ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF MEDICAL LABORATORY SCIENCES

ASSESSMENT OF DIALYSIS TREATMENT OUTCOME AND ASSOCIATED FACTORS AMONG CHRONIC KIDNEY DISEASE PATIENTS ATTENDING SELECTED GOVERNMENTAL HOSPITALS DIALYSIS TREATMENT CENTER ADDIS ABABA, ETHIOPIA

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This is my paper to certify that partial fulfillment master's degree entitled with assessment of dialysis treatment outcome and associated factors among chronic kidney disease patients attending selected governmental hospitals dialysis treatment center Addis Ababa, Ethiopia.

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Abbreviations

AKI Acute Kidney Injury

BMI Body Mass Index

C-G Cock croft – Gault equation

CKD Chronic Kidney Disease

CVD Cardio Vascular Disease

DALY Disability Adjusted Life Years

ESRD End Stage Renal Disease

ETB Ethiopian Birr

GBD Global Burden of Disease

eGFR estimated Glomerular Filtration Rate

HBV Hepatithus B Virus

HD Hemodialysis

HIV/AIDS Human Immune Virus/ acquired immunodeficiency syndrome

KDOQI Kidney disease outcome quality initiative

OPD Out Patient Department

SCr Serum Creatinin

SDI Socio-demographic Index

URR Urea reduction ratio

WHO World Health Organization

KT/V K= dialyzer clearance, T= duration of dialysis, V= volume of bodily water

Abstract

Background*:* Chronic kidney disease is an advanced loss in kidney function over a period of time. It is identified by higher amount of creatinine and lower glomerular filtration rate. Chronic kidney disease is a growing problem worldwide leading to increasing incidence of life-threatening complications and mortalities. Dialysis treatment is an indication of end stage renal disease in the chronic kidney disease patients. Effective dialysis procedure is reducing renal damage and disease complication.

Objective: the aim of this study was to assess the effective dialysis treatment and associated factors among chronic kidney disease patients at selected hospital Addis Ababa Ethiopia from April to June 2022.

Methods: A Hospital based Cross sectional study was conducted at the three selected hospitals from April to June 2022. Proportion to population size was applied to determine the proportion of participants from the study areas based on the number of chronic kidney disease dialysis patients that attended the hospitals during the study period. During the study, besides to collecting socio-demographic information, history of comorbidity and treatment questionnaires related to risk factor assessment for poor dialysis outcomes were administered. Blood sample were collected and serum creatinine and urea were analyzed and calculated using Cockcroft Gault equation for eGFR. The effectiveness of dialysis was evaluated with URR, Kt/v and eGFR. The collected data was encoded, checked, cleaned and entered in to Microsoft excel software, and then imported to SPSS version 26 software for further statistical analysis.

Result: The total study subjects were 102. Of them 65(63.7%) were males and the mean ±SD age of the subject was 38.67 ± 13.06 years with 18-86 years range. The mean ±SD of URR, KT/V and eGFR values were 68.74% ± 20.61, 1.46 ± 0.24 and 25.63± 12.38ml/min/1.73m2 respectively. Assessment of hemodialysis results 64(62.75%) and 75(73.5%) were very good in URR and KT/V respectively. 71(69.6%) were good in eGFR value.

Conclusion: The present study indicated that overall evaluation of dialysis treatment conducted at the selected hospitals were very good.

Key words: chronic kidney disease; dialysis; Hypertension; Diabetes; URR; Effectiveness, Addis Ababa, Hospital, Ethiopia

1. Introduction

1.1 Background

Kidneys are a pair of bean-shaped organs, and basic structures of the body responsible for regulating homeostasis, acid-base equilibrium, as well as electrolytes. A number of conditions can affect the kidneys' normal structure and functions [1].

Chronic kidney disease is one of the most common chronic disorders and is characterized by structural or functional abnormalities of the kidney with or without a decrease in glomerular filtration rate (GFR less than 60 mL per minute per 1.73m^2 of body surface area for a minimum of three months) [2-3]. CKD is classified in five stages, according to the level of kidney damage and the ability of the kidneys to filter blood. GFR Category G1 > 90 in mL/min/ 1.73 m^2 was Normal or high, G2 60-89 was slightly lower than normal or high. G3a 45-59: mildly to moderately decreased G3b 30-44: moderately to severely decreased, G4 15-29 severely decreased, and G5 < 15 Kidney failure. Stage 5 CKD is also known as ESRD. Most patients at this disease stage require renal replacement therapy, such as dialysis or a transplant [4].

There are many risk factors for the development and progression of CKD [5]. Potential risk factors for CKD include socio-demographic characteristics and medical histories such as hypertension, diabetes mellitus, glomerulonephritis, etc. As age increases, the risk for kidney disease increases. CKD is more common in people aged 65 or older [6-8]. Diabetes is the leading cause of kidney failure. About 1 out of 3 adults with diabetes has kidney disease. It can impact blood circulation within the glomerulus, a part of the kidney's blood-filtering system [9]. Hypertension is one of the leading causes of CKD. BP > 130/80 mm/Hg is associated with a higher risk of kidney failure. It can cause damage to the blood vessels and filters in the kidney, making removal of waste from the body difficult [10].

There are some options to treat chronic kidneys disease. The option for treatment is kidney replacement therapy, which includes both kidney transplantation and dialysis. Kidney transplantation remains the gold standard treatment, whereas dialysis is the most common and most practiced modality of treatment for kidney failure and helps filter waste products from the blood when the kidneys are not working properly [11]. In the case of severe kidney damage,

dialysis is an option. It is only used for end-stage kidney failure, where 85 to 90% of kidney function is lost [12].

There are two types of dialysis: hemodialysis and peritoneal dialysis. Hemodialysis: An artificial kidney or hemodialyzer removes waste, additional fluids, and chemicals. Blood travels into the hemodialyzer, receives treatment, and then returns to the body. It is usually done in a hospital or outpatient dialysis center, although sometimes hemodialysis is done at home. In peritoneal dialysis, the peritoneal membrane filters waste products as excess fluids enter the abdominal cavity. In continuous peritoneal dialysis, the fluid drains through a catheter. The individual discards these fluids 4 to 5 times a day. In automated peritoneal dialysis, the process occurs over time. More regular dialysis has a more beneficial effect [4].

The effectiveness of dialysis is determined by comparing urea levels before and after dialysis and obtaining a value, known as the URR (urea reduction ratio) or PRU (urea reduction percentage). Pre- and post-dialysis urea levels are required for the calculation of the URR. The urea reduction ratio (URR) calculator uses the formula URR = (Upre - Upost)/Upre x 100% = (1 - Upre/Upost) x 100%.

Based on the URR formula, a URR of 65% is considered the minimum standard of hemodialysis adequacy, a URR of 65% or higher is considered very good hemodialysis adequacy, a URR of 55–64.99% is considered relatively good, and a URR of less than 55% is considered poor hemodialysis [13].

URR is related to Kt/V, which is one of the main methods by which dialysis measurements are made. (K x t)/V = -ln (1 - URR) is the equation for the relationship between the two. Where K (dialyzer clearance) is the blood passage rate in mL/min; t is the duration of dialysis; and V is the volume of bodily water. The minimum target value for the URR based on National Kidney Foundation guidelines, KDOQI, and ESRD Network recommendations is at least 65% and a Kt/V of at least 1.2 for dialysis effectiveness. The mean URR of a dialysis unit is often used as a measure of unit performance in dialysis delivery. However, this approach may obscure the number of at-risk patients with low URR values. Instead, one should examine the percentage of patients not achieving a target URR and use this as a standard of performance for individual

dialysis facilities [14–16]. According to KDOQI guidelines concerning blood pressure target ranges for hypertension in hemodialysis patients, pre-dialysis and post-dialysis BP goals should be <140/90 mm Hg and <130/80mm Hg, respectively. According to the current standard procedure in many dialysis clinics for diabetic patients, the glucose level should be recommended for glycemic control (HbA1c 6.5%, FBS 120 mg/dl, and RBS 200 mg/dl) to adequate dialysis treatments [16].

