VASCULAR ACCESS PROFILE OF HAEMODIALYSIS PATIENTS AT KENYATTA NATIONAL HOSPITAL

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REGISTRATION NUMBER : H114/35682/2019

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MAY 2021

A DISSERTATION SUBMITTED IN PART FULFILMENT OF THE REQUIREMENTS FOR AWARD OF THE FELLOWSHIP IN NEPHROLOGY AT THE EAST AFRICA KIDNEY INSTITUTE AT THE UNIVERSITY

DECLARATION

This dissertation is my original work being submitted as part fulfilment for the award of a Fellow of nephrology at the East Africa Kidney institute at the University of Nairobi , and that to the best of my knowledge has not been presented at any other University or Institution of higher learning

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ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my husband, my Parents and my children for their unending support, my supervisors and lectures for their words of wisdom and encouragement and my colleagues.

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LIST OF ACRONYMS & ABBREVIATIONS

AV	Arteriovenous
AVF	Arteriovenous fistula
AVG	Arteriovenous graft
CKD	Chronic Kidney disease
CVC	Central venous catheter
tCVC	Tunneled central venous catheter
ntCVC	Non- tunneled central venous catheter
DOPPS	Dialysis Outcomes and Practice Patterns Study
ESKD	End stage Kidney disease
GFR	Glomerular filtration rate
HD	Hemodialysis
HRQOL	Health-related Quality of life
KDQOL-36	Kidney Disease and Quality of life 36 Item short Form Survey
KNH	Kenyatta National Hospital
PI	Principal Investigator
ePTFE	expanded Polytetrafluroethylene
RA	Research Assistant
RRT	Renal replacement Therapy
SF-VAQ	Short Form Vascular Access Questionnaire
US	United States
VA	Vascular Access
VACs	Vascular Access Coordinators

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ABSTRACT

Background

There is a rapidly growing population of patients with end stage kidney disease on hemodialysis in Kenya. The vascular access is a hemodialysis patients' lifeline. Ideal vascular access planning should begin in the early stages of chronic kidney disease before the patient requires dialysis. Decisions surrounding the choice of vascular access and the timing for its' creation are complex. Descriptive data on the process of referral and timing for access creation, types of access utilized, the processes of access creation, after care and management of access complications, vascular access related morbidity and socioeconomic determinants should be documented in order to inform vascular access practice in Kenya.

Objective

Document the vascular access profile of haemodialysis patients at Kenyatta national hospital and document the factors that determine their choice of vascular access.

Methods

This was a hospital based descriptive cross-sectional study that evaluated adult patients undergoing hemodialysis for end stage kidney disease for more than three months at the Kenyatta National Hospital Renal Unit. Consecutive sampling was employed to recruit 80 participants. Eligible participants who gave written consent were interviewed via an investigator administered questionnaire to document vascular access types utilized and the individual participants' vascular access score as the denominator.

Results

Between January and March 2021, 80 patients who were undergoing regular hemodialysis for ESKD were invited to participate in this study. The participants were predominantly young persons below forty years of age (50.1%) with a comparable number of male to female participants. The distribution of the incident vascular accesses was the non-tunneled central venous catheter (ntCVC)(77.5%), tunneled central venous catheter (tCVC)(20%) and the arteriovenous fistula (AVF)(2.5%) in descending order of frequency. The distribution of prevalent vascular accesses was tCVC (42.5%), CVC with maturing AVF (20%), AVF (18.8%), ntCVC (17.5%) and bridging CVC in a patient on peritoneal dialysis (1.25%)

The AVF was the least used vascular access in either group.

The median number of access per participant was two with a range of 1 to 20 (n=235). The vascular accesses participants utilized most during their dialysis vintage was a ntCVC(48.5%). The right internal jugular vein was the most common site used for CVC placement [RIJntCVC (25.6%), RIJntCVC (21.8%)] while the left brachiocephalic region was the most common location for AVF placement (10.3%).

38.3% of the participants reported having a problem with their current vascular access with the reported vascular access complications included vascular access infection, vascular access dysfunction and vascular access related pain and vascular access bleeding that required transfusion (51.6%, 45.2% and 25.8%, 6.5%) respectively.

The mean VAQ score was 17.0. There were significantly better (lower) VAQ scores in participants who had an AVF (9.4, p=0.007), those who were single (13.6,p=0.041) those who had not had a problem with their vascular access in the last one year (14.1, p=0.002) and those were very satisfied with their current VA (11.4 p=0.001).There were lower VAQ scores at the extremes of age, amongst those with tertiary level of education(14.7) and those who had a dialysis vintage of more than 2 years(14.7).There were worse (higher) VAQ score in female participants (19.1) and those who had diabetes mellitus (18.9). The VAQ score was comparable in participants who had an AVF in either the dominant or nondominant arm.

Various factors were identified as possible contributors to the choice of vascular access. Most participants were referred late for nephrology and vascular access services. 77.5% reported initiation on HD within three months of being diagnosed with ESKD, 85% were initiated on HD as an emergency while 85% had their incident vascular access placed as an emergency. 75% reported being reviewed by a nephrologist within a 3 month period prior to initiation of HD, 21.3% were reviewed by a nephrologist at least 3 months prior to initiation of HD while 7.5% were reviewed by a vascular access surgeon at least 3 months prior to initiation of HD. Only 7.5% had an AVF attempted prior to initiation of HD.

At initiation of HD, 18.8% were not aware of any forms of KRT, 62.5% were only aware of HD and only 7.5% reported being aware of the various vascular access types. 58 (73.1%) of the participants were aware of the advantages of AVFs over CVCs and listed them as having less access related infections, better blood flows, ease of bathing, access longevity, aesthetic

appeal and ease of conjugal activities ((n= 58) 93.1%, 81%, 39.7%, 36.2%, 3.4% and 1.75% respectively).Their source of information on KRT and vascular access types was from the dialysis nurses, doctors and fellow patients (78.9%, 73.7% and 23.7% respectively).
All the participants reported that their first vascular access was recommended by their doctor. Subsequently, almost a half of them (43.8%) had a change of their vascular access within the first 3 months of initiation of HD because of the need to get a definitive vascular access(56.5%), due to vascular access infections (30.4%), access failure (28.8%) and vascular access extrusion (13%). The most common vascular access converted to was a tCVC (48.9%), followed by ntCVC (37.8%) and AVF least (13.3%). About a fifth (n=17, 21.3%) reported having vascular access related hospitalization in the last one year. The reasons for hospitalization included vascular access infections (61.1%), vascular access bleeding (22.2%) and superior venacava syndrome (11.1%).

At the time of the study, 59 participants (73.7%) were using a CVC for HD though majority of them (84.7%) reported having been advised to get an AVF. The reasons listed for not having/ using an AVF included long uncoordinated processes (32%), having a previous AVF that never worked (28%), long surgery waiting times (20%), having a CVC therefore seeing no need for another access (18%), financial constraints (16%), having an AVF that was yet to mature (16%), having unsuitable blood vessels (12%) and feeling that an AVF would interfere with their occupation (4%).

About a half of the study participants (n= 38, 47.5%) reported having an AVF placement during their dialysis vintage. Of these, a fifth (18.5%) had an AVF in their dominant arm with resultant discomfort in 36.4% reported as difficulty conducting household chores (75%) and/or changes in sensation (50%). 18 (22.5%) of our participants reported a previous AVF that failed. 2,(11.5%) were offered a corrective procedure and 77.8% were willing to get another AVF.

Most participants were satisfied with their current access (83.8%) and felt that their access was easy to use (92.5%). More than half (68.8%) would recommend their current access to a fellow patient. The vascular access most preferred was the AVF (68.8%). 11.3% did not know which vascular access they preferred while 6.3% had no preference. Most participants felt that the nurses preferred an AVF (65%).

Conclusion

This study demonstrates that most participants were young persons expected to be at the peak of their productivity and hence an optimal vascular access is crucial to their ESKD management and their vascular access health related quality of life. The AVF is the least common vascular access in either incident or prevalent accesses, yet it is the most preferred access by both patients and dialysis nurses and has better VAQ scores. Non tunneled CVC is the predominant incident vascular access type while the tunneled CVC is the predominant prevalent access type and this is most likely due to late referral for nephrology and vascular access care, low levels of predialysis patient education and systemic barriers in vascular access acquisition and maintenance. Individualized vascular access placement should consider the patients' preference, their comorbidities, previous vascular access experience, their socioeconomic determinants and their vascular access related quality of life. A vascular access coordination team is key to ensure optimal individualized vascular access outcomes.

CHAPTER 1 : INTRODUCTION

Chronic Kidney Disease (CKD) ranks high amongst the major causes of morbidity and mortality worldwide. In 2017, Bikbov *et al* documented that 697.5 million cases of CKD were recorded world-wide with an estimated global prevalence of 9.1% (8.5 to 9.8).(1) Further on, the prevalence of CKD in sub-Saharan Africa was estimated at 13.9% following a systematic review and meta-analysis of prevalence studies by Stanifer *et al*.(2) CKD rose from being the 36th global cause of death worldwide in 1990 to the 19th cause in 2013.(3) According to unpublished data from the Kenya Renal Association registry, there are an estimated 4 Million Kenyans living with chronic kidney disease, out of those, more than 10,000 have end stage kidney disease (ESKD).

Patients with chronic kidney disease progress to end stage kidney disease requiring lifesaving kidney replacement therapy (KRT). At present, the options available for management of end stage kidney disease include; non-dialytic maximum conservative management, pre-emptive renal transplantation or dialysis. Dialysis may be a conduit to renal transplant or serve as definitive management with either haemodialysis or peritoneal dialysis.

In 2010, a worldwide systemic review evaluating the availability of KRT for patients with ESKD by Liyanage *et al* showed that, more than an estimated two million people may have died prematurely due to inability to access this lifesaving treatment . The treatment gaps were more apparent in low income countries in Asia (with an estimated 1·907 million people requiring but not accessing KRT in the conservative model) and in countries in Africa (estimated 432 000 people requiring but not accessing KRT in the conservative model).(4)

There has been an exponential growth in the number of patients being enrolled for chronic haemodialysis in Kenya from an estimated 300 patients in the year 2006 to about 4,300 patients by the end of 2020. This has been accompanied by a marked rise in the number of haemodialysis centers in Kenya, with about 204 registered in the year 2020. Despite this, there are few health care workers specially trained in vascular access creation and care (nephrologists, vascular access surgeons and interventional radiologists) to serve this growing population. At the moment, patients with kidney disease in Kenya are served by 41 nephrologists. The East Africa Kidney Institute currently runs a nephrology preceptorship and

fellowship programme to train various cadres of health care service providers on specialized kidney care in order to bridge this gap.

Decisions surrounding the choice and timing of a vascular access are complex.(5) Having the *"right access, for the right patient, at the right time, for the right reasons,"* positively impacts the patients overall quality of life. In view of this, adequate planning needs to be considered to ensure successful creation and maintenance of a durable long-term access in the pre-dialysis stage of CKD and being pro-active to secure, protect, create and preserve the subsequent accesses, way before the prevalent one fails. (7)

According to the Kidney Disease Outcomes Quality Initiative (KDOQI), each patient with progressive CKD and/or an estimated glomerular filtration rate (eGFR) of 15-20ml/min/1.73m^2 or already on KRT should have an individualized ESKD life plan that is regularly documented and updated. The ESKD life plan takes into consideration the preparation time available, the expected time on dialysis, current and future KRT modalities available to the patient, a contingency and a succession plan in case the current modality fails.

For patients who choose hemodialysis, the vascular access is their lifeline. Details of their vascular access, how it functions, any complications encountered, risks anticipated and potential future dialysis accesses should be documented. In Kenya, there are more patients on hemodialysis than peritoneal dialysis.(8)

The patients choice of vascular access depends on their individual characteristics (age, sex, comorbidities, level of education, predialysis patient education on the available modes of KRT modalities and vascular accesses available, their vascular anatomy, socioeconomic status and personal preferences), institutional factors (processes of care i.e. timing of referral, the local or institutional vascular access guidelines, availability of vascular access expertise for vascular access creation, monitoring and maintenance) and their previous vascular access experience (vascular access satisfaction and vascular access health related quality of life).

The three principal forms of chronic vascular accesses used include arteriovenous fistulas (AVF) , arteriovenous grafts (AVG) and central venous catheters (CVCs). Each form of vascular access has distinct advantages and disadvantages with specific types working well for certain patients. The hemodialysis access is preferentially attained via the vessels of the upper

extremities followed by the lower extremities and then the chest less preferentially via the trans lumbar and transhepatic routes. (9)

The AVF is the vascular access of choice as recommended by various international guidelines. This is because of its superiority, its' long term patency, greater performance and less likelihood of complications. In the event that the AVF is not the most appropriate VA for the patient, the next option is AVG. The CVC is the access of choice either during an emergency or when the AVF or AVG no longer function. It can safely be used until a permanent vascular access is achieved. Tunneled CVC (tCVC) is considered a permanent VA in patients with hypovolemia, those who lose veins needed for AVF creation prematurely, patients with recurrent clotting of the vascular access, those who experience steal syndrome, those with extreme fear of needles and patients with a reduced life expectancy.(7)

An AVF is a surgically created end to side connection between a native vein and artery. Commonly radiocephalic or brachiocephalic and less commonly brachiobasilic as it is usually too deep. The advantage of AVFs is that they have low complication rates once mature and rarely have infections. Their disadvantage is that they have a high risk for primary failure at about 40% and may require repeated angioplasty to initiate use and/ or maintain blood flow. (9)

Arteriovenous grafts are constructed by interposing graft material made up of expanded polytetrafluroethylene (ePTFE) between an artery and a vein. It typically has a diameter of 6mm and can be a straight fore-arm, looped fore-arm, straight upper arm and looped upper arm graft. Its' advantages include the choice of early cannulation on grafts that have been created on the same day. They have lower primary risk failure rates compared to AVF but have comparatively higher long term complication rates i.e. stenosis at the venous anastomosis or thrombosis requiring repeated interventions, infectious complications and a higher rate of intradialytic steal syndrome. (9)

Chronic hemodialysis catheters are dual lumen central venous devices constructed from polyurethane, silicone or silicone composites that are normally inserted via the internal jugular vein and tunneled via a subcutaneous tract. They have a Dacron cuff positioned at the exit site. The prevalence of central venous catheters amongst both incident and prevalent hemodialysis patients.(9) Factors contributing to this include its relative ease of placement and high levels

of patient satisfaction, and this may be an important driver for catheter use. Primary failure is rare unless there is poor positioning or kinking. It has high risk of complications after initial use including low blood flow, thrombosis, mechanical complications such as extruded cuffs, cracked lumens or accidentally being pulled out, infectious complications either at the exit site, the tunnel or blood stream and damage to the central veins. The cumulative CVC risk is 30% at 1 year and 38% at 2 years. (6)

Recent studies have shown that vascular access related choices and outcomes may be improved by considering the patients characteristics individually. Choice of vascular access should be patient centered and should involve a multidisciplinary team composed of experienced nephrology nurses, nephrologists, radiologists and vascular surgeons. (10)

There is limited information available on vascular access practice in Kenya. The results of this study provide descriptive data on the processes of referral and timing for access creation, types of accesses utilized, information on the process of access creation, after care and management of access complications and, the patients social and economic characteristics. This information will inform appropriate practice patterns for timing & referral for access creation and maintenance.

