)

☐ Every 2-3 months (4)

☐ Never (5)

☐ Irregularly (6)

6. How important do you think it is to follow your dialysis schedule?

☐ Not important (1)

☐ Little importance (2)

☐ Moderately important (3)

☐ Very important (4)

☐ Highly important (5)

7. How much difficulty do you have in staying for the entire dialysis session as prescribed?

☐ A lot of difficulty (1)

☐ Moderate difficulty (2)

☐ Little difficulty (3)

☐ No difficulty (4)

8. During the last months, how many dialysis treatments did you miss completely?

☐ Missed more than 3 (1)

☐ Missed three (2)

☐ Missed two (3)

☐ Missed one (4)

If missed dialysis session, why? …………………………

9. During the last month, how many times have you shortened the dialysis time?

☐ Thrice or more than thrice (1)

☐ Twice (2)

☐ Once (3)

☐ None (4)

10. During the last month, how many times have you rescheduled your dialysis session?

☐ Three or more (1)

☐ Two (2)

☐ One (3)

☐ None (4)

Part 3: Therapy related factors

1. What was the main reason you have for shortening your dialysis treatment?

☐ Cramping

☐ Bathroom use

☐ Restlessness

☐ Low blood pressure

☐ Access clotted

☐ Physician appointment

☐ Personal business or emergency

☐ Work schedule

☐ Transportation problem

☐ Staff decision (poor blood flow, clotting dialyzer, machine malfunction)

Part 4: Healthcare related factors

1. Do you think distance to and from hospital affects your adherence to dialysis?

☐ Yes   ☐ No

2. Do you think cost of haemodialysis affects your adherence to dialysis?

☐ Yes   ☐ No

Appendix IV: Beck's depression inventory

Beck's Depression Inventory

This depression inventory is self-scored. The scoring scale is at the end of the questionnaire.

Sadness		
	0	I do not feel sad
	1	I do feel sad
	2	I am sad all the time
	3	I am so sad and unhappy
Pessimism		
	0	I am not discouraged about the future
	1	I feel discontent about the future
	2	I feel I have nothing to look forward to
	3	I feel the future does not have hope and that things cannot improve
Past failure		
	0	I do not perceive myself as a failure
	1	I feel I have failed more than the average person
	2	Looking back in my life, all I can see is a lot of failures
	3	I feel I am a total failure as a person
Loss of pleasure		
	0	I get as much fulfilment out of things as I used to
	1	I don't enjoy things the way I used to
	2	I don't get real fulfilment out of anything anymore
	3	I am bored with everything
Guilty feelings		
	0	I don't feel guilty
	1	I feel guilty a good amount of the time
	2	I feel guilty most of the time

	3	I feel guilty every time
Punishment feelings		
	0	I don't feel I am being punished
	1	I feel I may be punished
	2	I expect to be punished
	3	I feel I am being punished
Self-Dislike		
	0	I don't perceive disappointed in myself
	1	I am displeased in myself
	2	I am disgusted with myself
	3	I hate myself
Self-criticalness		
	0	I don't feel I am any worse than anybody else
	1	I am critical of myself for my weaknesses or mistakes
	2	I blame myself all the time for my faults
	3	I blame myself for everything bad that happens
Suicidal thoughts or wishes		
	0	I don't have any thoughts of killing myself
	1	I have thoughts of killing myself, but I would not carry them out
	2	I would like to kill myself
	3	I would kill myself if I had the chance
Crying		
	0	I don't cry any more than usual
	1	I cry more now than I used to
	2	I cry all the time now
	3	I used to be able to cry, but now I can't cry even though I want to
Agitation		
	0	I am no more irritated by things than I ever was
	1	I am slightly more irritated now than usual
	2	I am quite annoyed or irritated a good deal of the time
	3	I feel irritated all the time