Kidney function is important in a number of clinical situations, including assessing renal damage and monitoring the progression of chronic renal failure. The glomerulus is a high-pressure filtration system composed of a specialized capillary network. It produces an ultra-filtrate that is free of blood and contains significant amounts of blood proteins. Renal damage or alterations in glomerular function affect the kidneys' ability to remove metabolic substances from the blood into the urine. (GFR) is the rate (volume per unit of time) at which ultra-filtrate is formed by the glomerulus. Approximately 120 mL per minute of renal function can be evaluated by measuring the GFR. eGFR is regarded as a good laboratory tool to show abnormalities of kidney function that can be calculated from the serum creatinine level [17–19]. eGFR can be determined by measuring the plasma clearance of different glomerular filtration markers like inulin and ethylene-diamine-tetra-acetic acid, but none of these are practical or economical for routine use. Serum creatinine (SCr) has been recommended as an endogenous marker of GFR and is used most frequently to assess renal function in clinical practices. However, the SCr level, which is affected by factors other than the GFR, is insufficiently sensitive to detect CKD on its own, and might remain in the normal range despite the fact that renal function is significantly impaired [20].

1.2 Statement of the Problem

Chronic kidney disease is a non-communicable disorder, and it has a major impact on global morbidity and mortality. Globally, kidney and urinary tract diseases are the 12th leading cause of death and the 17th leading cause of disability. CKD affects around 10–13% of the general population. It has been estimated that more than 500 million individuals globally have CKD, regardless of the cause [12, 21].

The burden of end-stage kidney disease (ESKD) is characterized by a requirement for lifesaving dialysis or kidney transplantation. It is estimated that more than 1.4 million people worldwide are affected by ESRD, and the annual incidence exceeds 8% worldwide [11]. In a 2015 WHO study, the Global Burden of Disease estimated that 1.2 million deaths, 19 million disability-adjusted life years, and 18 million years of life lost from cardiovascular diseases were directly attributable to reduced GFR [11-12, 22]. By now, CKD ranks 18th among the global causes of death. Also, it ranked 27th in 2011, and the number of deaths from CKD rose to 82% during that time. It is the third among the top 25 causes of death, next to HIV/AIDS and diabetes [23-24].

In 2010, an estimated 2.3–7.1 million people with end-stage kidney disease died without access to chronic dialysis [12]. Currently, in Iran, about150 000 sessions of hemodialysis are performed every month, with more than 13 000 patients being treated through dialysis. In Isfahan, Iran, 1500 patients are undergoing hemodialysis. Hemodialysis treatment influences the lifestyle, health status, and role of the individual within the family and community. Despite the significant advances made in this treatment process, these patients still do not have a satisfactory quality of life [25].

There were 697.5 million cases of CKD worldwide in 2017, and 1.2 million people died each year as a result of the high economic cost of treatment. The burden of CKD has been increasing, particularly in Oceania, sub-Saharan Africa, and Latin America. Hence, developing countries have insufficient resources to address the CKD epidemic and its serious long-term complications [12].

CKD has a high morbidity and is linked to an increase in cardiovascular mortality, with 5–10 million deaths worldwide each year [12, 24, 26]. In the USA, about 100 000 ESRD patients die

per year, which is about 4% of total deaths in that country among the general population. According to African Nations Data, CKD accounts for a significantly higher percentage of renal disease deaths, accounting for up to 22% of all deaths in Madagascar. In low-income countries, there are certain limitations to regular maintenance dialysis, including a lack of dialysis units, the restriction of these units to urban centers, and the absence of government funding or health insurance to cover the high costs of such treatment [27]. The burden of CKD in sub-Saharan Africa is at least three to four times that of the developed world [12].

Risk factors for the development and progression of CKD are diabetes and hypertension. CKD due to diabetes and hypertension affects nearly 5–7% of the world's population and is more common in developing countries [24]. Diabetes causes 9.1–29% of the cases of end stage renal disease (ESRD) in various developing countries, and hypertension leads to 13-21% of the cases [4]. Hypertension affects almost 25% of the adult population in Africa and is the cause of chronic kidney failure in 21% of patients on renal replacement therapy in South Africa. The prevalence of diabetic nephropathy is estimated to be 23.8% in Zambia, 14%–16% in South Africa, 12.4% in Egypt, 9% in Sudan, and 6.1% in Ethiopia [28].

Hemodialysis by nature has many side effects like low blood pressure (hypotension), muscle cramps, itching, sleep problems, anemia, bone diseases, high blood pressure (hypertension), and fluid overload due to known and unknown reasons. In addition, to the side effects, ineffective hemodialysis also leads to the following complications: fluid shifts, access-related problems, venous needle dislodgement, anticoagulation-related problems, first-use syndrome, cardiovascular problems, vitamin deficiency, and electrolyte imbalances. Finally, patients who were on hemodialysis will die due to the complications stated above.

Therefore, effective hemodialysis minimizes the death of patients who were undergoing ineffective hemodialysis and also minimizes the risk of exposure to complications.

1.3. Significance of the study

Filling the gap on the assessment of CKD dialysis patients and identifying associated factors helps to challenge the problem. Assessing effective hemodialysis outcomes by measuring the urea reduction ratio (URR), KT/V, and eGFR based on pre- and post-dialysis. These study findings reveal information that is useful to improve the performance of hemodialysis based on the identified gaps. This study helps that dialysis service staffs who is giving this treatment to patients to be serious about those changes in these parameters and act upon them. This assessed and quantified change will also help policy makers to develop and implement a strategy to prevent chronic kidney disease or a plan to make patients to arrive and to maintain the optimal level of glomerular filtration status.

This study will also provide insight for health institutions, educational centers, policymakers, and the government to see the level of the problem and develop intervention tools.

2. Literature Review

In a cross-sectional descriptive study conducted at Yasuj University, Iran, in the year 2013 by Roozitalab M. et al., 41 eligible patients were admitted to hemodialysis units; of those, the minimum and maximum KT/V indices were 0.45 and 1.77, respectively, with the mean ± SD of 0.94±0.4. In terms of the standard KT/V level, 41.5% of patients received adequate dialysis (KT/V > 1.2), and the minimum and maximum URR were 28% and 75%, respectively, with a mean SD of 50%± 0.69 and 48.8% of patients receiving inadequate dialysis URR values < 65%, with only 31.7% receiving adequate URR values. 82.9% of participants were married, and 61% were illiterate; the underlying cause of renal chronic failure was 39.0% hypertension, and 22% was diabetes mellitus [29].

The descriptive cross-sectional study was conducted from November to December, 2016 among a total of 202 patients undergoing hemodialysis in three hemodialysis centers in Isfahan, Iran, by Rezaiee O. et al. The most common underlying disease was diabetes [112 (55.4%)]. Hemodialysis adequacy was optimal in 56.4% of patients, in 29.7% near optimum, and less than optimal in 13.9%. Generally, the results of the study showed that approximately half of the patients did not have an optimal level of hemodialysis adequacy, and multiple individual and personnel factors affect hemodialysis adequacy directly or indirectly [13].

A cross-sectional, multicenter study was conducted by Mortazavi Khatibani SS et al. during six months on 344 hemodialysis patients referred to dialysis centers in the Guilan province in the north of Iran in 2022. Dialysis adequacy was evaluated using Kt/V (>1.2) criteria. The mean Kt/V was 1.24±0.36 with a median of 1.2. Adequacy of dialysis was desirable in 51.2% of the patients. Moreover, the most common causes of end-stage renal disease were related to hypertension (49.8%) and diabetes mellitus (27.4%) [30].

Manandhar DN et al. conducted a retrospective study at Nepal Medical College and Teaching Hospital and discovered 186 dialysis sessions out of 60 total dialysis patients in the reviewed case, with records dating back to 2008. Dialysis adequacy was determined using single pool Kt/v (spKt/v) and the urea reduction rate (URR). Mean pre urea, post urea and spKt/v were 160± 51.2

mg/dL, 71.8±28.5 mg/dL and 0.95±0.28 respectively. 54.82±11.24% was the average URR. Out of a total of 186 sessions, spKt/v was ≥ 1.2 in only 31 sessions (17.0%) [15].