CHAPTER 2 : LITERATURE REVIEW

2.1 DISTRIBUTION OF TYPES OF HEMODIALYSIS ACCESS

The prevalence of vascular accesses varies widely worldwide. The heterogeneity is contributed to by practice patterns and guidelines, patient choices and patient factors such as dialysis vintage (incident versus prevalent), sex (male versus female), age (young versus old) and co-morbidities , availability of predialysis care, timing of referral to a nephrologist and expertise for and commitment to vascular access care. (11) At the moment, there is limited information on the distribution of vascular access' in the Kenyan hemodialysis population. Table 1 shows a summary of studies discussed herein, showing distribution of vascular access in various populations and factors that have contributed to the choice of access in those populations. Some of these factors will be explored in our questionnaire.

Table 1: Distribution of incident vascular accesses

Prevalence of Incident vascular accesses				
Year and type of study	Author	Study site	Participants	Prevalence
2018 Cross sectional study	Kabinga et al(8)	Kenya	n = 80	ntCVC (80%) tCVC (18%) AVF (2%)
2018 Cross-sectional	Atieh et al (12)	Palestine	n = 156	nt CVC 73% tCVC 13% AVF 13%
2016 Cross-sectional	Ndinya et al(13)	Kenya	n = 150	ntCVC (81%) tCVC (16%) AVF(3%)
2014 Cross-sectional Descriptive	Gowda et al(14)	India	n = 79	ntCVC 84.5% AVF 13.6%
2005-2010 Multicenter retrospective	Kane et al(15)	Senegal	n = 65	CVC 92.2% AVF 7.8%
2001 Australian registry	Polkinghorne et al(16)	Australia	n = 877	CVC 28% AVF 61% AVG 11%
2000-2011 Catalan registry	Roca-Tey et al(17)	Spain	n = 9,956	ntCVC 35% tCVC 15.9% AVF 47.9% AVG 1.2%

Table 2: Distribution of prevalent vascular accesses

Prevalence of prevalent (current) vascular access				
Year and type of study	Author	Study site	Participants	Prevalence (%)
2019 Korea registry data	Kim Y et al(18)	Korea	n = 93,884	CVC (8%) AVF (76%) AVG (16%)
2016 Cross-sectional	Ndinya et al(13)	Kenya	n = 150	ntCVC (31%) tCVC (47%) AVF (23%)
2014 Cross-sectional	Gowda et al(14)	Iran	n = 103	AVF (67.9%) AVG (29.1%)
2008 Japanese renal registry	Fukasawa et al(19)	Japan	n = 315,664	tCVC (0.5%) AVF (89.7%) AVG (7.1%)
2001 Australian registry	Polkinghorne et al (16)	Australia	n = 4091	CVC (4%) AVF (77%) AVG (19%)

The distribution of vascular accesses amongst incident patients varies widely and depends on multiple factors including prior exposure to comprehensive kidney care where patients can receive education on the various modalities of KRT and the types of vascular access. Patients who get predialysis care and education are more likely to have an AVF especially if referred for access creation on time while patients who are referred late are more likely to present to the dialysis unit for urgent hemodialysis resulting in high CVC use due its ease of placement and ability to be used immediately after placement.(20)

In Australia , Polkinghorne et al evaluated the prevalence of vascular access types amongst adult HD patients in the nationwide registry and divided them into two cohorts, an incident group (<150 d from first dialysis) and a prevalent group ($\geq$ 150d from first dialysis). In the incident group, the prevalence of AVF at 61%, AVG at 11% and CVC at 28% , while in the prevalent group, the prevalence of AVF was higher at 77%, AVG at 19% and CVCs markedly reduced at 4% (all $P<0.001$) (16). There were significant variations in the type of access in various hemodialysis unit locations suggesting influence by physician practice patterns.

Amongst incident HD patients (n=79) in a tertiary facility in Iran, Gowda et al documented a prevalence of 13.6% of them having been initiated on HD with an AVF, compared to the 67.9% in the prevalent population (n=103) at the time of the study. He suggested that a nephrologist evaluation prior to initiation of hemodialysis had a positive influence on the choice of HD access. The reasons highlighted for lower numbers of incident AVF use in this population included reluctance of the a patients to undergo surgical access placement while still asymptomatic (14). These prevalences have been demonstrated in table 1 and 2 above.

Ethier *et al* utilized data from the Dialysis Outcomes and Practice Patterns Study (DOPPS), a prospective, observational study of HD practices and patient outcomes at more than 300 HD units carried out across 12 countries to examine international trends in VA use and patient characteristics. More than 35,000 randomly selected patients were reviewed between 1996 and 2007. There was a wide variation in the preferred VA. Countries with a greater prevalence of diabetes in HD patients had a significantly lower percentage of patients using an AVF. 58-73% of newly diagnosed ESKD patients used a CVC during HD initiation despite the fact that 60-79% of them had been seen by a nephrologist at least 4 months prior.(21)

In the US, AVF use rose from 24 to 47% between 1996 and 2007while AVG use fell from 58% to 28% over the same period of time. In 2005, Native AVF use ranged between 67-91% amongst prevalent HD patients in Japan, Italy, Germany, France, Spain, the UK, Australia and New Zealand, and between 50-59% in Belgium, Sweden and Canada. Patients were less likely to have an AVF if they were female, older, diabetic, had history of peripheral vascular disease, a high Body Mass Index or a history of recurrent gangrene or cellulitis. Their findings showed that the native AVF was the VA of choice in ensuring good outcomes however, patient characteristics and delays in between referral and creation of a VA had key roles to play in the choice of VA. (21)

In Korea, Kim *et al* (2006) documented prevalence of AVF use amongst prevalent patients at 76% (compared to AVG at 16% and CVC at 8%) in line with most international guidelines and documented that it had been that way for five years according to their 2019 registry data. The reasons for a higher prevalence of AVF use included; following international guidelines, timely referrals, having skilled interventional radiologists and vascular access surgeons and having a mandatory medical insurance.(18)

Kane Yaya *et al* conducted a retrospective study on the type and outcome of HD vascular accesses in two dialysis units in Dakar, Senegal between September 2005 and September 2010 .He evaluated 65 patients whose mean age was 50.2 years . He indicated that 92.2% of the patients had a CVC while 7.8% had an established AVF at the initiation of dialysis. Of those with a CVC , 81.6% were femoral CVCs while 18.4% were located at the Internal jugular region.(15)

In 2018, Kabinga *et al* carried out a study to evaluate preparation of ESKD patients for RRT by assessing the types of VA at onset of HD and at least 3 months after initiation of hemodialysis at KNH. Of the 82 patients evaluated, 85.4% were enrolled from the hypertension and diabetes clinics, 50% of the population were male, 74.4% had been initiated on HD as an emergency with 80% of them initiated with acute non-tunneled CVCs in the jugular and subclavian veins ($p<0.001$) .11.85% had tunneled CVCs and less than 2% had an AVF at initiation of HD .Three months after initiation, 40% of the patients had acute non-tunneled CVCs, 40% had tunneled CVCs while 14.5% were using AVF.(8)

In countries where the CVC is the most common initial access used during initiation of HD, it happens as a result of late referrals for comprehensive kidney care, lack or delay in patient education, rapid loss of kidney function, a protracted referral system or lack of expertise in access creation

The prevalence of AVF use is high amongst patients on hemodialysis in studies in Korea, United States of America and Australia while the CVC use is more prevalent in Kenya, Iran and Senegal.(18)(22)(16) This variation has been explained by factors such as local and international guidelines, timing of referral ,patient education and availability of expertise to create the various access.

2.2 FACTORS AFFECTING CHOICE OF ACCESS

2.2.1 Individual patient characteristics

Individual patient characteristics have an important role to play in the choice of vascular access. In order to achieve good vascular access outcomes it is imperative consider the patient's characteristics, their life expectancy, comorbidities and preferences and to balance the benefits versus the risks of each vascular access to the individual patient.

Age

Selection of an optimal vascular access amongst elderly patients is difficult as one has to put into consideration several factors including their frailty status and comorbidities and how these will affect the functioning of a particular vascular access. Elderly patients are more likely to have lower AVF use, have failure to mature of AVFs (FTM) and reduced primary and secondary patency rates for both AVFs and AVGs. Lok et al conducted a study aimed at identifying predictive factors that increased the chances of failure of maturation of AVF and found a high likelihood for those who were ≥65 years old (OR 2.23; 95%CI), those who had peripheral vascular disease (OR 2.97; 95% CI), those with coronary artery disease (OR 2.83; 95% CI), and if they were of the white race (OR 0.43; 95% CI). In view of this findings an elderly patient may opt for a less permanent VA type such as a tCVC.(23) The DOPPS study revealed that CVCs were the most commonly used VA type amongst elderly patients in Australia , Europe and North America. However they were uncommon amongst HD patients in Japan.(24)

Comorbidities

Co-morbidities play a key role in the choice of an optimal VA in an patient. Multiple comorbidities such as atherosclerosis, diabetes mellitus and peripheral arterial disease affect the vascular wall leading to poor vascular access outcomes.(25) HD patients who have chronic heart failure are likely to get worsening of their symptoms after fashioning of an AVF due to changes in blood flow , pulmonary pressures and cardiac output especially when the AVF blood flow is greater than 2000ml/min.(26) HD patients who have an AVF and get heart failure with New York Heart Association ≥2 have been shown to have an improvement of their heart failure symptoms after closure of the AVF.(27)

Gender

There have been studies conducted on the gender disparities affecting choice of VA. AVF use is lower in female HD patients. It has been postulated to be due to smaller vessel diameters and poor maturation. Miller *et al* conducted a comparative study to explore the effect of Gender on AVF use and outcomes after pre-operative vessel mapping. Female AVF use was inferior and could not be explained solely by the differences in vessel diameter. There was an inferior outcome despite the location of the AVF with comparing at forearm at 18 vs 43% (P=0.002) while the upper arm had 39 vs 60% success (P=0.004). 31% of the patients underwent one or more salvage procedures due to failure of maturation and female patients were more (42 vs 23% p = 0.04), concluding that AVF were less likely to work well in female HD patients.(28)

Patients' level of Education

A patients' level of education has a key role to play in the functioning of the vascular access. Yolgosteren *et al* evaluated 349 patients undergoing HD in a private facility in Istanbul and found a statistically significant relationship between the patients level of education and their AVF patency (p =0.016). Fistula patency was significantly lower amongst the illiterate, those with primary, secondary or high school level of education compared to university graduates. They recommended that patient training on AVF aftercare needs to be tailored to the patients level of education.(29)

Predialysis patient education

Pre-dialysis patient education translates to better outcomes by deferring dialysis initiation, lengthening survival and aiding them in selfcare by providing information on important aspects of care such as blood pressure and blood sugar control, appropriate physical activity, nutritional guides , compliance to medication and avoidance of nephrotoxic drugs. It is also a means by which their questions and concerns can be addressed. Patient involvement in planning their ESKD life plan has a key role to play in the selection and maintenance of an AVF. The patients can then explore treatment options taking into account medical evidence and their personal preferences to choose the most suitable form of renal replacement therapy and/or vascular access.

Patient education is important in deciding type of access, how and when to get the access, how to take care of access and prepare for the next access in case of access failure . Both the patients

and their relatives should be educated on vessel preservation in the predialysis stage i.e. avoiding major vessels of the forearm for phlebotomy, intravenous infusions, angiography etc.

The information may be disseminated via focused group discussions (CKD patients) , digital media, booklets or over family conferences. It is important to identify potential challenges and address them. Patient barriers include a low level of literacy, lack of interest in the disease process, they may be too unwell to understand the complexities of Chronic kidney disease. Provider challenges such as lack of time or incentives to explain the disease course and available treatment options. Lack of an interdisciplinary care model hinders patient education within the healthcare system. Patients who have predialysis care are more likely to have a permanent VA and are more likely to have better outcomes.(30)(31)

Patient socioeconomic factors

Patient socioeconomic factors play key role in the selection of VA. Financing and health insurance are determine whether the patient can acquire a certain access. In the National Health Insurance Fund in Kenya, certain amount of money is reimbursed for creation of an AVF but it does not pay for CVCs. Disparities in insurance coverage affects the choice of vascular access.(32)

2.2.2 Processes of care

This encompasses vascular access practice patterns, timing and processes of referral, availability of vascular access creation expertise, monitoring and maintenance.

Vascular access guidelines

According to most current international guidelines the placement of a VA should be done at least six months prior to the anticipated initiation of hemodialysis. A native AVF is the preferred VA if it can be placed and can mature in less than 12 weeks due to its high longevity, reduced cost and less requirement for maintenance compared to the other types of access. However, the timing is difficult as , as creating it too early may require many procedures to keep it patent until initiation of HD and waiting too long puts the patient at risk of starting HD with a CVC. Worse still, even when a patient is on regular follow up under a kidney disease specialist, the progression of CKD to ESKD is not constant and need for dialysis may be precipitated unexpectedly by clinical events.