Loss of interest		
	0	I have not lost interest in other people
	1	I am less interested in other people than I used to be
	2	I have lost most of my interest in other people
	3	I have lost all of my interest in other people
Indecisiveness		
	0	I make decisions about as well as I ever could
	1	I put off making decisions more than I used to
	2	I have greater difficulty in making decisions more than I used to
	3	I can't make decisions at all anymore
Worthlessness		
	0	I don't feel that I look any worse than I used to
	1	I am worried that I am looking old or unattractive
	2	I feel there are permanent changes in my appearance that make me look unattractive
	3	I believe that I look ugly
Loss of energy		
	0	I can work about as well as before
	1	It takes an extra effort to get started at doing something
	2	I have to push myself very hard to do anything
	3	I can't do any work at all
Changes in sleep pattern		
	0	I can sleep as well as usual
	1	I don't sleep as well as I used to
	2	I wake up 1-2 hours earlier than usual and find it hard to get back to sleep
	3	I wake up several hours earlier than I used to and cannot get back to sleep.
Irritability		
	0	I don't get more tired than usual
	1	I get tired more easily than I used to

	2	I get tired from doing almost anything
	3	I am too tired to do anything
Changes in appetite		
	0	My appetite is no worse than usual
	1	My appetite is not as good as it used to be
	2	My appetite is much worse now
	3	I have no appetite at all anymore
Concentration difficulty		
	0	I haven't lost much weight, if any, lately
	1	I have lost more than five pounds
	2	I have lost more than ten pounds
	3	I have lost more than fifteen pounds
Tiredness or fatigue		
		I am no more worried about my health than usual
	1	I am worried about physical problems like aches, pains, upset stomach or constipation
	2	I am very worried about physical problems and it's hard to think of much else
	3	I am so worried about my physical problems that I cannot think of anything else
Loss of interest in sex		
	0	I have not noticed any recent change in my interest in sex
	1	I am less interested in sex than I used to be
	2	I have almost no interest in sex
	3	I have lost interest in sex completely

INTERPRETING THE BECK'S DEPRESSION INVENTORY

Add up the score for each of the twenty-one questions by counting the number to the right of each question you marked. The highest possible total for the whole test is sixty-three.

Total Score_____ Levels of Depression

1-10_____ These ups and downs are considered normal
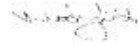
11-16_____ Mild mood disturbances

17-20_____ Borderline clinical depression

21-30_____ Moderate depression

31-40_____ Severe depression

Over 40_____ Extreme depression

Appendix V: Research license from NACOSTI

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY & INNOVATION

Ref No: 398243

Date of Issue: 15/May/2020

RESEARCH LICENSE

This is to Certify that Mr.. Gabriel Njuguna Kilonzo of Jomo Kenyatta University of Agriculture and Technology, has been licensed to conduct research in Nairobi on the topic: DETERMINANTS OF ADHERENCE TO HAEMODIALYSIS AMONG PATIENTS WITH CHRONIC KIDNEY DISEASE AT MBAGATHI COUNTY AND AVENUE HOSPITALS for the period ending : 15/May/2021.

License No: NACOSTI/P/20/4900

398243

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY &
INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document,
Scan the QR Code using QR scanner application.

Appendix VI: Ethical review and approval letter from NHBRC

THE NAIROBI HOSPITAL

Our Ref. TNH/ADMIN/CEO/27/04/20

27 April 2020

Gabriel Njuguna Kilonzo
P. O. Box 921-90200,
Kitui

Dear Kilonzo,

RE: DETERMINANTS OF ADHERENCE TO HAEMODIALYSIS AMONG PATIENTS WITH CHRONIC KIDNEY DISEASE AT MBAGATHI COUNTY AND AVENUE HOSPITALS

Reference is made to your request for ethical review of the research proposal on the above subject.

We are pleased to inform you that ethical review has been done and approval granted. In line with The Nairobi Hospital research projects Policy, you will be required to submit a copy of the final research findings to the Committee for records.

Please note that this approval is valid for the period April 2020 to April 2021, if an extension is required, a fresh application should be done before proceeding with the study.

You will also be required to seek for a research permit from the National Commission for Science, Technology and Innovation (NACOSTI).