Systematic reviews in English and Farsi during the year 2016 were identified by searching the related keywords in various electronic databases; a total of 6677 patients had been enrolled in 21 studies that were chosen for this systematic review. According to the random effects model, the overall dialysis adequacy (KT/V) was greater than 1.2, with a confidence interval of 36.3%; additionally, the URR in all studies was less than 65%, at 28.8% [31].

A cross-sectional study was conducted in four dialysis centers in Dar es Salaam, Tanzania by Somji SS et al, in 2020; the total sample size was 143. Proportion of patients receiving inadequate hemodialysis mean of URR and Kt/V were 60.9 ± 12.0% and 1.1 ± 0.3, respectively. Proportion of patients' international journal of nephrology receiving adequate hemodialysis among patients undergoing chronic hemodialysis in Dar es Salaam based on URR was 34.3% and based on Kt/V was 40.6% [16].

A case-control study was conducted between September 2011 and March 2012 among 180 CKD patients attending Obafemi Awolowo University Teaching Hospitals in Nigeria by Oyetola et al. 90 cases and 90 controls were recruited, interviewed and examined. Urinalysis and blood creatinine levels were determined. Glomerular filtration rate (GFR) of each patient was calculated from the blood creatinine using Cockcroft and Gault formula. Results were present in 86 out of 90 (96.5%) CKD patients compared with 15 out of 90 (16.7%) controls. In CKD subjects, the mean GFR was 57.6 ml/min/1.73 m2 and the control mean GFR was 35.5 ml/min/1.73 m2 [32].

A retrospective study that reviewed the medical case records of consenting adult CKD patients from January 2014 to June 2016 at Lagos University involved 123 adult CKD patients. The most common comorbid conditions were hypertension (91.10%) and diabetes mellitus (36.60%).The majority of the respondents (53.66%) were on maintenance dialysis; 43.09% were on conservative care, while 3.25% were on renal transplantation [26].

A hospital-based cross-sectional study conducted in Sub-Saharan Africa from October 20 to December 10, 2017 by Kore C., Tadesse A., Teshome B., Daniel K., Kassa A., et al. found that

320 of the 320 CKD participants in the study were contributing participants. From the total number of participants, the assessed prevalence of CKD was 12.2%. CKD cases related to diabetes include 17.9% of cases of diabetic mellitus, 58.9% of cases of hypertension, and 23.1% of patients with cardiac problems. CKD prevalence was higher among participants with a history of kidney infection, at 89.7% [10].

A prospective study was conducted by Hafez Abdel-Naiem A et al. at Sohag University Hospital in Egypt in 2018 on 112 study participants. The results showed that 69.64% of patients had adequate hemodialysis (KT\V >1.2), and only 30.36% of patients had inadequate hemodialysis (KT\V>1.2) [33].

3. Objectives

3.1 General Objective

To assess the effectiveness of dialysis treatment and associated factors among chronic kidney disease patients at selected Governmental dialysis treatment center Addis Ababa, Ethiopia, from April to June, 2022.

3.2 Specific objectives

- To determine the effectiveness of dialysis among chronic kidney disease patients at selected Governmental dialysis treatment center Addis Ababa, Ethiopia
- To identify factors associated with dialysis treatment at selected Governmental dialysis treatment center Addis Ababa, Ethiopia

4. Materials and Methods

4.1 Study area

The study was conducted at three selected Governmental hospitals in Addis Ababa city. Addis Ababa is the capital city of Ethiopia. It is the largest city in Ethiopia, with a population of 3,475,952 according to the 2007 population census with an annual growth rate of 2.7 %. Its area is estimated to be 530Km2 with altitudes ranging from 2200 to 3000m above sea level, an average temperature of 22.8C° and an average rainfall of 1,180.4mm. Addis Ababa has 41 hospitals (14 publics and 28 NGO and private).

The three selected Federal hospitals were St. Paul Hospital Millennium Medical College, Zawditu Memorial hospital and Menelik II Hospital.

St. Paul Hospital millennium medical college is found in Addis Ababa, capital city of Ethiopia. It is governed by a board under the Federal Ministry of Health. It is teaching and referral Hospital located western part of Addis Ababa, Gulelle sub-city, Woreda 9, House No 461. The hospital is built by Emperor Haile Selassie in 1969 with the help of the German Evangelican church aimed to serve the poor. A Millennium medical college was started in 2007. St Paul's is in the process of building its capacity quickly in a short period of time, growing from 3 to 250 faculty members in the last six years, and expanding teaching facilities. The college has more than 2800 clinical, academic and administrative and support staffs that provide medical specialty services to patients who are referred from all over the country, teaching medicine and nursing students and doing basic and applied researches. While the inpatient capacity is more than 700 beds, The College sees an average of 1200 emergency and outpatient clients daily. The laboratory gives service on average 600 patients daily including private wing. Many patients referred from different parts of the country. St. Paulo's hospital is pioneer for health service specially related to kidney problem and has the first kidney-transplanting center which will be beneficial from the outcome of our research. The hospital gives the most dialysis treatment about 260 patients among governmental dialysis center.

Zawditu Memorial hospital is found in kirkos Sub city, Addis Ababa city administration. The hospital, which was first built by Swedish missionaries in the compound of the present National

Palace, moved out to its current location behind the palace after constructing better facilities. It was built, owned and operated by the Seventh-day Adventist Church, but was nationalized during the Derg regime in about 1976. The hospital is named after Empress Zawditu, the cousin and predecessor on the throne of Emperor Haile Selassie. Today the Zawditu Hospital is operated by the Ministry of Health. It has a catchment population of more than five million. The hospital has 300 beds for inpatient service. The hospital has been providing the appropriate health services. Besides, incorporates over 12 departments that include internal medicine, neurology, general surgery, ENT, psychiatry, ophthalmology, dentistry (maxillofacial surgery), radiology, dermatology, gynecology and obstetrics, pediatrics, and emergency medicine. This hospital was gave the least dialysis treatment about 56 patients per year.

Menelik II Hospital is located in Addis Ababa, Yeka sub-city, Woreda 02 in the northeastern part of Addis Ababa City. This hospital was established during Adawa war, March, 1898 (1890 EC) by five Foreign medical team members of Russian citizen by the name of Red Cross. The team had started their work in the tent to support the injured persons in the war. Later on, the first modern government-run hospital was built by Emperor Menelik II in 1910 in its present location. This hospital has then given the Menelik II hospital with a capacity of only 30 beds. It was the first hospital that trained health professionals including health assistants, nurses and medical doctors (Menelik II Hospital Magazine, Oct/2015).This hospital was dialysis treatment center for about 92 patients per year next to saint Paulo’s hospital.

4.2 Study design and period

A Hospital based Cross sectional study was conducted at the three selected governmental hospitals (St. Paul Hospital Millennium Medical College, Zewuditu Memorial hospital and Minilik II hospital) from April to June, 2022.

4.3 Population

4.3.1 Source population

Stage 5 CKD patients were attending the renal clinic of St. Paul's Hospital millennium medical college, Menelik II Referral Hospital and Zewditu memorial hospital during the study period.

4.3.2 Study population

All CKD patients having dialysis treatment who were undergoing dialysis center in St. Paul's Hospital millennium medical college, Menelik II Referral Hospital and Zewditu memorial hospital during the study period and fulfill the inclusion criteria.

4.4 Eligibility criteria

4.4.1 Inclusion criteria

All ESRD (G5) CKD patients who were undergoing dialysis at St. Paul's Hospital millennium medical college, Menelik II Referral Hospital and Zewditu memorial hospital during the study period and volunteers were included. Those patients age 18 and above were included.

4.4.2 Exclusion criteria

Patients with known cases of liver disease, Malignancy, without dialysis treatment renal patients and unconscious CKD dialysis patients were excluded.