Timing of referral

Early referral provides ample time for acquisition of an optimal VA.(11) Arora et al evaluated 135 patients at the New England medical center and its affiliate clinics and documented the prevalence, predictors and consequences of late nephrology referrals. 22% had a late nephrology referral (more than 3 months between diagnosis and initiation of HD) and the major cause was disparities in the insurance covers. There was no significant difference with regard to age, gender or cause of ESKD. Patients who referred late were less likely to have a received erythropoietin and less likely to have a functional permanent VA (40% vs 4%).(32) In Korea, Suh Kim et al found that the most common barrier to timely referral was non-compliance , other factors identified included patients lack of acceptance of the severity of the disease, uncoordinated processes of care for patient evaluation and vascular access surgery, lack of resources to provide adequate vascular access education to the patients and losing patients on follow up.(33)

Timely nephrology referral depends on early identification of chronic kidney disease by primary health care providers. In order to improve this, emphasis should be placed on training medical officers, internal medicine registrars and other physicians on early identification and referral for VA acquisition and care in their training curriculums and in conferences and continuous medical education programs.

Coordination of appointments

Loss of follow up or uncoordinated processes of care cause unnecessary delays in vascular access acquisition and care. Potential methods to troubleshoot delays on referral or loss to follow up that have worked include use of electronic medical records or medical informatics where CKD patients who are at risk for progression and require nephrology and vascular access referral are identified , and both the patient and relevant sub-specialties are notified via alerts on an efficient care platform for care coordination following a planned protocol/ pathway i.e. if a patient choses HD in their life plan, the nurse gets an prompt that facilitates a sequence of steps to engage the patient to go for AVF placement by booking vessel mapping, a surgical appointment and subsequently VA maturation monitoring. (34)

2.2.3 Patient preferences

More often than not , the patients' choice of vascular access is influenced by their pre-dialysis vascular access education if any, their prior vascular access experience, their desired quality of life, their frailty, the experience and recommendation of their fellow patients and caregivers and their life goals amongst others. Extreme fear of injections may play a role.

1,400 United States patients on Dialysis were evaluated during The Dialysis Outcomes and Practice Patterns Study (DOPPS) survey where they were asked about their preferred vascular access. In the analysis, 24% of patients expressed having no preference whilst 12% preferred a CVC. The most documented reasons for preferring a CVC were that it did not involve any pricking or bleeding , that it was more aesthetically appealing and that there was less chance of disfigurement. About 20% of patients had no VA knowledge, this can be translated to lack of understanding of the risks and benefits of various vascular access types. (22)

Chaudhry *et al* conducted a multicenter survey among 322 patients and their vascular access coordinators (VACs) among patients who were consistently using their CVCs to explore the reasons for their persistent CVC use and to predict associations for their persistent use. About a third (34.8%) indicated "non-medical" reasons, a quarter (25.8%) reported that the main reason they were using CVCs was due to having previously failed fistulas/grafts and fear of disfiguration (11.5%).12% of patients indicated a desire to change their CVC, yet the VAC was unaware of this 78% of the time suggesting a gap in communication, understanding, or vascular access education between patients and their VACs. Early predialysis education would address this gap. (34)

2.2.4 Vascular access health related quality of life

Various studies have postulated that hemodialysis patients have worse health-related quality of life (HRQOL) compared to the general population. The major influence is played by the VA type placed. Quinn *et al.* developed a vascular access questionnaire using a symptom score to assess patient-reported views depending on the type of VA they had . Patients who were using AVFs were more likely to complain of disfigurement by the access, experience pain, bleeding and bruising . They noted that elderly patients reported lower symptom scores with CVCs *vs.* AVFs. (35)

Kim Hyoung *et al* evaluated a newly initiated hemodialysis cohort of patients in a prospective multicenter study to investigate the relationship between their HD vascular access types and all-cause mortality, their health related quality of life (HRQOL) and their degree of depression. Patients with AVF showed significantly better overall survival compared to patients with other access types ($p<0.001$). The AVF group and AVG group had higher Kidney Disease Quality of Life Short Form (KDQOL-36) and lower Beck's Depression Inventory scores than the CVC group at 3 months and at 12 months after initiation of HD. (36)

2.2.5 Vascular access performance

Despite the fact that AVF use has improved because of the fistula first initiative , AVG use has probably declined while CVC use has remained relatively unchanged. A possible explanation is that, as more AVFs are fashioned, the CVC acts as a bridging access until the AVF is suitable for cannulation. Delays in AVF maturation may also slow down conversion of CVC to AVF in patients due to increased interventions required to promote AVF maturation. A survey was conducted in Fresenius Medical Care North America Outpatient dialysis facilities by Axley *et al* in 2012 to document reasons why patients with CVCs resist permanent access placement. They got 1573 responses which were organized according to the three most frequent responses as follows;

i. A poor prior surgical experience
ii. Having failed a prior permanent access
iii. Fear of cannulation and/or pain

The findings showed that using a patient survey is important in discerning reasons as to why patients resist permanent access placement and thus is key in the development of possible strategies to intervene in reduction of CVC utilization and hence improve patient outcomes. (37)

Patient education on preservation of peripheral veins in an important component of vascular access planning. They need to be educated on avoidance of iatrogenic trauma from phlebotomy or intravenous access especially in the non-dominant arm from CKD stage four to five.

2.2.6 *Impact of Vascular Access Nurse Coordinators*

Vascular access coordinators have the expertise skills and capacity to build relationships with patients and multiple team members in order to educate, coordinate, guide and manage vascular

accesses for the patients. They play a key role especially in coordinating timely management of access complications.

In 2009, Polkinghorne et al documented findings of a quality improvement report on the effect of having a Vascular access coordinator to reduce CVC use amongst incident HD patients in a tertiary referral hospital over a one year period (2005-2006). After adjusting for age, sex, cause of kidney failure, late referral and type of presentation, patients who started HD after implementation of a vascular access coordinator were more likely to start HD with an AVF (Odds ratio , 2.85; P= 0.008). The total number of catheter days in the implementation phase was half that in the pre-implementation phase (2,833 vs 4,685 days). The findings confirmed that a multidisciplinary team including a vascular access coordinator with an algorithm prioritizing surgery, significantly increased the chances of a patient starting HD with an AVF due to overall efficiency in coordination of the surgical waiting list. (38)

In conclusion, various factors come into play in securing the hemodialysis patients lifeline. By conducting this study, we wish to fill the gap in literature on distribution of vascular access of patients on hemodialysis in our population, availability of predialysis care and its effect on type of access, patient literacy on the types of accesses available and the advantages and disadvantages of each, processes of timing , referral and follow up for access acquisition and maintenance, the potential barriers to appropriate access acquisition, the types of access complication commonly experienced and how they are managed and how the various types of VA affect the patients' health related quality of life.

2.3 JUSTIFICATION

There is a growing population of patients with End Stage Kidney disease on Hemodialysis in Kenya, little is known about vascular access practice.

An optimally functioning vascular access is crucial in a hemodialysis patients' life.

Descriptive data on the process of referral and timing for access creation, type of access, process of access creation, after care and management of access complications, patient morbidity and social and economic determinants should be documented in order to inform appropriate timing & referral for access creation and maintenance, and to focus the attention of the healthcare community and planners on vascular access management.

2.4 RESEARCH QUESTION

What is the vascular access profile of hemodialysis patients at the Kenyatta National Hospital and what determines their choice of vascular access?

2.5 RESEARCH OBJECTIVES

2.5.1 BROAD OBJECTIVE

To document the types of vascular access utilized by patients undergoing hemodialysis at KNH Renal Unit and document the factors that determine their choice of vascular access

2.5.1.1 SPECIFIC OBJECTIVES

2.5.1.1.1 PRIMARY OBJECTIVES

1. To find out the proportion of each type of vascular access amongst both incidental and prevalent hemodialysis patients
2. To record the number and types of vascular access each patient has had during their dialysis vintage
3. To document vascular access complications encountered during their dialysis vintage
4. To demonstrate the impact of their current vascular access on their quality of life using a Vascular access questionnaire

2.5.1.1.1.2 SECONDARY OBJECTIVES

1. To document possible factors contributing to patients' choice of vascular access

CHAPTER 3 : STUDY METHODOLOGY

3.1 STUDY SITE

The study was carried out at the Kenyatta National Hospital Renal Unit.

KNH is a National Referral And Teaching Hospital situated in the Capital City of Kenya, Nairobi. It boasts a bed capacity of ~ 1,800 beds with over 6,000 staff members. It has 50 wards, 22 outpatient clinics and 24 theatres. The dialysis unit runs daily, with 22 dialysis machines. The unit dialyzes about 50- 55 patients per day and a total of 120-150 patients on average per week.

3.2 STUDY POPULATION

Adult patients above 18 years of age seeking hemodialysis for end stage kidney disease at the Kenyatta national hospital dialysis unit.

3.3 STUDY DESIGN

This was a hospital based descriptive cross-sectional survey

3.4 SAMPLE SIZE CALCULATION

According to information from KNH hospital records, about 100-120 patients undergo hemodialysis in the renal unit monthly.

A representative sample was drawn from the hemodialysis population over a 1 months' period of the study and the sample size calculation will be obtained using the formula for finite population (Daniel, 1999).

Computation of the sample size was based on the reported proportions of non-tunneled CVCs, CVCs and AVF (40%, 40% and 14.5% respectively) in a 2018 study at KNH (8).

The final sample size was the larger of the two resulting sample sizes.

The calculation was as follows:

$$n' = \frac{NZ^2P(1-P)}{d^2(N-1)+Z^2P(1-P)}$$

Where

n' = sample size with finite population correction,

N = size of the target population = 100

Z = Z statistic for 95% level of confidence = 1.96

P = Estimated proportion of patients with AVF (0.4)

d = margin of error = 5%

The resulting minimum sample size was 79.

3.5 SAMPLING METHOD

Patients undergoing hemodialysis were identified using the daily hemodialysis allocation register in the dialysis unit. Eligibility criteria was applied and those who met the criteria were recruited consecutively until the desired sample size was achieved.

3.6 CASE DEFINITION

Study participants were adult patients above 18 years of age seeking hemodialysis for End Stage Kidney Disease with a physician diagnosis of End Stage Kidney Disease, documented kidney damage for more than three months and decreased GFR of less than 15ml/min/1.73m^2 undergoing hemodialysis at the Kenyatta National Hospital.

We then documented the type of hemodialysis access i.e. as follows:

a. Central venous access:
    i. Tunneled central venous catheter (tCVC)
    ii. Non-tunneled central venous catheter (nt CVC)
b. Central venous catheter with immature fistula
c. Arteriovenous fistula
d. Arteriovenous graft

3.7 INCLUSION & EXCLUSION CRITERIA

3.7.1 INCLUSION CRITERIA

i. Written informed consent
ii. All hemodialysis patients above 18 years of age undergoing regular hemodialysis for end stage kidney disease at the Kenyatta national hospital.

3.7.2 EXCLUSION CRITERIA

i. Patients who decline to give consent
ii. All patients undergoing hemodialysis due to acute kidney injury
iii. Patients less than 18 years of age
iv. Patients who have no data on incident access
v. Patients who have not dialyzed for more than 3 months

3.8 STUDY PARTICIPANT RECRUITMENT PROCEDURE

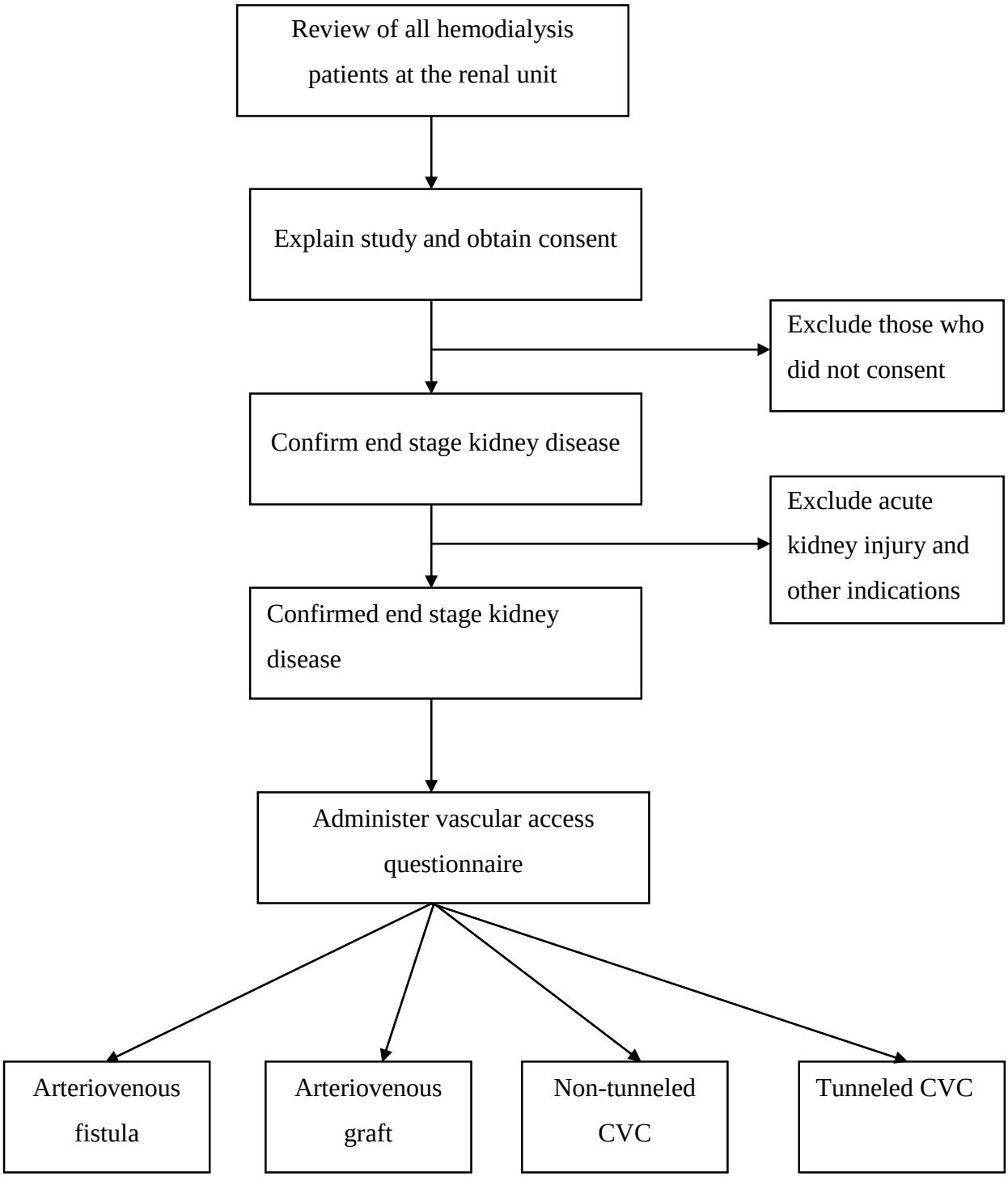
With the aid of a trained research assistant who was trained prior to the study, the daily register and medical records of patients with a diagnosis of End Stage Kidney Disease coming for hemodialysis at the Kenyatta National hospital Renal Unit were reviewed and subjects were approached when they came for dialysis.