Yours sincerely,
FOR: THE NAIROBI HOSPITAL

Dr. Allan Pamba
CHIEF EXECUTIVE OFFICER

C.c.   Chairman - Bioethics & Research Committee

P.O. Box 30026 - 00100 Nairobi, Kenya | Tel: +254 020 2845000 | Fax: +254 020 2728003
Email: hosp@nbihosp.org | Website www.nairobihospital.org

82

AppendixVII: Notification letter to the county governor of intention to carry out research in Nairobi County

GABRIEL NJUGUNA KILONZO

P.O BOX 921-90200

KITUI

18/05/2020

TO

THE COUNTY GOVERNOR OF NAIROBI

P.O BOX 30075-00100

NAIROBI

> Nairobi City County
> RECEIVED
> 1 8 MAY 2020
> Director
> Human Resource Development

RE: NOTIFICATION OF INTENT TO COMMENCE RESEARCH IN NAIROBI COUNTY

Dear Sir/Madam,

My name is Gabriel Njuguna Kilonzo a student at Jomo Kenyatta University of Agriculture and Technology pursuing a Masters degree in Nursing (Critical Care). As part of the degree I am supposed to conduct a research thesis. Part of the research process, involves informing the relevant authorities in the county of the intention to commence the research after ethical approval and licensure by National Commission of Science, Technology and Innovation (NACOSTI).

Therefore, following ethical approval from The Nairobi Hospital Bioethics and Research Committee (Ref. No. TNH/ADMIN/CEO/27/04/20) and after being granted a research license by NACOSTI (License No. NACOSTI/P/20/4900), I hereby notify you of my intention to commence my research.

The title of the research is **DETERMINANTS OF ADHERENCE TO HAEMODIALYSIS AMONG PATIENTS WITH CHRONIC KIDNEY DISEASE AT MBAGATHI COUNTY AND AVENUE HOSPITALS.** The research is for a period of one year as from 15th May 2020 to 15th May 2021.

Attached are copies of the letter of ethical approval, letter of affiliation to Jomo Kenyatta University of Agriculture and Technology, research permit license and my practice license.

Yours Sincerely

Gabriel Njuguna Kilonzo

Appendix VIII: Notification letter to the county commissioner of intention to carry out research in Nairobi County

GABRIEL NJUGUNA KILONZO

P.O BOX 921-90200

KITUI

18/05/2020

TO

THE COUNTY COMMISSIONER

NAIROBI

RE: NOTIFICATION OF INTENT TO COMMENCE RESEARCH IN NAIROBI COUNTY

Dear Sir/Madam,

My name is Gabriel Njuguna Kilonzo a student at Jomo Kenyatta University of Agriculture and Technology pursuing a Masters degree in Nursing (Critical Care). As part of the degree I am supposed to conduct a research thesis. Part of the research process, involves informing the relevant authorities in the county of the intention to commence the research after ethical approval and licensure by National Commission of Science, Technology and Innovation (NACOSTI).

Therefore, following ethical approval from The Nairobi Hospital Bioethics and Research Committee (Ref. No. TNH/ADMIN/CEO/27/04/20) and after being granted a research license by NACOSTI (License No. NACOSTI/P/20/4900), I hereby notify you of my intention to commence my research.

The title of the research is **DETERMINANTS OF ADHERENCE TO HAEMODIALYSIS AMONG PATIENTS WITH CHRONIC KIDNEY DISEASE AT MBAGATHI COUNTY AND AVENUE HOSPITALS.** The research is for a period of one year as from 15th May 2020 to 15th May 2021.

Attached are copies of the letter of ethical approval, letter of affiliation to Jomo Kenyatta University of Agriculture and Technology, research permit license and my practice license.

Yours Sincerely

Gabriel Njuguna Kilonzo

Appendix IX: Notification letter to the county director of education of intention to carry out research in Nairobi County

GABRIEL NJUGUNA KILONZO

P.O BOX 921-90200

KITUI

18/05/2020

TO

THE COUNTY DIRECTOR OF EDUCATION

P.O BOX 49416-00100

NAIROBI

RE: NOTIFICATION OF INTENT TO COMMENCE RESEARCH IN NAIROBI COUNTY

Dear Sir/Madam,

My name is Gabriel Njuguna Kilonzo a student at Jomo Kenyatta University of Agriculture and Technology pursuing a Masters degree in Nursing (Critical Care). As part of the degree I am supposed to conduct a research thesis. Part of the research process, involves informing the relevant authorities in the county of the intention to commence the research after ethical approval and licensure by National Commission of Science, Technology and Innovation (NACOSTI).

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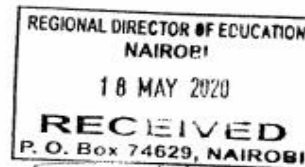
The title of the research is **DETERMINANTS OF ADHERENCE TO HAEMODIALYSIS AMONG PATIENTS WITH CHRONIC KIDNEY DISEASE AT MBAGATHI COUNTY AND AVENUE HOSPITALS.** The research is for a period of one year as from 15th May 2020 to 15th May 2021.