4.5 Study variables

4.5.1 Dependent variables

URR, eGFR & KT/V

4.5.2 Independent variables

Age, Sex, Educational status, Occupation, marital status, Diabetes mellitus, Residency, hypertension, comorbidity and Duration of hemodialysis

4.6 Sample size calculation and sampling method

4.6.1 Sample size calculation

Proportional stratified sampling method was used for this study. First selection of representative from dialysis centers hospitals. Considering the hospitals as strata by using systematic simple random sampling method /lottery method/.

The sample size for each hospital of the study was determined by the following formula.

$nf=Ni\times n/N$

Where ni= total sample size in each hospital

Ni=total number of patients who were undergoing hemodialysis in hospitals

N=total number of patients under hemodialysis

n= total simple size determine

For saint Paulo's hospital $=260\times102/408 =65$

For Zewuditu memorial hospital $=56\times102/408 =14$

For Minilik hospital $=92\times102/408 =23$

A total of 102 patients who were selected who were undergoing dialysis in St. Paul's Hospital millennium medical college, Menelik II Referral Hospital and Zewditu memorial hospital during the study period.

4.6.2 Sampling method

Convenient sampling technique was used who were undergoing dialysis in three selected governmental dialysis center during the study period.

4.7 Measurement and data collection

4.7.1 Data collection procedure

After informed consent was obtained from patients, all necessary information regarding socio-demographic characteristics, medical history and laboratory investigations was collected from the patients using well-structured and pre tested questioner and Patients‟ card were reviewed. Additionally, physical measurements such as weight, height, Kt/v were measured. Pre-HD blood sample was taken before connecting patients to HD and post-HD sample was collected after 4 hours' session of HD with a special container by trained Nurse under the supervision of the investigator. 5ml of peripheral venous blood was drawn from the cubical vein of each subject using aseptic technique in plain gel vacationer container, centrifuged at 3000rpm to separate the serum within one hour of blood collection and stored at 2 −8˚C.

4.7.2 Laboratory analysis

The laboratory analysis was pre and post hemodialysis serum creatinine and urea, performed by trained laboratory technologist on sample collection, handling, transport of sample and how to run test on using Cobas 6000 fully automated analyzer.

Cobas 6000 fully automated analyzer it uses enzymatic method. Renal function test principle: This enzymatic method is based on the conversion of creatinine with the aid of creatininase, creatinase, and sarcosine oxidase to glycine, formaldehyde and hydrogen peroxide. Creatinine concentration in the reaction is directly proportional to the color intensity of the quinone imine chromogen formed it produce a red color complex. The measuring mode of the test is absorbance, which calculate the analytes absorbance at end point with wavelength A/B of 552/659nm. COBAS 6000 analyzers automatically calculate the analyte concentration of each sample. Urea is hydrolyzed by urease to form ammonium and carbonate. In this reaction two

moles of NADH are oxidized to NAD+ for each mole of urea hydrolyzed. The rate of decrease in the NADH concentration measured photometrically at 700/340 nm is directly proportional to the urea concentration. Roche/Hitachi COBAS C systems automatically calculate the analyte concentration of each sample.

Blood tests are done to measure URR and it is usually measured once a month. It may vary from treatment to treatment. When measuring URR, the first blood sample should be taken before (pre) hemodialysis treatment starts. The second sample should be taken after (post) the hemodialysis treatment is finished and the blood pump is slowed or stopped. The blood tests measure the blood urea nitrogen (BUN) which measures waste in the blood. Increased BUN levels suggest impaired kidney function. The amount of urea in these two blood samples is compared to see how much was removed during dialysis.

It is calculated as: $URR\% = \frac{\text{Pre BUN - Post BUN}}{\text{Pre BUN}} \times 100$

Lower URR values (<65%) are associated with more health problems, hospitalizations and a greater risk of death and causes of low URR may be Dialysis treatment too short, Dialysis treatment stopped early on lab day when URR is measured, Problems with blood flow, Problems with access site (fistula, graft or catheter) and Artificial kidney too small. The effectiveness of dialysis was interpreted based on before and after URR level according to KDOQI guidelines, (Table 1) such as; ≥ 65% is good dialysis, 55 to 64% is moderate and less than 55% is poor dialysis [14-15].

The parameter KT/V is a measurement of the efficacy of a hemodialysis session. It identifies the effective removal of a specific solute (clearance K) resulting from a given treatment (characterized by time t) in a given patient (with a specific volume of distribution V for the solute considered) [14-15]. The formula is: KT/V

Where K = dialyzer (artificial kidney) clearance of urea

T = dialysis time

V = patient's total volume water space (patient's weight)

4.8 Data collection quality assurance

Data quality management started during questionnaire development by translating the questionnaires prepare in English language and reviewing different literatures into the local Amharic language. Before data collection, training was given for data collectors regarding the objective of the study, inclusion and exclusion criteria's, which group of patient, was involved in the study. Assign these trained data collectors improve the data quality during data collection. Data quality was also assured in pre-analytic stages during blood sample collection by strictly following the standard and aseptic operational procedure, labeling and transport of the sample, during analytic stages, in post-analytic stages data was checked for documentation and completeness. It was also checked that instruments used were properly calibrated before sample analysis.

4.9 Data analysis and interpretation

Data entry, cleaning and screening was done exclusively by the principal investigator. The collected data was encoded, checked, cleaned and feed in to Microsoft excel software, and then imported to SPSS version 26 software for further statistical analysis. Descriptive statistics was performed using Frequency tables, percentages, means and standard deviations and cross tabulation between dependent and independent variables as well as Pearson's chi-square test. This test was used to test whether two categorical variables were related to each other.

4.10 Operational definition

Chronic kidney disease: was defined as chronic disorders that is characterized by structural or functional abnormalities of the kidney with or without a decrease in glomerular filtration rate GFR < 60 mL/min /1.73m2 of body surface area for minimum of three months.

Estimated glomerular filtration rate (eGFR): was defined as a test that measures level of kidney function and determines the stage of kidney disease.it was estimated using Cockcroft – Gault (CG) equation as follow: CrCl (male) = ([140-age] × weight in kg)/ (serum creatinine × 72), CrCl (female) = CrCl (male) × 0.85. The interptetation of eGFR ≥ 60 mL/min /1.73m2 Saied to be very good dialysis, 30 to 59 mL/min /1.73m2 good and bellow 30 mL/min /1.73m2 was poor dialysis.

A risk factor: was defined as an attribute that is associated with increased risk of an outcome.

Effective dialysis treatment: was defined as the value of URR should be ≥ 65% 65% and KT/V ≥ 1.2 according to KDOQI guidelines.

Urea reduction ratio (URR): was defined as the measure of pre and post dialysis urea level how effectively a dialysis treatment removed waste products from the body and is commonly expressed as a percentage.it was URR value < 65% poor, 65% to 80% good and >80% is very good dialysis.

KT/V: was defined as a measure of dialysis adequacy. K = clearance the amount of urea dialyzer can remove (liters/minute) t = time the duration of treatment (minutes) V = volume the amount of body fluid (liters) the value of KT/V should be ≥ 1.2.

Table1. Operational definition of URR, KT/V & eGFR values

Measurements	Poor	Well/good	Very good/Excellent
URR	<65%	65% to 80%	>80%
KT/V	<1.2	1.2 to 1.29	≥ 1.3
eGFR	<30mL/min/1.73 m^2	30 to59mL/min/1.73m^2	≥ 60 mL/min/ 1.73 m^2

4.11 Ethical consideration

The study was approved by Addis Ababa University College of health sciences department of medical laboratory sciences Ethical Review Board. Ethical clearance also was obtained from Addis Ababa public health research and emergency management directorate. Formal letters from Department of Medical Laboratory Sciences, College of Health Science Addis Ababa University was written to, St. Paul's Hospital millennium medical college, Menelik II Referral Hospital and Zewditu memorial hospital and study was started after obtaining permission from those hospital authorities. The study was kept confidentiality, codes were used and unauthorized persons could not access. The whole objective of the study was justified to the laboratory head as well as those assigned in the dialysis unit and nephrology department.