The consenting process was carried out after explaining the details of the study to the participants using the consent form outlined in appendix 1.A translator was sought for patients who could not understand either English or Kiswahili.

Participants were encouraged to ask questions and seek clarification on what they did not understand. Patients who declined to participate were allowed to do so without any repercussions.

3.8.1.PARTICIPANT FLOW CHART

Figure 1 : Participant Flow Diagram



3.9 DATA COLLECTION

Participants were identified using the daily dialysis allocation register and approached. The study was explained followed by a request for consent. Those who gave consent proceeded to have an investigator administered questionnaire that looked at the types of vascular access and their vascular access score as the denominator.

Sociodemographic information and information on participants' vascular access was collected using a questionnaire. The questionnaire was a modification of the validated Vascular Access Questionnaire developed and validated by Quinn et al in 2008 in University of Toronto, Canada which was found to have high test—retest reliability as well as internal consistency on psychometric evaluation. It consists of a patient-reported questionnaire composed of 17 vascular access related questions, with responses on a five-point Likert scale which are summed, to give a Vascular Access Score, a lower overall score indicating greater satisfaction.

Information from semi-structured interviews with twelve chronic hemodialysis patients who were asked about the advantages and disadvantages of their vascular accesses , expert opinion from two nephrologists, a vascular access coordinator and a health services researcher in dialysis outcomes and questionnaire design was collected and used to create the content of the VAQ.

The original form takes about ten to fifteen minutes to administer. It evaluates four domains of the patient vascular access satisfaction: their overall satisfaction, physical symptoms, social functioning, and vascular access complications. It is easy to administer, contains relevant items to the vascular access and can detect changes within patients and their respective accesses over time and hence useful for intervention evaluation in vascular access programs. Its limitation is that it was developed for an English speaking population. This hurdle was handled by using the language most comfortable to the participant as it was an interviewer administered questionnaire.

The modified interviewer administered questionnaire used collected demographic data and information on the patients vascular access health related quality of life. See Appendix for Structured Questionnaire

Participants were stratified according to their type of hemodialysis access; Arteriovenous fistula, arteriovenous graft, temporary hemodialysis catheter, cuffed long stay dialysis catheter and catheter with immature fistula, then further as either incidental or prevalent dialysis patients.

3.9.1 STUDY VARIABLES

3.9.1.1 DEFINITION OF STUDY VARIABLES

3.9.1.1.1 DEPENDENT VARIABLES

A. Types of Vascular Access
    i. Central venous access:
        1. Tunneled central venous catheter (tCVC)
        2. Non-tunneled central venous catheter (nt CVC)
    ii. Arteriovenous fistula
    iii. Arteriovenous graft
B. Vascular access score – sum of vascular access related symptoms.

    Scores were categorized as ;

    i. Not at all (0-17)
    ii. A little (18-34)
    iii. Moderately (35-51)
    iv. Quite a bit (52-68)
    v. Extremely (69-85)

3.9.1.1.2 INDEPENDENT VARIABLES

i. Age
ii. Sex
iii. Comorbidities – diabetes mellitus, hypertension, glomerulonephritis
iv. Vascular access – types, number, location, complications, satisfaction
v. Predialysis patient education
vi. Socioeconomic status -occupation, level of education
vii. Timing of referral
viii. Patient preference

3.9.2 QUALITY CONTROL AND ASSURANCE

The research assistant was trained on the process of consent administration and collection of data to ensure the study was carried out as per the protocol. The vascular access questionnaire is a validated tool .The study was carried out using the modified questionnaire that sought additional information on the patient's sociodemographic characteristics and details about their vascular access history.

3.9.3 DATA MANAGEMENT

Data was captured using a serialized study proforma to avoid duplication. All the data was entered into Microsoft Excel to STATA Release 16 and stored in a password protected computer to maintain patient confidentiality.

3.9.4 DATA ANALYSIS

Data was be exported from Microsoft Excel to STATA Release 16 for cleaning and analysis. The study participants were described using measures of central tendency in terms of sociodemographic characteristics, types of access, medical history and the vascular access score. Continuous data was analyzed using means (standard deviations) and medians (interquartile ranges) while categorical data was analyzed using frequencies. Results have been presented using tables and pie charts.

The proportion of each type of vascular access amongst both incidental and prevalent hemodialysis patients has been summarized using frequencies and percentages. The impact of the vascular access on quality of life was analyzed using frequencies and percentages based on feedback of the vascular access questionnaire. Similarly, frequencies and percentages have been used to document the types of vascular access and vascular access complications each patient had during their dialysis vintage.

At bivariate analysis, Chi square tests were used to explore possible factors contributing to patients' choice of vascular access. At Multivariable level multinomial logistic regression was used to evaluate the factors contributing to patients' choice of vascular access while controlling

for confounding variables. Statistical significance was interpreted at 5% level (p value less or equal to 0.05).

3.9.5 DISSEMINATION OF STUDY FINDINGS

The findings of this study were presented to the East Africa Kidney Institute. The findings have also been availed to the University of Nairobi, School of Medicine Library and will be presented on forthcoming Nephrology conferences. In addition to this, a manuscript has been prepared for publishing in one of the peer- reviewed journals.

3.9.6 ETHICAL CONSIDERATIONS

Before commencing this Study, permission was sought from the Kenyatta National Hospital administration, the East Africa Kidney Institute as well as the Ethics and Research Committee of Kenyatta National Hospital / University of Nairobi.

Only patients who gave informed consent were recruited into the study. No patients were coerced. There was no discrimination against those who declined to participate. All the information that was collected was treated with confidentiality. All participants had serialized user numbers and all filled questionnaires were stored in a locked room.

Any information deemed as important to the management of the patient was communicated to the primary health care provider.

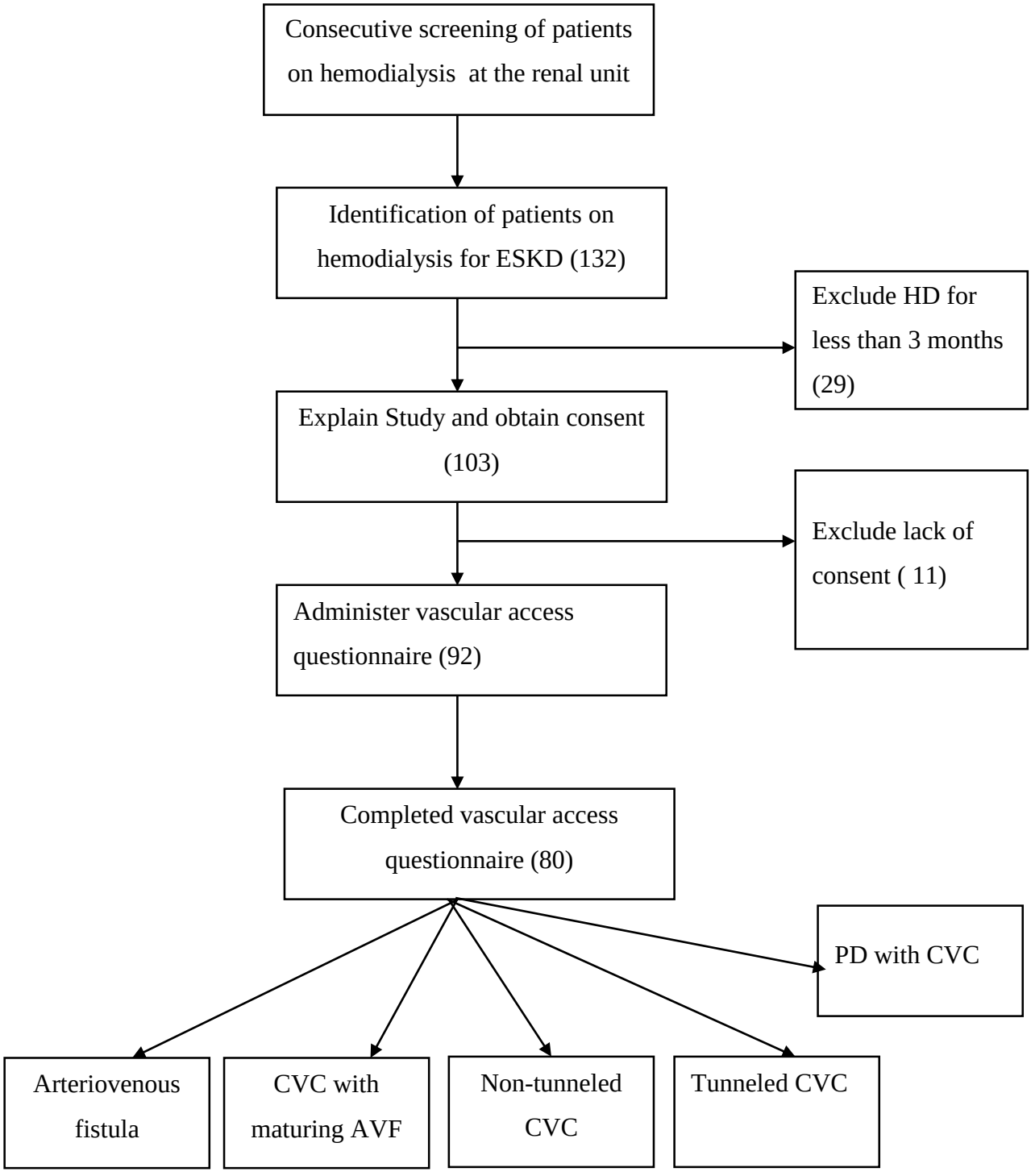
The cost of the study was met by the Principal investigator.

CHAPTER 4 : RESULTS

4.1 PATIENT RECRUITMENT FLOW CHART

132 patients were identified using the daily dialysis allocation register and approached. Study details were explained and consent sought. The questionnaire was administered to those who consented to participating in the study.

Figure 2 showing a flow chart of participant recruitment into the study



4.2 PARTICIPANT SOCIODEMOGRAPHIC CHARACTERISTICS

Table 3. Socio-demographic characteristics (n=80)

Variable	Frequency/Median	Percent
Age in categories (years)		
18 – 29	21	26.3%
30 – 39	19	23.8%
40 – 49	15	18.8%
50 – 59	11	13.8%
60+	14	17.5%
Sex		
Female	37	46.3%
Male	43	53.7%
Marital Status		
Married	55	68.8%
Single	14	17.5%
Widowed	5	6.2%
Separated	4	5.0%
Occupation		
Unemployed	37	46.3%
Self Employed	15	18.8%
Employed Artisan	11	13.8%
Employed Professional	9	11.2%
Student	7	8.8%
Retired	1	1.2%
Level of education		
None	1	1.2%
Primary	23	28.8%
Secondary	36	45.0%
Tertiary	20	25.0%
Comorbidities		
Systemic hypertension	73	91.3%
Glomerulonephritis	13	16.25%
Diabetes Mellitus	12	15%
Obstetric & Gynaecologic conditions	9	11.25%
Previous AKI requiring hemodialysis	7	8.8%
Heart failure	5	6.25%
Obstructive uropathy	3	3.8%
Cerebrovascular accidents	3	3.8%

Half of our participants were less than 40 years of age with the bulk of them being between 18 and 29 years (26.3%) .There were slightly more male participants (53.7%) and more than half of the participants were married (68.8%). Most participants reported that their highest level of education was secondary school (45%) yet about half of the participants were unemployed (46.3%).The most common comorbidity reported was hypertension (91.3%) followed by diabetes mellitus (15%). Of note, 8.8% of the participants reported having had an episode of AKI requiring hemodialysis prior to the diagnosis of ESKD and subsequent long term hemodialysis whilst 11.35% of the participants had significant Obstetric and gynecological comorbidities that led to ESKD. 6.3% had a history of Gestational hypertension (pre-eclampsia/ eclampsia) while others reported history of being on treatment for cervical Cancer and Endometriosis. This is illustrated in table 3 above.

Majority of the patients reside in Nairobi (78.8%) whilst some had travelled from as far as Mombasa and Kilifi for specialized kidney care services.

4.3 PROPORTION OF EACH TYPE OF VASCULAR ACCESS

Table 4 Showing proportion of each type of vascular access n =80

Variable	**Frequency n = 80**	**(%)**
Incident vascular access		
ntCVC	62	77.5%
tCVC	16	20%
AVF	2	2.5%
Prevalent (current) access		
ntCVC	14	17.5%
tCVC	34	42.5%
CVC with maturing AVF	16	20%
AVF	15	18.8%
CVC with PD	1	1.25%

The most common type of VA used by our participants at the initiation of HD was a non-tunneled CVC (77.5%) followed by tunneled CVC (20%) and AVF being the least at 2.5%.