Attached are copies of the letter of ethical approval, letter of affiliation to Jomo Kenyatta University of Agriculture and Technology, research permit license and my practice license.

Yours Sincerely

Gabriel Njuguna Kilonzo

REGIONAL DIRECTOR OF EDUCATION
NAIROBI

18 MAY 2020

RECEIVED
P. O. Box 74629, NAIROBI

Appendix X: Research authorization letter from Nairobi County health services office

NAIROBI
METROPOLITAN
SERVICES
REPUBLIC OF KENYA

Directorate of Health Services

REF: EOP/NMS/HS/7/VOL.1/RS/19   DATE: 1st September, 2020

Gabriel Njuguna Kilonzo
Principal Investigator
Jomo Kenyatta University of Agriculture and Technology
P. O. Box 921- 90200
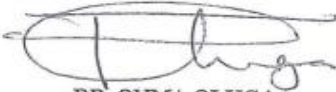Nairobi

Dear Sir,

RE: RESEARCH AUTHORIZATION

This is to inform you that the Nairobi Metropolitan Services - Health Directorate's Research Technical Working Group (RTWG) reviewed the documents on the study titled "Determinants of non-adherence to haemodialysis among chronic kidney disease patients at Mbagathi County hospital and Avenue hospital."

I am pleased to inform you that you have been authorized to undertake the study at Mbagathi Hospital in Nairobi. The researcher will be required to adhere to the ethical code of conduct for health research in accordance to the Science Technology and Innovation Act, 2013 and the approval procedure and protocol for research for Nairobi.

On completion of the study, you will submit one hard copy and one copy in PDF of the research findings to the RTWG. By copy of this letter, the Medical Superintendent – Mbagathi Hospital to accord you the necessary assistance to carry out this research study.

Yours sincerely,

DR. OUMA OLUGA
FOR: DIRECTOR HEALTH SERVICES

Cc:
o Medical Superintendent – Mbagathi Hospital

Nyayo House. 10th Floor | P.O. Box 49130-00100. GPO, Nairobi, Kenya
Tel: +254 (0) 20 2217774/3
E-mail: health@nms.go.ke | Web: www.nms.go.ke

Gabriel.
0713510813.

Appendix XI: Research authorization letter from Nairobi County director of human resource development.

NAIROBI CITY COUNTY

Telephone: +254 20 2221349
Web: www.nairobi.go.ke

City Hall
P .o. box 30075-00100
Nairobi
Kenya

DEVOLUTION AND PUBLIC SERVICE MANAGEMENT

Ref: NCC/HRD/HRM/10/584/GKG/2020

Date: 31st August, 2020

Gabriel Njuguna Kilonzo
P. Box. 921- 90200
Nairobi
Kenya.

RE: RESEARCH AUTHORIZATION

Reference is hereby made to your application letter dated 18th May, 2020 on the above subject:

The Nairobi City County Government has approved your request subject to the following:

1. The period of Research will be two (2) months with effect from 7th September 2020 to 30th October 2020.
2. You have been authorized to undertake the study in Health Sector.
3. You are expected to adhere to the rules and regulations pertaining to the research study.
4. That during your study there will be no costs devolving on the County.
5. That you undertake to indemnify the County against any claim that may arise from your research study.
6. You are required to submit a **Copy of the Final Research Document** within one month after completion to the Human Resource Development.
7. Research will be on:
    "**Determinants of Adherence to Haemodialysis among patients with Chronic Kidney Disease at Mbagathi County** "

You are expected to pay a research fee of Ksh 5,000/=

The Chief Administrative Officers, Health Sector is requested to accord you the necessary assistance.

CHARLES CHOI
FOR: DIRECTOR HUMAN RESOURCE DEVELOPMENT.

Appendix XII: Research authorization letter from Mbagathi hospital

NAIROBI METROPOLITAN SERVICES
REPUBLIC OF KENYA

Mbagathi Hospital, P.O Box 20725 – 00202
Email: mbagathihosp@gmail.com
Tel: 0721311808, 2724712, 2725791

DATE: 7th Oct. 2020

Gabriel Njuguna Kilonzo

JKUAT

RE: RESESEARCH AUTHORIZATION

This is in reference to your application for authority to carry out a research on *"Determinants of non-adherence to haemodialysis among chronic kidney disease patients at Mbagathi Hospital."*

I am pleased to inform you that your request to undertake research in the hospital has been granted.