4.12 Dissemination of the result

The result of this study will be submitted and presented to Addis Ababa University College of Health Sciences Department of Medical Laboratory Sciences and the results also will be disseminated to Addis Ababa public health research and emergency management directorate and St. Paul's Hospital millennium medical college, Menelik II Referral Hospital and Zewditu memorial hospital. In addition, I will present my findings in different work shop and annual conferences of professional societies. Manuscript will be prepared and submitted to appropriate scientific Journal for publication.

5. Result

5.1. Demographic and clinical characteristics of CKD patients

A total of 102 dialysis treatment CKD patients who fulfilled the inclusion criteria were included in this study. From those 65 dialysis treatment CKD patients were at SPHMMC, 23 were at Menelik II Referral Hospital and 14 were at Zewditu memorial hospital. The mean age of the subject was 38.67 ± 13.06 years with the age range of the dialysis treatment CKD patients was 18-86 years. Of them 65(63.7%) were males 37(36.3) were female and More than half 56 (54.9%) of dialysis treatment CKD patients were married and 37(36.3%) were single. 44 (43.1%) of dialysis treatment CKD patients reached college and above, 31(30.4%) completed secondary school, 15(14.7%) were primary school, 9(8.8%) were read & write and 3(2.9%) were illiterate. The majority of the patient 99(97.1%) were from Urban and 3(2.9%) were from Rural areas. 29(28.7%) of dialysis treatment CKD patients were government employee.

62 (60.8%) of the study subjects had hypertension, 21 (20.6%) had diabetes mellitus and 31 (30.4%) of the study subjects had other than hypertension and diabetes mellitus factors but they had CKD problems. (Table 2)

Table 2: Socio-demographic and factors associated with CKD patients characteristics of dialysis in three selected governmental hospitals in Addis Ababa, Ethiopia 2022: (N=102).

Variables		Frequency (N)	Percentage (%)
Age in years	18-31	29	28.4
	32-48	48	47.1
	49-64	21	20.6
	Above 64	4	3.9
Gender	Male	65	63.7
	Female	37	36.3
Marital status	Single	37	36.3
	Married	56	54.9
	Divorced	4	3.9
	Widowed	5	4.9
Education status	Illiterate	3	2.9
	Read & write	9	8.8
	Primary school	15	14.7
	Secondary School	31	30.4
	Collage & above	44	43.1
Residence	Urban	99	97.1
	Rural	3	2.9
Occupation	Merchant	19	18.6
	Government employee	30	29.4
	Farmer	1	1
	Student	9	8.8
	Other	43	42.2
Comorbidity	Diabetes Mellitus	9	8.8
	Hypertension	50	49.0
	Both Diabetes mellitus & Hypertension	12	11.8
	Other	31	30.4

5.2 Laboratory and clinical finding of CKD patients

All 102 respondents of the study CKD patients were treated by hemodialysis with hollow-fiber synthetic membrane and the average time of one session hemodialysis procedure was 4 hour and number of HD per week was maximum 3 times and minimum 2 times per week and the mean duration of HD was 4.86 ± 2.31 years with a minimum 3 months and maximum 10 years. All study participant CKD patients were measured pre and post urea, creatinine as well as age and weight to assess the effectiveness of dialysis

by calculating URR, KT/V and also interpreted the result of eGFR based on the stage of GFR. The mean ±SD of URR was 68.74% ± 20.61. The mean ±SD of KT/V was 1.46 ± 0.24. The mean ±SD of eGFR was 25.63± 12.38 after removed 7 outliers which could affect mean value.

The amount of CKD patients receiving hemodialysis in three selected hospitals based on URR value 23 (22.5%) were below 65% (poor), 15 (14.7%) were between 65-80%(good) and 64 (62.7%) were above 80% (very good).In case of KT/V value 16 (15.7%) were below 1.2(poor), 11 (10.8%) between 1.2-1.29(good) and 75 (73.5%) were 1.3 and above(very good). Based on eGFR 22 (21.6%) were below 30 mL/min/ 1.73 m^2 (poor), 71 (69.6%) were between 30 -60 mL/min/ 1.73 m^2 (good) and 9 (8.8%) were above 60 mL/min/ 1.73 m^2 (very good).

The present study indicated that overall evaluation of dialysis procedure conducted at the selected health institution the study sites were good. But URR and KT/V were recommended for assessment of effective hemodialysis as compared (Table 3)

Table-3. Laboratory and clinical measurements of CKD patients in three selected hospitals in Addis Ababa, Ethiopia, 2022 (N=102)

Variables	Minimum	Maximum	Mean	Std. Deviation	Assessment of dialysis		
					Poor	Good	very good
Duration of HD in year	0	10	4.89	2.277	-	-	-
Duration of one session HD in hour	4	4	4.00	.000	-	-	-
No of HD per week	2	3	2.94	.236	-	-	-
Weight in KG	30	93.3	56.37	11.81	-	-	-
Age	18	86	38.67	13.05	-	-	-
URR in %	12.67	97.64	68.74	20.61	23 (22.55%)	15 (14.71%)	64 (62.75%)
KT/V	0.86	2.00	1.46	0.24	16 (15.7%)	11 (10.8%)	75 (73.5%)
eGFR in mL/min/ 1.73 m^2	4.47	65.35	25.63	12.38	22 (21.6%)	71 (69.6%)	9 (8.8%)

5.3 Factors associated with dialysis outcomes of the CKD patients

Different **Socio-demographic** and other clinical features which may associate with dialysis outcomes of the study participants were analyzed through cross tabulation. Accordingly, no association was found between age group and KT/V(X^2(6) ≥2.627, p=.854) and URR (X^2(6) ≥11.866, p=.065); between gender and eGFR (X^2(2) ≥0.317, p=.853), KT/V(X^2(2) ≥1.066, p=0.587) and URR (X^2(2) ≥2.600, p=.273); between marital status and eGFR (X^2(6) ≥3.053, p=0.802), KT/V(X^2(6) ≥5.773, p=0.449) and URR (X^2(6) ≥9.187, p=.163); between education status and eGFR (X^2(8) ≥6.491, p=.592), KT/V(X^2(8) ≥7.044, p=.522); between occupation and eGFR (X^2(8) ≥5.125, p=.744), KT/V(X^2(8) ≥5.104, p=.746) and URR (X^2(8) ≥5.084, p=.749); between comorbidities and KT/V(X^2(6) ≥3.729, p=.713) and URR (X^2(6) ≥8.172, p=.226); between Duration of HD in year and KT/V(X^2(2) ≥579, p=.749) and URR (X^2(2) ≥0.423, p=.809) and between number of HD per week and eGFR (X^2(2) ≥0.806, p=.668) and KT/V(X^2(2) ≥0.775, p=.679). However, there was significance association between age group and eGFR(X^2(6) =18.680, p=.005); between educational status and URR (X^2(8) =18.008, p=.042);between Comorbidities and eGFR X^2(6) =14.353, p=.026);between duration of HD in year and eGFR X^2(2) =22.811, p<.001) and between number of HD per week and URR (X^2(2) =11.530, p=.003).Table(4)

Table.4 Chi-square tests between dependent and independent variables

Variables Category	eGFR		KT/V		URR	
Pearson chi-square value	X^2(df)	P-value	X^2(df)	P-value	X^2(df)	P-value
Age group	18.68(6)	.005	2.627(6)	.854	11.866(6)	.065
Gender	0.317(2)	.853	1.066(2)	.587	2.600(2)	.273
Marital status	3.052(6)	.802	5.773(6)	.449	9.187(6)	.163
Educational status	6.491(8)	.592	7.044(8)	.522	18.008(8)	.042
Residency	0.475(2)	.789	1.113(2)	.573	1.835(2)	.399
Occupation	5.125(8)	.744	5.104(8)	.746	5.084(8)	.749
Comorbidity	14.353(6)	.026	3.729(6)	.713	8.172(6)	.226
Duration of HD in year	22.811(2)	.000	0.579(2)	.749	0.423(2)	.809
No of HD per week	0.806(2)	.668	0.775(2)	.679	11.530(2)	.003