The most common current vascular access was the tunneled CVC (42.5%) followed by those who had a CVC and maturing AVF (20%), AVF only (18.8%) , non-tunneled CVC (17.5%) and one participant who had a bridging CVC during initiation of peritoneal dialysis.

This is shown in table 4 above.

4.4 NUMBER AND TYPES OF VASCULAR ACCESS UTILIZED PER PATIENT IN THEIR DIALYSIS VINTAGE

The median number of vascular accesses were 2 (IQR 2,3) and ranged from 1 to 20 during their dialysis vintage.

Figure 3: Distribution of various types of vascular access utilized in the dialysis vintage (n=235)

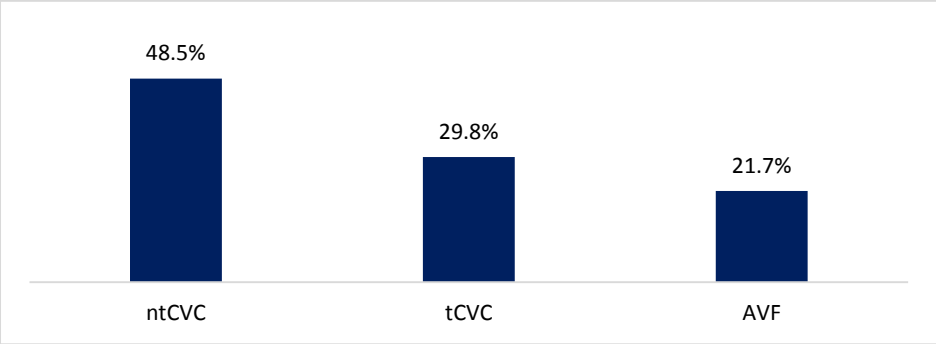


Table 5: Distribution of locations utilized for vascular accesses (n=235)

Central venous accesses (%)		
Location	Tunneled CVC (%)	Non-tunneled CVC (%)
Right internal jugular	21.8%	25.6%
Left internal jugular	1.3%	3.8%
Right subclavian vein	-	1.3%
Left subclavian vein	-	0.4%
Right femoral vein	4.3%	7.7%
Left femoral vein	2.6%	9.0%
Arteriovenous fistula		
Location	Right arm (%)	Left arm (%)
Radiocephalic	1.7%	5.6%
Brachiocephalic	3.8%	10.3%
Brachiobasilic	-	-

Most participants had a ntCVC (48.5%) followed by a tCVC (29.8%) and AVF being the least utilized vascular access (21.7%).

The most common location used for the central vascular access was the right internal jugular (RIJ) (46% in total with RIJntCVC used in 25.2% vs RIJtCVC 21.8%) while the left brachiocephalic region was the most commonly used location for AVF placement (10.3%) .

4.5 COMPLICATIONS ENCOUNTERED WITH THEIR CURRENT VASCULAR ACCESS

Table 6: Complications encountered with current vascular access

Vascular access complication n =31	n (%)
Infection	16 (51.6%)
Vascular access dysfunction	14 (45.2%)
Vascular access related pain	8 (25.8%)
Minor bleeding	3 (9.7%)
Bleeding requiring transfusion	2 (6.5%)
Infiltration	1 (3.2%)
Aneurysm	1 (3.2%)

31 participants (38.3%) reported having a problem with their current vascular access. A half of them (51.6%) had experienced a vascular access infection, almost half of them (45.2%) reported vascular access dysfunction , a quarter (25.8%) had vascular access related pain while 6.5% had vascular access bleeding that required blood transfusion.

4.6 IMPACT OF THEIR CURRENT VASCULAR ACCESS ON THEIR QUALITY OF LIFE USING THE VASCULAR ACCESS QUESTIONNAIRE (VAQ)

The score ranges from 0 to 85 with seventeen items graded according to the level at which they bothered the participant in the four weeks prior to the study. The score can be interpreted as Not at all (0-17), a little (18-34), moderately (35-51), quite a bit (52-68) or extremely (69-85).

Table 7 : Showing the comparison of the vascular access score for each vascular access type (n=80)

Variable	N	Mean	SD	Median	IQR
All patients	80	17.0	9.8	15	11.0 - 23.5
AVF	15	9.4	7.0	7	4 – 15
CVC + Maturing AVF	16	19.3	10.1	16	12 – 27
nt-CVC	14	18.3	9.8	15	13 – 31
t-CVC	34	19.1	9.2	16	12-25

The mean VAQ score for all the patients was 17.0 with the lowest mean score being recorded amongst participants who were using an AVF (9.4) and the highest amongst participants who were using a CVC with a concurrently maturing AVF (19.3) as shown in table 7 above.

COMPARISON OF THE VAQ SCORES WITH PARTICIPANT DEMOGRAPHIC AND ACCESS RELATED FACTORS

Table 8 Showing Comparison of participant factors with the VAQ scores. (n=80)

		VAQ Score		
Variable	**N (%)**	**Mean (SD)**	**Median (IQR)**	**P Value**
Gender				
Female	37 (46.3%)	19.1 (9.7)	17 (12,25)	0.0545
Male	43 (53.7%)	15.1(9.7)	13(8,18)	
Age (years)				
18 – 29	21 (26.3%)	13.0 (10.0)	12 (6,15)	0.3496 *
30 – 39	19 (23.8%)	21.3 (10.3)	19 (12,30)	
40-49	15 (18.8%)	16.9 (8.5)	14 (12,25)	
50 – 59	11 (13.8%)	19.3 (10.2)	17 (11,32)	
≥60	14 (17.5%)	15.3 (8.2)	14.5 (11,18)	
Marital status				
Single	25 (31.3%)	13.6 (9.2)	13 (7,17)	**0.0408**
Married	55 (68.7%)	18.5 (9.9)	16 (11,25)	
Education level				
None/primary	24 (30.0%)	17.9 (10.6)	14.5 (12.5,25.5)	0.3995 *
Secondary	36 (45.0%)	17.6 (10.1)	15.5 (9.5,25)	
Tertiary	20 (25.0%)	14.7 (8.5)	14 (11,17.5)	
Occupation				
Employed (artisan & professional)	20 (25.0%)	17.5 (10.6)	16 (12.5,25)	0.8642
Self employed	15 (18.8%)	16.6 (10.3)	15 (7,23)	
Unemployed (includes student and retired)	45 (56.2%)	16.8 (9.6)	14 (11,23)	
Diabetes				
No	68 (85.0%)	16.6 (9.8)	15 (11,22.5)	0.4705
Yes	12 (15.0%)	18.9 (10.3)	15.5 (12,28.5)	
Hypertension				
No	18 (22.5%)	20.0 (12.2)	18.5 (11,32)	0.2475
Yes	62 (77.5%)	16.1 (9.0)	14.5 (11,21)	
Dialysis vintage (months)				
3-6	22 (27.5%)	19.1 (10.6)	16.5 (11,31)	0.2682*
7-12	18 (22.5%)	15.2 (6.3)	14 (12,18)	
13-18	11 (13.8%)	19.0 (9.9)	16 (11,27)	

		VAQ Score		
Variable	**N (%)**	**Mean (SD)**	**Median (IQR)**	**P Value**
19-24	9 (11.3%)	17.8 (11.1)	16 (11,25)	
>24	20 (25.0%)	14.7 (11.1)	14.5 (6.5,18)	
Current access type				
AVF	15 (19.0%)	9.4 (7.0)	7 (4,15)	**0.0068**
CVC + Maturing AVF	16 (20.3%)	19.3 (10.1)	16 (12,27)	
CVC + PD	1 (*Not included in model*)	-	-	
nt-CVC	14 (17.7%)	18.3 (9.8)	15 (13,31)	
t-CVC	34 (43.0%)	19.1 (9.2)	16 (12, 25)	
AVF on dominant arm				
No	31 (81.6%)	14.0 (9.4)	13 (7,17)	0.8463
Yes	7 (18.4%)	14.4 (9.4)	13 (4,22)	
Problem with current access				
No	49(61.3%)	14.1 (8.3)	13 (8,17)	**0.0019**
Yes	31(38.7%)	21.5 (10.5)	21 (13,31)	
Satisfied with current access				
Somewhat satisfied	39 (48.8%)	16.8 (8.3)	15 (12,23)	**0.0001**
Very satisfied	28 (35.0%)	11.4 (7.2)	11 (6,16)	
Somewhat dissatisfied	6 (7.5%)	25.0 (7.4)	26 (21,30)	
Very dissatisfied	7 (8.8%)	33.4 (5.4)	32 (29,39)	

p-values are from Mann-Whitney (2 groups of categorical variables) or Kruskal-Wallis tests (>2 groups of categorical variables), unless stated otherwise, and bold p-values are significant at $p < 0.05$.
*p-Value from Spearman's rho, as the factor is ordinal.

There were significantly better (lower) scores in participants who had an AVF (9.4 p=0.007), those who have not experienced a problem with their current vascular access (14.1, p =0.002), those who were very satisfied with their vascular access (11.4, p=0.0001) and in single participants (13.6, p=0.041).

There were poor (higher) scores in female participants (19.1) and in those who had diabetes mellitus (18.9) and better (lower) scores in male participants (15.1), those at extremes of age (18-29 had a mean of 13.0 while those >60 years had a mean of 15.3), those who had been on dialysis for more than two years (14.7) and those with a tertiary level of education (14.7). The

VAQ score was not affected by having an AVF in either the dominant or the non-dominant arm. The difference of scores in the age categories were not significant.

This findings are illustrated in table 8 above.

4.7 POSSIBLE FACTORS CONTRIBUTING TO PARTICIPANTS CHOICE OF VASCULAR ACCESS

4.7.1 Timing of referral

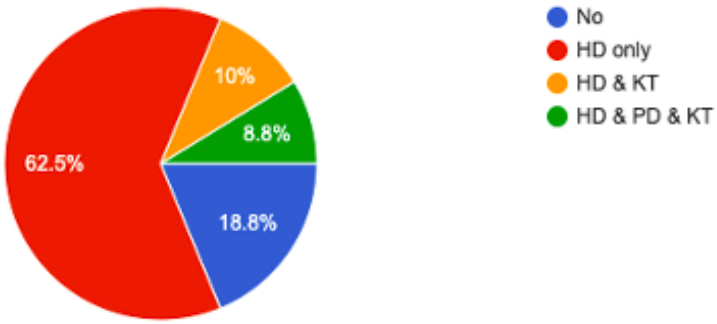
Table 9 Showing timing of referral for predialysis care

	n (%)
Participants initiated on HD within 3 months of ESKD diagnosis	77.5%
Participants initiated on HD as an emergency	85%
Participants who had their incident vascular access placed as an emergency	85%
Participants reviewed by a nephrologist at any point (< 3 months) prior to initiation of HD	75%
Participants reviewed by a nephrologist atleast > 3 months prior to initiation of HD	21.3%
Participants reviewed by a vascular access surgeon atleast > 3 months prior to initiation of HD	7.5%
Participants who had an AVF attempted prior to initiation oF HD	7.5%

More than three quarters of the participants were initiated on hemodialysis within three months of being diagnosed with ESKD (77.5%), most of them were initiated on HD as an emergency (85%), had their first vascular access placement as an emergency (85%) and most had their initial access placements in KNH (81.3%). Majority of the participants had been referred for , and consequently reviewed by a renal physician within the last three months prior to initiation of Hemodialysis (75%), however about a fifth (21.3%) reported having been reviewed by a renal physician at least more than three months prior to HD initiation and a further 7.5% being reviewed by a vascular surgeon at least three months prior to initiation of hemodialysis. Only 7.5% of our participants had an AVF attempted prior to initiation of hemodialysis.

4.7.2 Predialysis patient education

Figure 4: Pie chart showing proportion of participants aware of the modes of KRT



At the time of initiation of hemodialysis almost a fifth of the participants (18.8%) were not aware of any forms of RRT, most participants were aware about HD only (62.5%) , smaller proportions were aware of both HD & KT (10%) and all three forms of RRT (8.8%). Only 7.5% of the participants were aware of the various forms of vascular access.

73.1% were aware of the advantages of an AVF over a CVC. The advantages they listed included having less access related infections (93.1%), better blood flows (81%), ease of bathing (39.7%), access longevity (36.2%), ease of social activities such as bathing (5.2%), conjugal activities (1.7%) and that it is more aesthetically appealing (3.4%).

The participants source of information about vascular accesses was the nephrology nurses (78.9%) , their doctors (73.7%) and their fellow patients (23.7%).

4.7.3 Vascular access factors

All participants reported that their first vascular access was recommended by their doctor. About half of the participants had had their current access for less than six months (46.3%) while 10% had had the same access for more than two years.

Changing of vascular access

Almost half (43.8%) of them had a change of their VA within the first three months of hemodialysis. The most common vascular access changed to was a tunneled CVC (48.9%) , followed by non-tunneled CVCs at 37.8% and AVF least at 13.3%. The reasons given for changing of the VA within the first three months included getting a definitive access (56.5%), access failure (41.3%), vascular access infections (30.4%) and a vascular access falling off (13%).

Vascular access related hospitalization

About a fifth of the participants had been hospitalized due to access related conditions in the last one year. The reported reason included vascular access infection (61.1%), bleeding from the vascular access (22.2%) and superior vena cava syndrome (11.1%).

Perceived barriers to acquisition of an AVF

73.7% of the participants reported that they were currently using a CVC for hemodialysis (Figure 27). The reasons given for not actively using an AVF included difficulty getting the AVF due to long uncoordinated processes (32%), about a third (28%) had had a previous AVF that never worked, 20% reported a long surgery waiting time, 18% had a CVC and therefore did not see the need to get another access, 16% reported financial constraints ,16% had an AVF that was yet to mature, 12% had been informed that they had unsuitable blood vessels while 4% felt it would interfere with their occupation.

Arteriovenous Fistula performance and outcomes

Almost half of the participants (47.5%) had an AVF placement during their dialysis vintage. Of these 18.5% reported having an AVF in their dominant arm. Having an AVF in the dominant arm caused discomfort in 36.4% of that cohort and the listed problems included difficulty conducting household chores (75%) and changes in sensation (50%).