On completion of the research you are expected to submit one hard copy and one soft copy of the research report / thesis to this office.

Dr. David Kimutai

Chairman – Research & Training Committee

Mbagathi Hospital.

Appendix XIII: Research authorization letter from Avenue hospital

The Avenue Group

9th Floor Orbit Place, Westlands Road
P.O. Box 45280-00100 Nairobi, Kenya
Telephone (254) 732 175 200
admin@avenuehealthcare.com   www.avenuehealthcare.com

12th June 2020

Gabriel Njuguna Kilonzo

P.O Box 921-90200
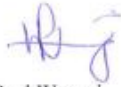
Kitui

Dear Gabriel,

RE: Permission to conduct research

I am happy to inform you that your request to perform research pertaining to your academic degree has been approved on condition that you adhere to the research protocols. The approval is valid for one year with effect from this date.

Sincerely,

Dr.Paul Wangai
Chief Quality and Standards Officer

Avenue Group
Head Office

12 JUN 2020

P.O. Box 45280 - 00100, NAIROBI

Avenue Hospital   Avenue Healthcare   Avenue Homecare   Avenue Rescue Services

Appendix XIV: Publication

Determinants of Adherence to Haemodialysis Frequency among Patients with End-Stage Kidney Disease at a Private Hospital in Nairobi, Kenya

Gabriel Njuguna Kilonzo*, Albanus Mutisya Kyalo and Joan Shisoka

School of Nursing, Jomo Kenyatta University of Agriculture and Technology (JKUAT), P.O. BOX 62000 Nairobi;

Corresponding author: Gabriel Njuguna Kilonzo, School of Nursing, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya. Email: gabrielkilonzo3@gmail.com.
ORCID Number: 0000-0002-5136-7385

Summary

BACKGROUND

Globally chronic kidney disease (CKD) is on the increase. It has become a public health concern because of the increasing number of patients maintained on haemodialysis (HD). CKD patients require HD thus making adherence to prescribed treatment essential. Poor adherence to HD is associated with increased mortality, morbidity, increased healthcare expenses and workload in HD units. In the renal unit of Avenue hospital, informal observation and clinical experience indicate that there is poor adherence to HD. Therefore, this study aimed to establish the level of adherence to HD and the factors affecting adherence to HD among patients with end-stage kidney disease (ESKD) at Avenue hospital.

MATERIALS AND METHODS

Between the months of June and August 2020, the study adopted an analytical cross-sectional study in Avenue hospital Nairobi to establish the level of adherence to HD and its associated factors. The study subjects were adult patients with ESKD on HD. Census was used. A total of 27 patients with ESKD participated in the study. Data was collected through a modified end-stage kidney disease adherence questionnaire (ESKD-AQ). It was then coded, cleaned and analyzed using Statistical Package for Social Sciences (SPSS) version 22. Bivariate analysis with Fischer's exact test was used to compare the independent and dependent variables. A P-value of <0.05 was considered statistically significant at a 95% confidence interval. The significant variables in the bivariate analysis were then subjected to multivariate logistic regression for further analysis to establish an association with adherence to HD.

RESULTS

Adherence to HD as assessed by ESKD-AQ revealed that more than half 14(51.85%) had high adherence while 3(11.11%) had low adherence. Bivariate analysis showed that cramping (p=<0.001) and distance to the hospital (p=0.005) were significantly associated with adherence to HD. Multivariate logistic regression analysis revealed that only cramping [OR=0.027 CI 95% (0.002-0.301) P=0.003] was significantly associated with adherence to HD.

CONCLUSION

Many patients are non-adherent to maintenance HD in Avenue hospital with the distance they have to travel to the HD unit and HD-associated muscular cramping contributing to the non-adherence significantly.

Keywords: End-Stage Kidney Disease; Haemodialysis; Determinants; Adherence.