This study show 25 (86.2%) of age group (18-31) were good in eGFR value whereas 28(58.3%) in age group (32-48) and 16(76.2%) in age group (49-64); In case of KT/V value the age group distribution was 23(79.3%), 33(68.8%) and 16(76.2%) very good at age group 18-31, 32-48 and 49-64 respectively; In case of URR value age group 18-31,32-48 and 49-64 distribution was 16(55.2%), 26(54.2%) and 19(90.5%) were very good value respectively. Based on gender 44(67.7%) male and 27(73%) female was good in eGFR value; 46(70.8%) of male and 29(78.4%) of female was distributed in very good value in KT/V and 37(56.9%) of male and 27(73%) of female was very good in URR value. Based on marital status most of them was married group and 38(67.9%) were good in eGFR; 43(78.8%) were distributed under very good value of KT/V and 32(57.1%) were very good in URR value. (Table 5)

Based on educational status from collage and above group 29(65.9%) were good in eGFR value, 30 (68.2%) were very good in KT/V and 34(77.3%) were very good in URR value. based on residency urban group were the most and 69(69.7%) good in eGFR value, 72(72.7%) very good in KT/V value and 61(61.6%) very good in URR value. From occupation other group distribution were 29(67.4%) good in eGFR, 30(69.8%) very good in KT/V and 28(65.1%) very good in URR value. Based on comorbidities hypertension was the most and distribution was 29(58%) good in eGFR, 38(76%) very good in KT/V and 37(74%) very good in URR value. The result of distribution hemodialysis performed less than five years among eGFR, KT/V and URR was 54(85.7%) good, 46(73%) very good and 38(60.3%) very good respectively. Based on hemodialysis performed three time per week show distribution was 66(68.8%) good eGFR, 70(72.9%) very good KT/V and 64(66.7%) very good in URR value. (See table 5)

Table: 5 Distribution and percentage of Subject characteristics and associate factors with adequacy hemodialysis (URR & KT/V) and eGFR

			eGFR Category			Total	KT/V Category			Total	URR Category			Total
			Poor	Good	Very good		Poor	Good	Very good		Poor	Good	Very good	
Age group	18-31	Count	4	25	0	29	4	2	23	29	6	7	16	29
		Percentage	13.8%	86.2%	0%	100%	13.8%	6.9%	79.3%	100%	20.7%	24.1%	55.2%	100%
	32-48	Count	13	28	7	48	9	6	33	48	15	7	26	48
		Percentage	27.1%	58.3%	14.6%	100%	18.8%	12.5%	68.8%	100%	31.3%	14.6%	54.2%	100%
	49-64	Count	5	16	0	21	3	2	16	21	1	1	19	21
		Percentage	23.8%	76.2%	0%	100%	14.3%	9.5%	76.2%	100%	4.8%	4.8%	90.5%	100%
	Above 64	Count	0	2	2	4	0	1	3	4	1	0	3	4
		Percentage	0%	50%	50%	100%	0%	25%	75%	100%	25%	0%	75%	100%
Total		Count	22	71	9	102	16	11	75	102	23	15	64	102
		Percentage	21.6%	69.6%	8.8%	100%	15.7%	10.8%	73.5%	100%	22.5%	14.7%	62.7%	100%
Sex	Male	Count	15	44	6	65	12	7	46	65	17	11	37	65
		Percentage	23.1%	67.7%	9.2%	100%	18.5%	10.8%	70.8%	100%	26.2%	16.9%	56.9%	100%
	Female	Count	7	27	3	37	4	4	29	37	6	4	27	37
		Percentage	18.9%	73%	8.1%	100%	10.8%	10.8%	78.4%	100%	16.2%	10.8%	73%	100%
Total		Count	22	71	9	102	16	11	75	102	23	15	64	102
		Percentage	21.6%	69.6%	8.8%	100%	15.7%	10.8%	73.5%	100%	22.5%	14.7%	62.7%	100%
Marital status	Single	Count	7	27	3	37	6	4	27	37	6	8	23	37
		Percentage	18.9%	73%	8.1%	100%	16.2%	10.8%	73%	100%	16.2%	21.6%	62.2%	100%
	Married	Count	12	38	6	56	8	5	43	56	17	7	32	56
		Percentage	21.4%	67.9%	10.7%	100%	14.3%	8.9%	76.8%	100%	30.4%	12.5%	57.1%	100%
	Divorced	Count	2	2	0	4	1	0	3	4	0	0	4	4
		Percentage	50%	50%	0%	100%	25%	0%	75%	100%	0%	0%	100%	100%
	Widowed	Count	1	4	0	5	1	2	2	5	0	0	5	5
		Percentage	20%	80%	0%	100%	20%	40%	40%	100%	0%	0%	100%	100%
Total		Count	22	71	9	102	16	11	75	102	23	15	64	102
		Percentage	21.6%	69.6%	8.8%	100%	15.7%	10.8%	73.5%	100%	22.5%	14.7%	62.7%	100%

Table: 5 Distribution and percentage of Subject characteristics continued……..

			eGFR Category			Total	KT/V Category			Total	URR Category			Total
			Poor	Good	Very good		Poor	Good	Very good		Poor	Good	Very good	
Educational status	Illiterate	Count	0	3	0	3	0	0	3	3	0	0	3	3
		Percentage	0%	100%	0%	100%	0%	0%	100%	100%	0%	0%	100%	100%
	Read & Write	Count	1	7	1	9	2	0	7	9	3	1	5	9
		Percentage	11.1%	77.8%	11.1%	100%	22.2%	0%	77.8%	100%	33.3%	11.1%	55.6%	100%
	Primary school	Count	3	12	0	15	3	3	9	15	4	1	10	15
		Percentage	20%	80%	0%	100%	20%	20%	60%	100%	26.7%	6.7%	66.7%	100%
	Secondary school	Count	6	20	5	31	2	3	26	31	12	7	12	31
		Percentage	19.4%	64.5%	16.1%	100%	6.5%	9.7%	83.9%	100%	38.7%	22.6%	38.7%	100%
	Collage and above	Count	12	29	3	44	9	5	30	44	4	6	34	44
		Percentage	27.3%	65.9%	6.8%	100%	20.5%	11.4%	68.2%	100%	9.1%	13.6%	77.3%	100%
Total		Count	22	71	9	102	16	11	75	102	23	15	64	102
		Percentage	21.6%	69.6%	8.8%	100%	15.7%	10.8%	73.5%	100%	22.5%	14.7%	62.7%	100%
Residence	Urban	Count	21	69	9	99	16	11	72	99	23	15	61	99
		Percentage	21.2%	69.7%	9.1%	100%	16.2%	11.1%	72.7%	100%	23.2%	15.2%	61.6%	100%
	Rural	Count	1	2	0	3	0	0	3	3	0	0	3	3
		Percentage	33.3%	66.7%	0%	100%	0%	0%	100%	100%	0%	0%	100%	100%
Total		Count	22	71	9	102	16	11	75	102	23	15	64	102
		Percentage	21.6%	69.6%	8.8%	100%	15.7%	10.8%	73.5%	100%	22.5%	14.7%	62.7%	100%
Occupation	Merchant	Count	4	13	2	19	2	3	14	19	5	3	11	19
		Percentage	21.1%	68.4%	10.5%	100%	10.5%	15.8%	73.7%	100%	26.3%	15.8%	57.9%	100%
	Government employee	Count	5	22	3	30	5	2	23	30	5	5	20	30
		Percentage	16.7%	73.3%	10%	100%	16.7%	6.7%	76.7%	100%	16.7%	16.7%	66.7%	100%
	Farmer	Count	1	0	0	1	0	0	1	1	0	0	1	1
		Percentage	100%	0%	0%	100%	0%	0%	100%	100%	0%	0%	100%	100%
	Student	Count	2	7	0	9	0	2	7	9	2	3	4	9
		Percentage	22.2%	77.8%	0%	100%	0%	22.2%	77.8%	100%	22.2%	33.3%	44.4%	100%
	Other	Count	10	29	4	43	9	4	30	43	11	4	28	43
		Percentage	23.3%	67.4%	9.3%	100%	20.9%	9.3%	69.8%	100%	25.6%	9.3%	65.1%	100%
Total		Count	22	71	9	102	16	11	75	102	23	15	64	102
		Percentage	21.6%	69.6%	8.8%	100%	15.7%	10.8%	73.5%	100%	22.5%	14.7%	62.7%	100%