22.5% of the participants reported having a previous AVF that failed. In this cohort of patients, only 11.5% were offered a corrective procedure and interestingly, 77.8% were willing to get another AVF.

Satisfaction with the vascular access

Most participants were satisfied with their vascular access (83.8%) and felt that their vascular access was easy to use (92.5%).More than half (68.8%) would recommend their current access to a fellow patient.

Patient and healthcare provider vascular access preference

Most participants preferred an AVF (68.8%), followed by the CVC (13.7%), 6.3% had no preference while 11.3% did not know what access they preferred.

Most participants felt that the nurses preferred an AVF (65%).

CHAPTER 5 : DISCUSSION

In an effort to document the vascular access profile of patients on hemodialysis for end stage kidney disease at the Kenyatta national hospital, a cross sectional hospital based study was carried out using an interviewer guided questionnaire on eligible participants.

This study has provided an important insight into patients vascular access experiences, preferences ,their perceived views of their vascular accesses and their vascular access health related quality of life.

Majority the participants were young person's similar to findings from previous studies carried out at the Kenyatta national referral hospital. The participants are expected to be at the peak of their productivity and are therefore more likely to be affected by a poor vascular access related quality of life. It is for this reason that efforts should be placed to secure an optimally functioning vascular access with consideration to their preferences, comorbidities and their ESKD life plan. Hypertension was the most common comorbidity and this is most likely due to underlying condition. About a third of the participants documented having diabetes . this is five times the prevalence of diabetes in the Kenyan population(39) , reinforcing that diabetes is a major risk factor for ESKD in Kenya and that it may be one of the places to target identification of patients for early nephrology intervention.

The most common type of VA used by our participants at the initiation of HD was a non-tunneled CVC (77.5%) followed by tunneled CVC (20%) and AVF being the least at 2.5%.

In 2018, Kabinga *et al* documented almost similar findings at the KNH renal unit with 80% being initiated with non-tunneled CVCs, 11.85% had tunneled CVCs and less than 2% had an AVF.(8)There was an improvement in use of tCVC's but no change in AVF uptake. We asked patients more details about their vascular access experience in order to understand the persistence and provide possible solutions to increase AVF uptake.

These incident VA prevalences are similar to those reported in other studies such as the 2017 United States Renal Data System annual report, which indicated an 80% prevalence of CVC use at the initiation of HD (40), a Palestine study conducted by Atieh *et al* who documented a similar pattern in incident VAs in a tertiary hospital with non-tunneled CVC (73%), tunneled CVC (13%) and AVF (13%)(12).Last but not least, in Senegal, Kane *et al* indicated that at

initiation of HD ,92.2% of the patients had a CVC while 7.8% had an established AVF.(15) These population are varied in terms socioeconomic status and expertise for VA placement yet the prevalence is similar with low incident AVF uptake. This may most likely be due to late nephrology and vascular access surgery referrals.

There were contrary findings in studies conducted amongst incident hemodialysis patients in Australia, Catalan (Spain) and Korea. In Australia the most commonly used incident VA was AVF at 61% followed by CVC at 28% and AVG at 11% being the least used VA.(16) while the Catalan registry (2000-2011) showed that most common incident Vascular access was the AVF (47.9%) of their patients were initiated on hemodialysis with a fistula, 1.2% with a graft, 15.9% with a tunneled catheter and 35% with an non-tunneled catheter.(41)

In countries where the CVC is the most common initial access used during initiation of HD, it happens as a result of late referrals for comprehensive kidney care, lack or delay in patient education, rapid loss of kidney function, a protracted referral system or lack of expertise in access creation.

The prevalence of AVF use is high amongst patients on hemodialysis in studies in Korea, United States of America and Australia while the CVC use is more prevalent in Kenya, Iran and Senegal.(18)(22)(16) This variation may be explained by factors such as local and international guidelines, timing of referral, patient education and availability of expertise to create the various access.

The most common current(prevalent) vascular access in our study population was the tunneled CVC (42.5%) followed by those who had a CVC and maturing AVF (20%), AVF only (18.8%), non-tunneled CVC (17.5%) and one participant who had a bridging CVC during initiation of peritoneal dialysis. This was in contrast to prevalent vascular accesses in studies conducted in Australia and Korea. In Australia, Polkinghorne *et al* documented that the prevalence of AVF was higher at 77%, AVG at 19% and CVCs markedly reduced at 4% (all $P<0.001$) in the prevalent hemodialysis group of patients (16) whilst in Korea, the VA type distribution has remained the same over a long period of time (in 2018: AVF 77%, AVG 15% and CVC at 8%).(42) The most likely reasons for a higher prevalence of AVF in these studies use included; following international guidelines, timely referrals, having skilled interventional radiologists and vascular access surgeons and having a mandatory medical insurance.

The median number of vascular accesses that each patient had were 2 (IQR 2,3) and ranged from 1 to 20 during their dialysis vintage. Most participants had a ntCVC (48.5%) followed by a tCVC (29.8%) and AVF being the least common (21.7%). The most common location used for the vascular access was the right internal jugular (RIJ) (46% in total with RIJntCVC used in 25.2% vs RIJtCVC 21.8%), the left brachiocephalic region was the most commonly used location for AVF placement (10.3%) followed by the left radiocephalic region (5.6%). The least commonly used location was the left Subclavian region (0.4%).One patient was undergoing peritoneal dialysis and had a bridging hemodialysis access. The locations utilized have followed international guidelines on choice of VA site in order to maximize outcome and reduce chances of complications such as central venous stenosis which is common after use of the Subclavian vein.

The VAQ score provides invaluable insight into the patients vascular access experiences. The score ranges from 0 to 68 with seventeen items graded according to the level at which they bothered the participant in the four weeks prior to the study. The score can be interpreted as Not at all (0), a little (1-17), moderately (18-34), quite a bit (35-51) or extremely (52-68) bothersome to the patient in the last four weeks. In our study, the mean VAQ score for all the patients was 17.0 with the lowest mean score being recorded amongst participants who were using an AVF (9.4) and the highest amongst participants who were using a CVC with a concurrently maturing AVF (19.3).

The VAQ score was found to significantly improve (lower scores) amongst participants who had an AVF **(p=0.0068)** who had a mean score of 9.4 vs ntCVC18.3 vs tCVC 19.1, participants who were satisfied with their VA **(p = 0.0001)** at a mean VAQ of 11.4 for those very satisfied vs 16.8 for somewhat satisfied and 33.4 for those very dissatisfied. It was also found to improve in single participants **(p=0.0408)** with a mean score of 13.6 compared to married participants who had a mean score of 18.5.

The VAQ score was significantly worse (higher scores) in participants who had had a problem with their VA **(p=0.0019)** at a mean score of 21.5 compared to those who had not had a problem ,at a mean score of 14.5. There was no significant association with either with age, gender, level of education, occupation, having Diabetes mellitus, Systemic hypertension, dialysis vintage or having an AVF in the dominant arm. The predictors for a worse VAQ score amongst

our participants were having a problem with the current VA in the last one year, dissatisfaction with the VA, having a CVC and being married. In a similar study conducted in multiple hemodialysis centers in the UK by Field et al the VAQ score was found to improve significantly with age (lower scores in those above 75 years **(p<0.001)** and significantly worse (higher score) in females **(p<0.001),** those with peripheral vascular disease **p=0.011.**

61.3% of our participants reported having a problem with their current access in the last one year. Of these, the reported access problems were, access infection (51.6%), pain related to access use (25.8%), blockage of the access (25.8%), poor flows (19.4%), minor bleeding (9.7%), bleeding requiring blood transfusion (6.5%), aneurysmal changes (3.2%) and access infiltration (3.2%). These problems are similar to those found in various studies including a single center study in Egypt by Ghonemy *et al* who documented 53.7% blood culture positive vascular access infections, 57% of vascular access related stenosis an 36.9% having aneurysmal complications. (43)We had fewer reported complications and this may be explained by possible lack of documentation.

About a fifth of the participants had been hospitalized due to access related conditions in the last one year. The reported reason included vascular access infection (61.1%), bleeding from the vascular access (22.2%) and superior vena cava syndrome (11.1%).

The optimal vascular access type in elderly hemodialysis patients has been widely debated given their limited life expectancy and lower AVF maturation rates. There was a higher (worse) but non-significant average VAQ score in female participants (19.1) compared to the male participants (15.1). According to the Catalan vascular access registry, the likelihood to start hemodialysis with fistula was significantly lower in females [adjusted odds ratio: 0.69, 95% confidence interval (CI): 0.61-0.75](41)

Hypertension was the most common morbidity noted (91.3%) , others included Diabetes Mellitus (15%), Glomerulonephritis (5%), Obstructive/Urological conditions (3.8%), Hepatitis B (5%) , Heart Failure (5%). Of note is that 11.35% of the population had ESKD due to obstetric and gynecologic conditions while 8.8% had a previous episode of AKI requiring hemodialysis. The comorbidities noted in a Belgian study by De Clerk *et al* on vascular access documented the comorbidities in their population as Diabetes mellitus (28%), Glomerulonephritis (7%),Autosomal dominant polycystic kidney disease (6%), malignancy

(5%) and obstructive/ urological problems (4%).(44) Based on this findings it may be easier to tailor vascular access care by training doctors who primarily manage patients in this areas to recognize features of CKD early in order to refer them for nephrology and vascular access care.

Vascular access complications are the leading cause of morbidity and mortality amongst patients undergoing hemodialysis and result in high healthcare costs. 61.3% of our participants reported having a problem with their current access in the last one year. Of these, the reported access problems were, access infection (51.6%), pain related to access use (25.8%),blockage of the access (25.8%), poor flows (19.4%), minor bleeding (9.7%), bleeding requiring blood transfusion (6.5%), aneurysmal changes (3.2%) and access infiltration (3.2%).Participants who had experienced a problem with their current VA had a significantly higher VAQ score (21.5 p=0.0019). About a fifth of the participants had been hospitalized due to access related conditions in the last one year. The reported reason included vascular access infection (61.1%), bleeding from the vascular access (22.2%) and superior vena cava syndrome (11.1%). Leslie Ng et al documented the risk of hospitalization related to VA types amongst incident HD patients in the US (1996-2004), Out of the 2635 patients interviewed, 60% used a CVC,22% an AVG and 18% used an AVF. CVC use was associated with an increased risk of all-cause hospitalization [adjusted RR = 1.30,95% CI: 1.09-1-54] compared to the AVG [RR = 1.07,95% CI :0.89 – 1.28](45)

Jones *et al* evaluated factors associated with hospitalization of patients on chronic hemodialysis and documented that HD patients were more likely to be hospitalized if they had repeated access procedures, lower functional status scores, lower phosphate and protein levels ,cardiovascular conditions, arthritis, psychiatric disorders, ischemic peripheral vascular disease, lung disease, or larger households. Sociodemographic characteristics did not have a significant influence on the risk of hospitalization.(46)

Referral time for end-stage renal disease (ESRD) patients to nephrologists and initial vascular access method are considered significant factors that impact health outcomes at the time of hemodialysis (HD) initiation. More than three quarters of the participants were initiated on hemodialysis within a period that was less than three months of being diagnosed with ESKD (77.5%), most of them were initiated on HD as an emergency (85%).

The incidence of late referral varies in various populations with the USRDS dialysis morbidity and mortality study documenting that only 33% of the participants had been referred for nephrology review in the four months prior to initiation of HD, in Europe 30% of the patients who had diabetes were referred within a month of initiating RRT while in the New Zealand Transplant Registry , 26% of patients were referred less than two months prior to initiation of RRT. In both Europe and New Zealand, those who were referred late were most likely participants who had a high burden of comorbidities, lacked health insurance or were from less presented groups. This is similar to the presentation in our participants which results in unplanned initiation of HD which is associated with a lot of vascular access related morbidity and mortality, high CVC use and high CVC related admissions.

Arora *et al* evaluated 135 patients at the New England medical center and its affiliate clinics and documented the prevalence, predictors and consequences of late nephrology referrals. 22% had a late nephrology referral (more than 3 months between diagnosis and initiation of HD) and the major cause was disparities in the insurance covers. There was no significant difference with regard to age, gender or cause of ESKD. Patient referred late were less likely to have a received erythropoietin and less likely to have a functional permanent VA (40% vs 4%).(32) In Korea, Suh Kim *et al* found that the most common barrier to timely referral was non-compliance ,other factors identified included patients lack of acceptance of the severity of the disease, uncoordinated processes of care for patient evaluation and vascular access surgery, lack of resources to provide adequate vascular access education to the patients and losing patients on follow up.(33) These reasons are similar to those in our population.

At the time of initiation of hemodialysis almost a fifth of our participants (18.8%) were not aware of any forms of RRT, most participants were aware about HD only (62.5%) , smaller proportions were aware of both HD & KT (10%) and all three forms of RRT (8.8%). Only 7.5% of the participants were aware of the various forms of vascular access. The participants source of information about vascular accesses was the nephrology nurses (78.9%) , their doctors (73.7%) and their fellow patients (23.7%). This is a great indicator of the deficit in our predialysis nephrology education.

Incident vascular access data from the Catalan registry between 2000-2011, the probability of using an AVF was significantly higher in patients who had predialysis nephrology care longer

than 2 years (4.14, 95% CI: 3.63-4.73) and steady chronic kidney disease (CKD) progression (10.97, 95% CI: 8.41-14.32).(41)

Atieh *et al* documented the impact of predialysis nephrology care on choice of incident VA amongst Palestine patients ,77% had been seen by a nephrologist prior to initiation of hemodialysis. All participants who been initiated dialysis with functional AVF had received prior nephrology care. Patients who were not seen by a nephrologist prior to HD initiation had no chance at starting HD with AVF.(12)

Patients who receive predialysis nephrology care are more likely to be initiated on HD with an AVF while those who do not get predialysis nephrology care start HD using a CVC Early nephrology referral and permanent access creation in the pre dialysis stage could avert the unnecessary complications and costs of CVC use. Patient education given during the early course of the disease is important in deciding type of access, how and when to get the access, how to take care of access and prepare for the next access in case of access failure. Patients who have predialysis care are more likely to have a permanent VA and are more likely to have better outcomes.