Introduction

CKD is defined as a progressive and irreversible loss of kidney function. According to glomerular filtration rate (GFR), CKD is a spectrum ranging from stage 1 to stage 5. Stages 1-3 are mild to moderate disease, stage 4 severe disease and stage 5 ESKD [1]. ESKD is an irreversible decline in kidney function, which is fatal in the absence of dialysis or transplantation [1]. In ESKD, individuals have an estimated GFR of less than 15 mL/minute/1.73 m² body surface area and require dialysis [1]. About two-thirds of people with ESKD receive HD, one quarter has kidney transplants, and one-tenth receive peritoneal dialysis [1].

Globally ESKD is a public health concern because of the high morbidity, mortality and increasing number of patients who require renal replacement therapy (RRT) which includes HD [2]. The increase in ESKD patients necessitates the management of patients with HD thus making adherence to prescribed treatment essential [3]. HD depends upon diffusion, osmosis, ultrafiltration and hydrostatic pressure. HD uses diffusion to remove solutes. The removal of the solutes is driven by a concentration gradient of solutes across a semi-permeable membrane [4]. Concentration gradient is maintained by countercurrent exchange of blood and dialysis fluid in a dialysis membrane. The two are driven in opposite directions at a ratio of 1:2. Blood moves across the dialysis membrane at a rate of 200-400ml/min whereas the dialysis fluid moves on the other side of the membrane about twice as fast at a rate of 500-800ml/min. Double lumen catheters, arterio-venous fistula or arterio-venous grafts are required for HD [5].

While HD can prolong life, it is unable to replicate the complexities of the human renal system. Patients endure physical and emotional distresses associated with HD such as fatigue, pain, reduced physical activity, constraints on holidays, social activities, employment, lower socioeconomic status, marital and family relationships problems and depression [6].

Due to the shortage of kidney allograft donors and resource constraints, kidney transplant is not popular and HD remains the preferred modality of treatment in developing countries [3]. HD requires strict adherence to the prescribed regimen for adequate dialysis and better outcomes. Adherence to HD refers to doing 2-3 sessions of HD in a week with each session lasting 4-5 hours, not missing scheduled dialysis sessions or rescheduling prescribed HD sessions [7]. Adherence to HD remains a major obstacle in the management of CKD patients. Available literature reveals that approximately 2-50% of individuals on maintenance HD are not adherent to the prescribed HD regimen [7, 8]. Poor adherence to HD is associated with increased mortality, frequent hospital visits and admissions, morbidity, increased healthcare expenses and workload in HD units [8].

Globally, missed, rescheduled and shortened HD sessions have been attributed to different factors [8]. Some of the factors that have been shown to affect adherence to HD include patient-related, therapy-related, health-care-related, socio-economic and disease-related factors [8].

In Kenya approximately four million people have CKD and only 10,000 of these have dialysis access. Furthermore, the level of awareness on CKD and adherence to treatment with HD is low in Kenya [9]. This study aimed to establish the level of adherence to HD, and the factors affecting adherence to HD among patients with ESKD at Avenue hospital using a modified ESKD-AQ. The ESKD-AQ questionnaire was used because it is easy to administer and has an acceptable validity of 0.99 and test-retest reliability of between 0.83-1.00 [10].

Materials and Methods

Study design

This was a quantitative analytical cross-sectional study done between the months

91

of June and August 2020 at Avenue hospital which is a tertiary referral private hospital in Nairobi Kenya. Avenue Hospital has a renal unit that offers HD treatment. The renal unit has a capacity of 7 beds and is manned by a nephrologist, qualified renal nurses and patient attendants. It has the capacity to treat 14-17 patients per day. The ancillary services include a laboratory and out-patient pharmacy for patient support. Study subjects consisted of all patients who had been diagnosed with ESKD and were on maintenance HD at the time of the study. Census was used. Included in the study were all adult outpatient CKD patients who were on HD for at least 3 months, who were able to read and write and gave informed consent. Excluded were all acute kidney injury patients and critically ill patients who were admitted at the time of the study. Critically ill patients were those patients who were mechanically ventilated.

Study tools

A modified ESKD-AQ was used. The modified ESKD-AQ was developed using components of the ESRD-AQ questionnaire and literature. It was researcher administered. Quality assurance was ensured through pretesting with five patients which were 10% of the actual population. Face validity was ensured by structuring the questionnaire into four parts. Part one captured the demographic data of the participants. Part two obtained information on the level of adherence to HD among the study subjects. Part three captured information about therapy-related factors affecting adherence to HD. Part four obtained information about healthcare-related factors affecting adherence to HD. Construct validity was ensured by checking items in the data collection instrument against study objectives to ensure that all constructs under study were measured. Cronbach alpha was performed to measure the internal consistency and reliability of the instrument. It was found to be 0.74 meaning that the instrument was a reliable measure of adherence to HD.