Table: 5 Distribution and percentage of Subject characteristics continued……..

			eGFR Category			Total	KT/V Category			Total	URR Category			Total
			Poor	Good	Very good		Poor	Good	Very good		Poor	Good	Very good	
Comorbidities	Diabetes mellitus	Count	0	9	0	9	3	0	6	9	3	2	4	9
		Percentage	0%	100%	0%	100%	33.3%	0%	66.7%	100%	33.3%	22.2%	44.4%	100%
	Hypertension	Count	17	29	4	50	7	5	38	50	10	3	37	50
		Percentage	34%	58%	8%	100%	14%	10%	76%	100%	20%	6%	74%	100%
	Both diabetes mellitus & Hypertension	Count	1	11	0	12	2	2	8	12	2	3	7	12
		Percentage	8.3%	91.7%	0%	100%	16.7%	16.7%	66.7%	100%	16.7%	25%	58.3%	100%
	Other	Count	4	22	5	31	4	4	23	31	8	7	16	31
		Percentage	12.9%	71%	16.1%	100%	12.9%	12.9%	74.2%	100%	25.8%	22.6%	51.6%	100%
Total		Count	22	71	9	102	16	11	75	102	23	15	64	102
		Percentage	21.6%	69.6%	8.8%	100%	15.7%	10.8%	73.5%	100%	22.5%	14.7%	62.7%	100%
Duration of HD in year category	less than 5	Count	3	54	6	63	11	6	46	63	15	10	38	63
		Percentage	4.8%	85.7%	9.5%	100%	17.5%	9.5%	73.0%	100%	23.8%	15.9%	60.3%	100%
	greater than or equal to 5	Count	19	17	3	39	5	5	29	39	8	5	26	39
		Percentage	48.7%	43.6%	7.7%	100%	12.8%	12.8%	74.4%	100%	20.5%	12.8%	66.7%	100%
Total		Count	22	71	9	102	16	11	75	102	23	15	64	102
		Percentage	21.6%	69.6%	8.8%	100%	15.7%	10.8%	73.5%	100%	22.5%	14.7%	62.7%	100%
No of HD per week category	2	Count	1	5	0	6	1	0	5	6	3	3	0	6
		Percentage	16.7%	83.3%	0%	100%	16.7%	0%	83.3%	100%	50%	50%	0%	100%
	3	Count	21	66	9	96	15	11	70	96	20	12	64	96
		Percentage	21.9%	68.8%	9.4%	100%	15.6%	11.5%	72.9%	100%	20.8%	12.5%	66.7%	100%
Total		Count	22	71	9	102	16	11	75	102	23	15	64	102
		Percentage	21.6%	69.6%	8.8%	100%	15.7%	10.8%	73.5%	100%	22.5%	14.7%	62.7%	100%

6. Discussion

The purpose of this study was to assess the effectiveness of dialysis treatment (hemodialysis adequacy) and associated factors among CKD patients at three selected hospitals in Addis Ababa. A total of 102 CKD patients were studied.

According to this study, the majority of participants were from urban areas (97.1%) (Table 2). Therefore, this study's findings could not generalize to the rural population.

In our findings, the most common cause of chronic kidney disease was hypertension (62.8%) ;(Table 2). Similarly, hypertension was found to be 58.9% in a study conducted in Sub-Saharan Africa by Kore C., Tadesse A., Teshome B., Daniel K., Kassa A., et al., and 91.1% in a study conducted at Lagos University by Fasipe et al. [10, 26]. But our study showed a higher percentage of hypertension than studies conducted in Iran (39% and 49.8%) by Roozitalab M. et al. and Rezaiee O. et al., respectively [29, 30]. In this study, 20.6% of the participants had chronic kidney disease due to diabetes mellitus. Studies in Sub-Saharan Africa (17.9%) and Iran (22%) found similar results to ours [10, 29]. But our finding was lower than studies conducted in Iran (55% and 27.4%) by Roozitalab M. et al. and Rezaiee O. et al., respectively, and in Lagos University (36.6%) [13, 26, 30].The variation in the prevalence of various comorbidities among CKD patients could be attributed to differences in the study participants' socio-demographic characteristics.

According to this study, the mean URR was 68±20%, which one of parameter used to assess hemodialysis adequacy. Based on the mean CKD patients, were effective in the URR value criteria (>65%), which was higher than previous studies conducted in Nepal (54.82± 11.24%) and Iran (50%±0.69) [15, 29]. Hemodialysis adequacy in 62.75% of patients was very good (URR value was >80%), in 14.71% of patients it was good (URR value was 65-80%) and in 22.55% of patients it was poor (URR value was <65%) (Table3). 77.46% of patients showed hemodialysis adequacy according to the KDOQI, which stated that a URR greater than or equal to 65% was adequate in hemodialysis patients. Other research done by Roozitalab M. et al. in Iran showed that 48.8% of patients received inadequate dialysis with an URR value of <65%,

only 31.7% of patients had an adequate URR value; a study conducted in Iran by Rezaiee O. et al. revealed that 56.4% of patients were optimal (URR value 65%), 29.7% were near optimal (URR value 55-64.99%), and 13.9% were less than optimal (URR value <55%); and a study conducted in Dar es Salaam, Tanzania, by Somji SS et al. revealed that 34.3% of patients had inadequate hemodialysis [13, 16,29].

In our finding, the mean ± SD of KT/V was 1.46±0.24 which was fulfilled the KT/V minimum standard value (>1.2). Our study showed higher than study conducted in Iran (0.94±0.4 and 1.24±0.36), in Nepal (0.95±0.28) and Tanzania (1.1 ± 0.3) [15, 16, 29, 30]. Hemodialysis adequacy in 73.5% of patients was very good (KT/V value ≥1.3), in 10.8% of patients was good (KT/V value 1.2-1.29) and in 15.7% of patients was poor (KT/V value <1.2) (Table 3). According to KDOQI KT/V (>1.2) standards in 84.31% of patients were received adequacy hemodialysis. In Iran, a study showed that 41.5% of patients received adequate dialysis (KT/V value≥ 1.2) [29]. Another study in Iran showed that 51.2% of patients were received adequacy dialysis based on KT/V value [30]. In Nepal, study showed 17.0% of patients were received adequacy dialysis (KT/V value≥1.2) [15]. The study showed in systematic reviews in English and Faris 36.3% of patients were received adequacy hemodialysis (KT/V value ≥1.2) [31]. In Tanzania, study showed that 40.6% of patients were received adequate hemodialysis [16]. In Egypt, study showed that 69.64% of patients were received adequate hemodialysis [33]. Therefore, these results indicated that the hemodialysis adequacy assessed in both URR and KT/V values in the hemodialysis centers of three selected hospitals was more advantageous compared to the cited centers. It appears that the increased awareness of the patients and frequent education of the hemodialysis personnel of these centers provided favorable conditions, so the patients benefited from a higher quality of hemodialysis. It also prevented the increased frequency of hemodialysis due to uncontrolled levels of waste in the blood and clinical symptoms of the patients, increased hospitalizations, increased hospital costs, and mortality among these patients.

In this study, the mean ± SD value of eGFR was 25.63± 12.38 mL/min/ 1.73 m^2 which met the criteria for eGFR (<30 mL/min/ 1.73 m2 is poor) and was lower compared to a study conducted in Nigeria (57.6 mL/min/ 1.73 m^2) [32]. In eGFR value, 8.8% of patients were very good (eGFR

value <60 mL/min/ 1.73 m^2), 69.6% of patients were good (eGFR value 30-60 mL/min/ 1.73 m^2) and 21.6% of patients were poor (eGFR value <30 mL/min/ 1.73 m^2) (Table 3). The low eGFR value in our study is because our study population was made up of CKD patients, which means patients who are undergoing hemodialysis because kidney function has failed (eGFR value <60 mL/min/ 1.73 m^2 for a minimum of 3 months). The variation of the eGFR value between our study and others may be due to differences in the methodology, variation in quality of care and quality of reporting, policy, and strategic differences.