73.7% of our participants reported that they were currently using a CVC for hemodialysis (Figure 27). The reasons given for not actively using an AVF included difficulty getting the AVF due to long uncoordinated processes (32%), about a third (28%) had had a previous AVF that never worked, 20% reported a long surgery waiting time, 18% had a CVC and therefore did not see the need to get another access, 16% reported financial constraints ,16% had an AVF that was yet to mature, 12% had been informed that they had unsuitable blood vessels while 4% felt it would interfere with their occupation. Shamasneh *et al* conducted a cross sectional study to evaluate the perceived barriers and attitudes to AVF creation in a dialysis center in Ramallah, Palestine. Perceived causes of no or delayed AVF were: patient's refusal of AVF in 54.5%, late referral to a surgical evaluation in 31.3% and too long to surgical appointments in 14.2%. Among those who refused AVF, reasons were: concern about the surgical procedure in 42.5%, poor understanding of disease/access in 23.3%, fear of needles in 15.1%, denial of disease or need for HD in 17.8%, and cosmetic reasons in 1.4%.(47) This findings are similar to those found in our study population and indicate areas in which to focus our vascular access care.

Forty six percent of patients reported that they received education about AVF prior to the creation of HD access, and 73.7% would recommend AVF as the method of access due to the lower risk of infection (96%), easier to care for (16%), easier showering (14%), and better-associated hygiene (3%)(47).Though presence of an AVF in the dominant arm caused discomfort in 36.4% of our participants, the VAQ score was similar between participants who either had or didn't have an AVF in the dominant arm . This is in similar to findings by Field et al where in his study the presence of the AVF in the dominant arm did not seem to be of concern. Since the vessel size in the dominant arm is more favorable for fistula maturation the longstanding avoidance of the dominant arm should be challenged in selected patients in favor of better vessel size.(48)

Patient satisfaction is an important driver of choice of vascular access amongst patients on hemodialysis. Satisfied patients will have a better health related quality of life and are more likely to recommend the same access to fellow patients on hemodialysis.

We found that most participants were overall satisfied with their vascular access (83.8% **p=0.0001**). AVFs were the access type that the patients were most satisfied with. The access type associated with the most dissatisfaction was the CVC. Participants who had an AVF had the lowest average VAQ score (9.4) compared to the t-CVC (19.1), nt-CVC (18.3), CVC with maturing AVF (19.3) **(p=0.0068).** Sridharan *et al* evaluated the association between the various VA types and levels of access related satisfaction amongst HD patients in Pennsylvania and went on further to compare the VAQ with a HRQOL questionnaire and found a significant level of satisfaction (lower scores) in participants who had an AVF compared to tCVC and AVG ((4.5 vs 6.5 vs 7.0 p=0.013)(49)

Most participants preferred an AVF (68.8%), followed by the CVC (13.7%), 6.3% had no preference while 11.3% did not know what access they preferred.1,400 United States patients on Dialysis were evaluated during The Dialysis Outcomes and Practice Patterns Study (DOPPS) survey where they were asked about their preferred vascular access. The findings were almost similar to those in this study. In the analysis, 24% of patients expressed having no preference whilst 12% preferred a CVC. The most documented reasons for preferring a CVC were that it did not involve any pricking or bleeding , that it was more aesthetically appealing and that there was less chance of disfigurement. 95.2% of patients had no VA knowledge compared to 20 % in the DOPPS study, this can be translated to lack of

understanding of the risks and benefits of various vascular access types. (22) Most participants felt that the nurses preferred an AVF (65%). This may have an influence on the participants VA preference due to the high contact time and may explain the preference that the participants documented

For participants who were still using a CVC despite knowing the advantages of an AVF over a CVC, it is important to troubleshoot the reason that they listed . Most of the reasons were systemic factors. At the time of the study ,most patients (73.1%) were aware of the advantages of an AVF over a CVC. The advantages they listed included having less access related infections (93.1%), better blood flows (81%), ease of bathing (39.7%), access longevity (36.2%), ease of social activities such as bathing (5.2%), conjugal activities (1.7%) and that it is more aesthetically appealing (3.4%).

73.7% of our participants reported that they were currently using a CVC for hemodialysis despite being advised to get an AVF . The reasons given for not actively using an AVF included difficulty getting the AVF due to long uncoordinated processes (32%), about a third (28%) had had a previous AVF that never worked, 20% reported a long surgery waiting time, 18% had a CVC and therefore did not see the need to get another access, 16% reported financial constraints ,16% had an AVF that was yet to mature, 12% had been informed that they had unsuitable blood vessels while 4% felt it would interfere with their occupation. This reasons are similar to those reported in multiple studies. These results emphasize the need to put in place a vascular access coordinator , VA progress notes and a team to ensure optimal VA outcomes.

22.5% of our participants reported having a previous AVF that failed. In this cohort of patients, only 11.5% were offered a corrective procedure and 77.8% were willing to get another AVF.

5.1 LIMITATIONS

1. Recall Bias as patients were required to remember events that had occurred several years back, some events may have occurred whilst gravely ill and thus they may not remember important details in their medical history

2. This was a hospital based study in one of the major public referral institutions in the country and the findings may not be generalizable to hemodialysis patients in the entire country. A larger country wide survey is recommended.

5.2 RECOMMENDATIONS

1. A vascular access care programme will have a positive impact on the hemodialysis patients health related quality of life. Vascular access coordinators have the expertise skills and capacity to build relationships with patients and multiple team members in order to educate, coordinate, guide and manage vascular accesses for the patients. They play a key role especially in coordinating timely management of access complications. Put in place a Vascular Infection quality control coordinator with a tool to assess VA infection outcomes.
2. Patient education programme on types of vascular accesses available, the advantages and disadvantages of each and preservation of peripheral veins in an important component of vascular access planning.
3. Timely nephrology referral depends on early identification of chronic kidney disease by primary health care providers. In order to improve this, emphasis should be placed on training medical officers, internal medicine registrars and other physicians on early identification and referral for VA acquisition and care in their training curriculums and in conferences and continuous medical education programs.

5.3 CONCLUSIONS

This study demonstrates that most participants were young persons expected to be at the peak of their productivity and hence an optimal vascular access is crucial to their ESKD management and their vascular access health related quality of life. The AVF is the least common vascular access in either incident or prevalent accesses, yet it is the most preferred access by both patients and dialysis nurses and has better VAQ scores. Non tunneled CVC is the predominant incident vascular access type while the tunneled CVC is the predominant prevalent access type and this is most likely due to late referral for nephrology and vascular access care, low levels of predialysis patient education and systemic barriers in vascular access acquisition and maintenance. Individualized vascular access placement should consider the patients' preference, their comorbidities, previous vascular access experience, their socioeconomic determinants and their vascular access related quality of life. A vascular access coordination team is key to ensure optimal individualized vascular access outcomes.

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CHAPTER 7 : APPENDICES

7.1 APPENDIX 1: PATIENT INFORMATION AND CONSENT FORM

VASCULAR ACCESS PROFILE OF HEMODIALYSIS PATIENTS AT THE KENYATTA NATIONAL HOSPITAL

I am Dr JOYCE BWOMBENGI, a Nephrology Fellow At The East Africa Kidney Institute. I am currently conducting a research on ***Vascular access profile of Hemodialysis patients at Kenyatta National Hospital***.

Study background

The dialysis access is a dialysis patients lifeline. The right access, for the right patient, at the right time is important in ensuring our hemodialysis patients have a good quality of life.

Broad Objective

We are carrying out this study in order to document the types of vascular access utilized by patients undergoing hemodialysis at KNH Renal Unit and document the factors that determine their choice of vascular access.

Study Procedures

If you agree to participate in this study, I will take a medical history that may include some personal questions about your vascular access' and how it (they) have impacted your quality of life. It will take approximately 15 minutes. There will be no risks to your health.

Voluntariness of Participation

Participation is voluntary and you are free to withdraw at any time during the course of this study. Your refusal to participate or withdrawal from the study will not in any way affect the quality of your treatment.

Confidentiality

All the information obtained will be handled with confidentiality. We will not use your name or any personal identifiers in our questionnaires and all filled questionnaires will be placed in a secured locker.

Benefits of Participation

Information on patients choice of dialysis access and how the current access has impacted their lives will ensure we put in proper measures for timely and appropriate vascular access' and protect future access.

Risks of Participation

There will be no risks to your health.

Right of Withdrawal

You are free to withdraw from participating at any time during the course of this study. There will be no consequences.

Endorsement

I conduct this study with the full endorsement of my lead supervisor Prof J. K Kayima and the Kenyatta National Hospital- University of Nairobi Ethics and Research Committee whom you can reach as follows;

Prof Joshua K. Kayima Tel : +254733730650 / 020-2726300 EXT 43733

Mailing address: P.O. BOX 19676-00202,KNH

Email: kayimajk@gmail.com

KNH-UoN ERC Email: uonknh_erc@uonbi.ac.ke

Website: http://www.erc.uonbi.ac.ke

Declaration

I..... do hereby agree voluntarily to participate in this research on ***Vascular access profile of hemodialysis patients at Kenyatta National Hospital***

The details of this study have been explained to me by Dr JOYCE BWOMBENGI

Signed/ Thumbprint.....Participant

Signed: .....Witness/ Researcher

Date: .....

7.2 APPENDIX 2: INVESTIGATORS STATEMENT

Vascular access profile of hemodialysis patients at Kenyatta National Hospital

Dear Sir/ Madam,

Thank you for accepting to participate in this important study. By doing so, you have agreed to be a part of a scientific process which will positively impact on Improving the quality of life of patients undergoing hemodialysis. Please answer a series of questions that I will read to you. Hopefully you will do this to the best of your ability. Thank you for accepting to spare your valuable time.

Dr Joyce Bwombengi (Principal Investigator)

7.3 APPENDIX 3: PATIENT INFORMATION AND CONSENT FORM (SWAHILI)

UCHAGUZI WA MISHIPA NA UMBO WASIFU MIONGONI MWA WAGONJWA WA FIGO KATIKA HOSPITALI YA TAIFA YA KENYATTA

Mimi ni Daktari JOYCE BWOMBENGI, mwanafunzi wa magonjwa ya figo katika taasisi ya Figo ya Afrika Mashariki. Ninafaya utafiti juu ya uchaguzi mishipa upatikanaji na umbo la wagonjwa wa figo wanahudhuria usafishaji wa damu katika kitengo cha usafishaji wa damu katika hospitali ya Taifa ya Kenyatta.

Upatikanaji wa mishipa ya usafishaji ni muhimu ili kuhifadhi Maisha ya wagonjwa ambao wana ugonjwa wa figo. Upatikanaji sahihi, kwa mgonjwa sahihi, wakati muafaka ni muhimu katika kuhakikisha wagonjwa wetu wanaohudhuria usafishaji wa damu kuwa na ubora mzuri wa maisha.

Maelezo kuhusu chaguo la wagonjwa wa kufikia usafishaji na jinsi upatikanaji wa sasa umeathiri maisha yao yatahakikisha kuwa tutatia katika hatua sahihi kwa muda na mwafaka wa mishipa kufikia ' na kulinda upatikanaji wa baadaye.

Ikiwa unakubali kushiriki katika utafiti huu, nitachukua historia ya matibabu ambayo inaweza kujumuisha baadhi ya maswali ya kibinafsi kuhusu ufikiaji wako wa mishipa ' na jinsi ilivyoathiri ubora wako wa maisha. Itachukua takribani dakika 15. Hakutakuwa na hatari kwa afya yako. Kushiriki ni kwa hiari yako na wewe na Kukataa kwako kushiriki au kujiondoa kutoka kwa utafiti haitasababisha kwa njia yoyote kuathiri ubora wa matibabu yako. Taarifa yote inayopatikana itashughulikiwa na usiri.

Tamko

I .....

Kwa kufanya hivi ninakubaliana nawe kwa hiari kushiriki katika utafiti huu juu ya mishipa upatikanaji chaguo na umbo wa wagonjwa wa figo wanaohudhuria usafishaji wa damu katika hospitali ya Taifa ya Kenyatta.

Maelezo ya utafiti huu yameelezewa kwangu na Dr JOYCE BWOMBENGI

Saini/Thumbprint .....Mshiriki

Saini:.....Shahidi

Tarehe ya mtafiti:.....

7.4 APPENDIX 4: INVESTIGATORS STATEMENT (SWAHILI)

Uchaguzi wa Mishipa upatikanaji na Umbo la wagonjwa wa figo wanaohudhuria usafishaji wa damu katika hospitali ya Taifa ya Kenyatta

Mpendwa bwana / mama, asante kwa kukubali kushiriki katika utafiti huu muhimu. Kwa kufanya hivyo, mmekubaliana kuwa sehemu ya mchakato wa kisayansi ambayo itakuwa na athari chanya juu ya kuboresha maisha ya wagonjwa wanaohudhuria usafishaji wa damu. Tafadhali jibu mfululizo wa maswali ambayo nitakusomea. Natumaini utafanya hivi kwa uwezo wako bora. Asanteni kwa kukubali kupata muda wako wa thamani.

Dr Joyce Bwombengi (mchunguzi mkuu)

7.5 APPENDIX 5:VASCULAR ACCESS QUESTIONNAIRE

Questionnaire for Vascular access profile of Hemodialysis patients on at Kenyatta National Hospital

Q. No_____ (Unique identifier)

Date: _____

Date of Birth:_____ Age_____

Gender M F (circle one)

Marital status: Single □ Married □ Separated □ Divorced □ Widowed □

Occupation _____

(Student Self Employed ,Employed professional ,Employed Clerical, Employed Artisan, Retired ,Unemployed) Tick one

Area of Residence _____

Highest level of education _____

Do you have a history of treatment for any of the following? (tick as appropriate)

Diabetes Mellitus	
Systemic hypertension	
Heart failure	
Liver disease	
Asthma	
Stroke	
Hepatitis	

Any other?_____

Primary renal diagnosis?_____

Who informed you that you had End Stage Kidney Disease?