Study procedure

Once informed consent was obtained, the participants who met the inclusion criteria were assisted in filling the ESKD-AQ to collect relevant data. The completeness of the filled-in questionnaires was then checked. Data obtained from the study were entered into a computer, coded and then secured by a password to ensure confidentiality. An adherence score was then calculated to come up with adherence scores for HD. To measure compliance to HD, an HD scoring system using an ordinal Likert scale was used.

Data analysis

Data analysis was done using SPSS software version 22. Shapiro Wilk test was used to test for normality of data before analysis. Descriptive statistics were used to describe the level of adherence to HD among ESKD patients.

To analyze the level of adherence to HD, the responses on adherence level to HD from the modified ESKD-AQ were classified in a Likert scale and then scores were calculated to reveal the level of adherence to HD in form of percentages. A score of between 80 and 100% was classified as high, between 70 and 79% as moderate and below 70% as low. The scoring system for this study had a minimum attainable score of 10 and a maximum attainable score of 34 and was expressed as a percentage. The scale was adopted from Mukakarangwa et al., [11] and Chironda et al., [8].

Inferential statistics inform of chi-square (Fischer's exact test) and logistic regression using odds ratio were used to test for association between therapy and health-care variables and level of adherence to HD among the ESKD patients. At 95% confidence, a p-value of <0.05 was considered significant.

Ethical consideration

The study was approved by Nairobi Hospital Bioethics and Research Committee (NHBRC), reference number TNH/ADMIN/CEO/27/04/20. It was then

licenced by the National Council of Science Technology and Innovation (NACOSTI), reference number NACOSTI/P/20/4900. The study was carried out in adherence to the requirements of the Declaration of Helsinki.

Results

Demographic characteristics

As shown in table 1, the mean age was 55.6±14.2 years. Males accounted for two thirds 18(66.7%) of the participants. Most of the study subjects 21(77.8%) were married. Fourteen (51.9%) of the participants were educated up to college or university level.

Adherence scores among the participants

Table 2 shows adherence to HD scores among the study subjects. The maximum adherence score obtained in this study was 32 (94%) and the minimum adherence was 19 (55.88%). More than half 14 (51.85%) had a high adherence score of above 80%, while 11.11% had a low adherence score of below 70%.

Therapy and healthcare related factors associated with adherence to HD

Table 3 below shows that distance to the hospital P< 0.005 and cramping P< 0.001 had a significant inverse association with adherence to HD. Other variables like cost of HD (P<0.335), poor blood flow (P<0.148), restlessness P<1.000, clotting dialyzer (P<0.481), intradialytic hypotension (P<1.000) and machine malfunction (P<0.094) were not significantly associated with adherence to HD.

Factors associated with adherence to haemodialysis

Multivariate logistic regression revealed that cramping P<0.003 had a significant association with adherence to HD as illustrated in table 4.

Discussion

Most of the participants were older than 60 years which is in agreement with other study findings where CKD is more prevalent in the elderly [12]. There were more males than a female which is a finding reported by other studies elsewhere [12].

The findings showed that, among the participants, 51.85% had high adherence to HD, while 11.11% had low adherence to HD. These findings correlate with other studies which indicate that between 2-50% of patients on HD are not adherent to HD [13].

Table 1: Socio-Demographic Characteristics

Characteristic	Frequency (%)
Age (Years)	Mean (55.6) SD (14.2)
Gender	
Male	18(66.7)
Female	9(33.3)
Marital status	
Married	21(77.8)
Single	1(3.7)
Divorced	1(3.7)
Separated	2(7.4)
Widowed	2(7.4)
Level of education	
Primary	6(22.2)
Secondary	7(25.9)
College/university	14(51.9)
SD, standard deviation	

93

Table 4: Logistic Regression Analysis for Factors Associated with Adherence to HD

Variable	B	Std. Err	Wald	Df	EXP (B) 95% C.I. for EXP(B)	95% confidence interval Lower	Upper	P-value
Distance to hospital	-0.645	0.907	0.507	1	0.525	0.089	3.100	0.477
Cramping	-3.597	1.223	8.659	1	0.027	0.002	0.301	0.003
B, estimate, Std. Err, standard error, Df, degree of freedom, C.I., Confidence interval, EXP (B), odds ratio								

This results in poor compliance with the treatment regimen. The results of this study and those of Fink, are similar to findings by Sayed in Egypt where he found that transport problems were the most common cause of absenteeism to scheduled HD sessions and also late appearances to HD sessions [17].