From the time you were aware you had End Stage Kidney Disease how long did it take before hemodialysis was initiated? (Tick one)

Less than 3 months

3-6 months

6-12months

More than 12 months

I don’t know

For how many years long have you undergone hemodialysis?_____

Was your first dialysis planned or emergency? (Tick one)

Where did you get your first vascular access? _____

At what point did you get your first vascular access?

Electively

As an emergency

Were you reviewed by a renal physician at any point prior to initiation of dialysis?

Y N (circle one)

Were you reviewed by a renal physician at least 3 months prior to initiation of dialysis? Y

N (circle one)

Were you reviewed by a vascular surgeon at least 3 months prior to initiation of dialysis? Y

N (circle one)

What was your first mode of renal replacement therapy?

Hemodialysis

Peritoneal dialysis

What form of hemodialysis access did you start dialysis with? (Tick one)

Non tunneled CVC

Tunneled CVC

AVF

AVG

Who recommended your first vascular access? (Tick one)

Doctor

Nurse

Fellow Dialysis patient

Internet

Other? _____

Were you aware of the various forms of Renal replacement therapy? Which one?

No, I was not aware of any form of RRT?

Hemodialysis

Hemodialysis & Peritoneal Dialysis

Hemodialysis, Peritoneal Dialysis & Kidney Transplantation

Was an AVF/ AVG attempted before the first dialysis? Y N (circle one)

What was your first mode of vascular access for hemodialysis (first 3 months of dialysis)?

AVF

AVG

Tunneled line

Non-tunneled line

Did you still have the same access as the one you had during the first 3 months of dialysis?

Y N (circle one)

If No,

Which was your next access?(Type & site)

What was the reason for change of access?

Getting a definitive access

Access failure

Infection

Other?_____

_____

What is your current mode of vascular access? (type & location)

AVF

Brachiobasilic

Brachiocephalic

Radiocephalic

AV graft

Lower arm

Upper arm

Upper leg

CVC

Femoral

Jugular

Other

CVC with fistula – locations?

For how long have you had your current access?_____

Have you encountered any problems with your dialysis access?

Y N (circle one)

If yes, which ones?

Bleeding

Bleeding requiring transfusion

Blockage

Infection

Pain in the extremities where the access is located

Others?

For those who have an AV fistula/ graft is it in your dominant arm?

Y N (circle one)

For those with an AVF/Graft on the dominant arm does it cause you any problems?

Y N (circle one)

What problems do you experience?_____

_____

For those with a CVC have you been advised to get an AVF?

Y N (circle one)

If yes? Why haven't you gotten it? (Tick all that apply)

Financial constraints

Fear of pain from needles

Long surgery waiting line

The AVF/AVG does not look good

Uncoordinated referral process

Previous AVF never worked

Previous AVF got blocked

Previous AVF got an infection

Previous AVF got an aneurysm

I already have a CVC and don't see the need to get another access

I am preparing for a renal transplant soon

Others _____

_____

If you had an AVF in the past that currently does not work would you get another?

Y N (circle one)

Do you know of any advantages that an AVF has over a CVC?

Y N (circle one)

If yes, which of the following have you heard of before?

Longevity

Less infections

Better blood flows

No pain from pricking

Others? _____

_____

Have you been hospitalized for an access related complication in the last one year?

Y N (circle one)

If yes, which one?_____

Are you satisfied with your current dialysis access? (circle one)

Very dissatisfied

Somewhat dissatisfied

Somewhat satisfied

Very satisfied

Would you recommend your current access to a fellow patient? (circle one)

No

Yes

Maybe

Is your access easy to use? (circle one)

Very difficult

Somewhat difficult

Somewhat Easy

Very Easy

Which vascular access do you prefer? (circle one)

AVF

CVC

Either

I don’t know

Which vascular access do you think the Nurses prefer? (circle one)

AVF

CVC

Either type

I don’t know

Prior to starting hemodialysis were you aware of the different types of vascular access?

Y N (circle one)

If your AVF blocked were you offered a corrective procedure for it?

Y N (circle one)

Where have you found information about your dialysis access?

Doctors

Nurses

Renal counsellor

Fellow patients

Television

Internet

Pamphlets

Others

During the past four weeks, how much were you bothered by each of the following problems related to your vascular access? Tick what describes your situation best

		Not at all	A little	Moderately	Quite a bit	Extremely
	Pain					
	Bleeding					
	Bruising					
	Swelling					
	Redness					
	Infection					
	Clotting					
	Appearance of your access					
	Worry that the access is working well to clean blood properly					
	Having to come early to the dialysis unit because of your access?					
	Having to leave the dialysis unit late because of your access?					
	Problems sleeping because of your access					
	Having to be careful to protect your access					
	Your access interfering with daily activities					
	Your access interfering with social and leisure activities					
	Worries about being hospitalized because of access problems					
	Worries about how long your access will last					

7.6 APPENDIX 6: VASCULAR ACCESS QUESTIONNAIRE (SWAHILI)

Nambari ya utafiti _____

Tarehe _____

Majina _____

Nambari ya hospitali _____

Tarehe ya kuzaliwa _____ Umri _____

Jinsia M F (chagua na mduara)

Hali ya Ndoa: Moja □Kuolewa □ Umetengwa □ Talaka □ Mjane □

Namba ya Pasipoti / Kitambulisho _____

Kazi unayofanya _____

Eneo la Makazi _____

Kwango cha juu cha masomo _____

Je! Una historia ya matibabu kwa magonjwa yoyote yafuatayo? (Jibu inafaa).

Ugonjwa wa kisukari	
Mfumo wa shinikizo la damu	
Kushindwa kwa moyo	
Ugonjwa wa ini	
Pumu	
Kiharusi	
Hepatitis	

Je! Nyingine yoyote?

Utambuzi wa figo ya msingi?

Ni nani aliyekujulisha kuwa una ugonjwa wa figo unaohitaji usafishaji wa damu?

Kuanzia wakati wa kwanza ulipojua kuwa unaugua ugonjwa wa Figo , ilichukua muda gani kabla ya kuanzishwa kwa usafishaji wa damu kuanza? (Tiki moja)

Chini ya miezi 3

Miezi 3-6

Miezi 6-12

Zaidi ya miezi 12

Sijui

Je! Umeshapata usafishaji wa damu kwa miaka mingapi? _____

Je! Dialysis yako ya kwanza ilipangwa au dharura? (Tiki moja)

Ulipata wapi ufikiaji wako wa kwanza wa mishipa?

Je! Ulipata ufikiaji wako wa kwanza wa mishipa?

a. Kwa uchaguzi

b. Kama dharura

Je ulihudumiwa na daktari wa figo wakati wowote kabla ya kabla ya kuanzishwa kwa usafishaji wa damu ? Y N (mduara moja)

Je ulihudumiwa na daktari wa figo angalau miezi tatu kabla ya kuanzishwa kwa usafishaji wa damu ? Y N (mduara moja)

Je Ulihudimiwa na daktari wa upasuaji angalau miezi tatu kabla ya kuanzishwa kwa usafishaji wa damu ? Y N (mduara moja)

Njia yako ya kwanza ya tiba mbadala ya figo ilikuwa nini?

a. Uchambuzi wa damu

b. Dialisisi ya peritoneal

Ulianza kupata usafishaji wa damu kwa kutumia mbinu gani wakati wako wa kwanza ? (Tiki moja)

Mpira uliowekwa handaki

Mpira usiowekwa handaki

CVC iliyochimbwa

AVF

AVG

Nani alipendekeza ufikiaji wako wa kwanza wa mishipa? (Tiki moja)

Daktari

Muuguzi

Mgonjwa mwenza wa Dialysis

Mtandao

Nyingine? _

Je! Ulikuwa unajua aina anuwai ya tiba ya kubadilisha figo?

Hapana nilijulishwa tu juu ya hemodialysis

Hapana sikuwa na afya nzuri sana

Ndio, nilikuwa najua upandikizaji wa figo, peritoneal na hemodialysis

Wengine_____

Je! Ulishawahi jaribu kutengenezewa na kutumia AVF / AVG kabla msimu wa kwanza wa usafishaji wa damu? Y N (mduara moja)

Je! Ilikuwa njia gani ya kwanza ya upatikanaji wa mishipa kwa hemodialysis (miezi 3 ya kwanza ya upigaji damu)?

AVF

AVG

Mpira uliowekwa handaki

Mpira usiowekwa handaki

PD

Je! Bado ulikuwa na ufikiaji sawa na ule uliokuwa nao wakati wa miezi 3 ya kwanza ya upigaji damu? Y N (mduara moja)

Ikiwa Hapana,

Ufikiaji wako uliofuata ulikuwa upi?

Je! Sababu ya mabadiliko ya upatikanaji ilikuwa nini?

Kupata ufikiaji Dhahiri

Kushindwa kwa ufikiaji

Maambukizi

Nyingine?

Je! Ni aina gani ya sasa ya upatikanaji wa mishipa?

AVF

Brachiobasilic

Brachiocephalic

Radiocephalic

AV graft

Sehemu ya chini wa mkono

Sehemu ya juu wa mkono

Sehemu ya juu ya mguu

CVC

Femoral

Jugular

Other

CVC with fistula – sehemu ipi?

Je! Umepata ufikiaji wako wa sasa kwa muda gani?

Je! Umewahi kupata shida yoyote kwa ufikiaji wako wa dayalisisi?

Y N (duara moja)

Ikiwa ndio, ni shida ipi?

Vuja damu

Kuvuja Damu inayohitaji kuongezewa damu

Uzuiaji wa usafishaji

Maambukizi

Maumivu katika miisho ambayo ufikiaji unapatikana

Shida zinginezo?

Kwa wale ambao wana fistula / grafia ya AV je iko kwenye mkono wako ambayo unategemea zaidi? Y N (mduara moja)

Kwa wale walio na AVF / Grafia kwenye mkono mkubwa inakusababisha shida yoyote? Y N (mduara moja)

Je! Unapata shida gani?

Je! Kwa wale walio na CVC umeshauriwa kupata AVF?

Y N (duara moja)

Kama ndiyo? Mbona haujapata? (Tiki alama zote zinazotumika)

Vikwazo vya kifedha

Hofu ya maumivu kutoka kwa sindano

Mstari wa kusubiri wa upasuaji

AVF / AVG haionekani vizuri

Mchakato wa rufaa usioratibiwa

AVF ya awali haijawahi kufanya kazi

AVF ya awali ilizuiwa

AVF iliyopita ilipata maambukizi

AVF iliyopita ilipata aneurysm

Tayari nina CVC na sioni haja ya kupata ufikiaji mwingine

Ninajiandaa kwa upandikizaji wa figo hivi karibuni

Shida zinginezo.....

Ikiwa ungekuwa na AVF zamani ambayo sasa haifanyi kazi ungepata nyingine?

Y N (duara moja)

Je! Unajua faida yoyote ambayo AVF inao juu ya CVC?

Y N (duara moja)

Ikiwa ndio, ni yapi kati ya haya uliyosikia hapo awali?

Muda mrefu

Maambukizi kidogo

Damu bora inapita

Hakuna maumivu kutoka kwa kuchomwa

Wengine?

Umelazwa hospitalini kwa shida inayohusiana na ufikiaji katika mwaka mmoja uliopita? Y N (mduara moja)

Je! Umeridhika na ufikiaji wako wa sasa wa dialysis? (mduara moja)

Sijaridhika sana

Sijaridhika

Nimeridhika kwa kiasi Fulani

Nimeridhika sana

Je! Unaweza pendekeza ufikiaji wako wa sasa kwa mgonjwa mwenzako? (mduara mmoja).

Hapana

Ndio

Labda

Je! Upatikanaji wako ni rahisi kutumia? (duara moja)

a. Ngumu sana

b. Ngumu kidogo

c. Rahisi kiasi

d. Rahisi sana

32. Je! Unapendelea ufikiaji gani wa mishipa? (duara moja)

a. AVF

b. CVC

c. Yeyote

d. Sijui

Je! Unafikiria Wauguzi wanapendelea huduma ipi ya misuli? (mduara moja)

a. AVF

b. CVC

c. Aina yeyote

d. Sijui

Kabla ya kuanza hemodialysis ulikuwa unajua aina tofauti za upatikanaji wa mishipa? Y N (mduara moja)

Ikiwa AVF yako ilizuiliwa ulipewa utaratibu wa kurekebisha?

Y N (duara moja)

Umepata wapi habari juu ya upatikanaji wako wa dayalisisi?

Madaktari

Wauguzi

Mshauri wa figo

Wagonjwa wenzangu

Televisheni

Mtandao

Vipeperushi

Nyingine

Katika kipindi cha wiki nne zilizopita, ulikuwa na shida gani kwa shida zifuatazo zinazohusiana na ufikiaji wako wa misuli? Jibu kile kinachoelezea hali yako bora

		Hapana kabisa	Kidogo	Kwa kiasi	Zaidi kidogo	Sana
	Uchungu					
	Kuvuja damu					
	Kuumia					
	Kufura					
	Uwekundu					
	Maambukizi					
	Kushikamana kwa damu					
	Uonekanaji wa upatikanaji					
	Wasiwasi kwamba upatikanaji unasafisha damu vizuri					
	Baada ya kuja mapema kwa Kitengo usafishaji kwa sababu ya upatikanaji wako?					
	Kuondoka kitengo usafishaji ukiwa umechelewa kwa sababu ya upatikanaji wako?					

	Matatizo ya kulala kwa sababu ya upatikanaji wako					
	Kuwa mwangalifu kulinda ufikiaji wako					
	Upatikanaji wako wa kuingilia kati na shughuli za kila siku					
	Upatikanaji wako wa kuingilia kati na shughuli za kijamii na burudani					
	Wasiwasi kuhusu kulazwa hospitalini kwa sababu ya matatizo ya upatanisho wa mizizi					
	Wasiwasi kuhusu muda gani upatikanaji wako utaendelea kufanya kazi					