Conclusion

This study aimed to establish the level of adherence to HD and the factors affecting adherence to HD among patients with ESKD at Avenue hospital using a modified (ESRD-AQ) questionnaire and overall based on the results, the study concluded that cramping and distance to hospital significantly affected adherence to HD. The level of adherence to maintenance HD was low with close to half of the patients being non-adherent. There is a need for healthcare professionals to consistently remind ESKD patients about the importance of not missing HD sessions, staying for the entire HD session and adhering to prescribed HD days.

Acknowledgement

We wish to thank the management and the renal unit staff of Avenue hospital for their support during the study and the patients who took the time to participate in this study.

Author Contact Email

Gabriel Njuguna Kilonzo - gabrielkilonzo3@gmail.com
Albanus Mutisya Kyalo - amutisya@jkuat.ac.ke
Joan Shisoka - joanshisoka@jkuat.ac.ke

References

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94

This may be attributed to more developed infrastructure and economic endowment in these countries that ensure dialysis units are closer to the patient. This eases the distance patients have to travel for dialysis.

The results showed that there was a significant association between cramping and adherence to HD. This implies that cramping during HD is more likely to affect adherence to HD and result in early disconnection. These findings are congruent with findings by Meira in Brazil who also found that muscle cramps were associated with early disconnection from HD treatment. He also attributed the cramping to the volume of ultrafiltration removed during an HD session. Meira also concluded that recurrent muscle cramps usually lead to poor adherence to HD treatment and impact the health-related quality of life of ESKD patients [15].

Among the healthcare-related factors examined in this study, distance to the hospital was significantly associated with poor adherence to HD. This is supported by findings by Fink which showed that availability of RRT and especially HD is not easy. This is because some of the patients reside far from existing HD centres and have to commute long distances to receive dialysis which in turn leads to HD inadequacy [16].

Table 2: Adherence to HD Scores among the Participants

Level of adherence according to scale	Frequency (%)
Low (<70%)	3(11.1)
Moderate (70-79%)	10(37.0)
High (80-100%)	14(51.9)

Table 3: Therapy and Healthcare-Related Factors and Association with Adherence to HD

Variable	Adherence			Inferential statistic		
	High	Moderate	Low	Chi-square	Df	P-value
Distance to hospital						
Yes n(%)	6 (42.9)	10 (100)	3 (100)			
No n(%)	8 (57.1)	0 (0)	0 (0)	9.927	2	**0.005**
Cost of haemodialysis						
Yes n(%)	0 (0)	1 (10)	1 (33.3)			
No n(%)	14 (100)	9 (90)	2 (66.7)	2.211	2	0.335
Cramping						
Yes n(%)	14 (77.8)	3 (16.7)	1 (5.6)			
No n(%)	0 (0)	6 (75)	2 (25)	14.204	2	**<0.001**
Poor blood flow						
Yes n(%)	0 (0)	0 (0)	1 (100)			
No n(%)	14 (53.8)	2 (7.7)	10 (38.5)	3.933	2	0.148
Restlessness						
Yes n(%)	2 (50)	2 (50)	0 (0)			
No n(%)	12 (52.2)	8 (34.8)	3 (13)	0.630	2	1.000
Clotting dialyzer						
Yes n(%)	0 (0)	1 (100)	0 (0)			
No n(%)	14 (53.8)	9 (34.6)	3 (11.5)	2.233	2	0.481
Intradialytic hypotension						
Yes n(%)	1 (100)	0 (0)	0 (0)			
No n(%)	13 (50)	10 (38.5)	3 (11.5)	1.561	2	1.000
Machine malfunction						
Yes n(%)	0 (0)	1 (50)	1 (50)			
No n(%)	14 (56)	9 (36)	2 (8)	3.858	2	0.094

Key: n, number, Df, degree of freedom

95

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96