In our study, eGFR had a significant association with age group, comorbidities, and the duration of HD in years. URR has a significance association with educational status and the number of HD per week. KT/V has no association with all associated factors (Tables 4 and 5).

7. Strength and Limitation

7.1 Strength

In our knowledge this study is the first in Ethiopia and it could be an input for further studies and policy makers.

7. 2 Limitation

This study was conducted only in Governmental dialysis center in Addis Ababa Ethiopia and sample size was not including rural CKD patients enough.

8. Conclusion and Recommendation

8.1 Conclusion

Evaluation of hemodialysis adequacy based on URR and KT/V parameters showed adequacy hemodialysis (good) for more than 75% of patients at three selected Hospitals and the remaining patients had relatively poor hemodialysis adequacy. Some individual and personnel factors directly or inversely affected the adequacy of hemodialysis. Therefore, in designing nursing care services for these patients, it is essential to consider these factors in order to increase hemodialysis adequacy.

The present study indicated that overall evaluation of dialysis treatment conducted at the selected hospitals were very good.

8. 2 Recommendation

Further study is needed either strength or modify the findings of current study.

To fill the gaps in inadequacy hemodialysis increase dialysis session per week.

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10. Annexes

Annex-I Information sheet in English Version

1. **Title of the Research project** Assessment of effective dialysis treatment and associated factors among Chronic Kidney Disease patients at three selected governmental dialysis treatment center Addis Ababa, Ethiopia". (SPHMMC, Menelik II Referral Hospital and Zewditu memorial hospital)

2. **Principal Investigator:** Simegn Mebratie (BSc, MSc candidate)

3. **Sponsoring Organization:** SPHMMC

4. **Name of the Organization:** Addis Ababa University College of health sciences department of medical laboratory sciences

5. **Introduction:** You are invited to participate as a study subject in a research conducted by MSc candidate, from Addis Ababa University. Your participation is voluntarily. The research teams will include one principal investigator, two advisors; from Addis Ababa University department of medical laboratory Please take as much time as you need to read or listen in the information sheet.

6. **Purpose of the Research Project:**

Objective**:** The purpose of this study is to assess effective dialysis treatment and associated factors among Chronic Kidney Disease patients at three selected governmental dialysis treatment center Addis Ababa, Ethiopia (SPHMMC, Menelik II Referral Hospital and Zewditu memorial hospital Addis Ababa Ethiopia)

7. **Procedures and the expected participation**

If you are willing to participate, you need to understand the purpose of the study and give your consent. Not only this but also specimen collected from you will be used for the research purpose, and the results of your sample will be exposed to some concerned professional staffs as it is needed. The required clinical sample will be collected by trained phlebotomist. Then, you are requested to

give your consent to the sample collector. After consent, a sample will be taken from your venous. Moreover, there will be a face-to-face interview for additional questions.

8. Potential risks and Discomforts

During collection of specimen from you, appropriate precaution will be taken and all samples will be collected by trained health professionals. If anything happened, appropriate medical care will be provided to you.

9. Confidentiality

We respect your privacy and confidentiality. Any information that identifies you will not be shared with anyone else outside the study team. The information we will collect from you as part of the study will be kept in a locked file cabinet, or be protected by a password on the computer only accessible to personnel involved in the study. There is no sensitive issue that you will be asked related with your social desirability but any information that is obtained in connection with this study and that can be identified with you will remain confidential.

10. Potential benefits to subjects and/or to the society

You will not receive any payment for your participation in this research study as compensation. However, based on the diagnosis result you will be treated in view of that. In addition, the result of the study will be beneficial for the detection and managing of chronic kidney disease. Hence, you are indirectly benefiting other patients and the society in this respect.

11. Participation and Withdrawal from the Study

The participation is voluntary and you have the right not to participate in this study. You may withdraw at any time and place without consequences of any kind. You may also reject to give any sample. You can ask any questions regarding to this study and you have a right to get a laboratory diagnosis result free.

12. Contact information

If you have any questions about this study you can contact the following principal investigators and advisors for further information.

Simegn Mebratie **Phone:** 0922419940 **E-mail:** simegna44@gmail.com

Dr. Mistire Wolde **Phone**: 0911699 710

Annex II English Version Consent form

I volunteer to participate in a research project conducted by Simegn Mebratie from Addis Ababa University. I understand that the study is designed to gather information about chronic kidney disease and associated factors among patients on dialysis treatment. At St. Paulo‟s Hospital millennium medical college, Menelik II Referral Hospital and Zewditu memorial Hospital Addis Ababa Ethiopia, I will be one of participants being selected for this research.

I understand that I will not be paid for my participation. I may withdraw and discontinue participation from the study at any time without penalty. I understand that the researcher will not identify me by name in any reports using information obtained from this interview and that my confidentiality as a participant in this study will remain secure.

Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals and institutions. I have given an opportunity to ask free which couldn't be clear.

I have been given a copy of this consent form and I have clearly understood the explanation Provided to me. So, I hereby approve my consent with my signature to take part in the study.

_____	_____	_____
Participant's code number	Date	Signature
_____	_____	_____
Data Collector's name	Date	Signature

Thank you for participating in the study

የ ተሳ ታፊዎች ፈ ቃድና መ ተማመኛ ቅፅ

በ አ ዲስ አ በ ባ ዩ ኒ ቨ ር ሲ ቲ ጤ ና ሳ ይ ን ስ ኮ ሌ ጅ የ ሕ ክ ምና ላ ቦ ራ ቶ ሪ ሳ ይ ን ስ ት/ክ ፍ ል በ ማ ስ ተ ር ስ ድ ግ ሪ ተ ማ ሪ የ መ መ ረ ቂ ያ ጥ ና ት ላ ይ እ ዲ ሳ ተ ፉ ተ ጋ ብ ዘ ዋ ል ፡ ፡ እ ባ ክ ዎ በ ዚ ህ ጥ ና ት ለ መ ሳ ተ ፍ ከ ማ ስ መ ም ዎ በ ፊ ት ከ ዚ ህ ቀ ጥ ሎ የ ሚ ገ ኘ ዉ ን ም ባ ብ በ ጥ ሞ ና ያ ን ብ ቡ ና ግ ል ጽ ያ ል ሆ ነ ል ዎ ት ን ማ ና ኛ ዉ ም ሃ ሳ ብ ይ ጠ ይ ቁ ፡ ፡

መ ግ ቢ ያ

የ ጥ ና ቱ ር ዕ ስ “Assessment of effective dialysis treatment and associated factors among Chronic Kidney Disease patients at three selected governmental dialysis treatment center Addis Ababa, Ethiopia”. (SPHMMC, Menelik II Referral Hospital and Zewditu memorial hospital)

የ እ ር ስ ዎ በ ዚ ህ ጥ ና ት ላ ይ የ ሚ ኖ ር ዎ ት ተ ሳ ት ፎ ማ ሉ በ ማ ሉ በ በ ጎ ፈ ቃ ደ ኝ ነ ት ላ ይ የ ተ መ ሳ ረ ተ ነ ዉ ፡ ፡ በ ዚ ህ ጥ ና ት ዉ ስ ጥ ላ ለ መ ሳ ተ ፍ ወ ይ ም ለ መ ሳ ተ ፍ ከ ወ ሰ ኑ በ ኃ ላ ለ ማ ቋ ረ ጥ የ ሚ ወ ስ ኑ ቢ ሆ ን ም እ ን ኩ ዋ በ ዚ ህ ሆ ስ ፒ ታ ል የ ሚ ሰ ጡ ዉ ማ ና ኛ ዉ ም አ ገ ል ግ ሎ ት አ ይ ቋ ረ ጥ ም ፡ በ ጥ ና ቱ ለ መ ሳ ተ ፍ የ ሚ ስ ማ ሙ ከ ሆ ነ የ ስ ም ማ ት ቅ ጹ ላ ይ በ ጹ ሁ ፍ ወ ይ ም በ ጣ ት ፊ ር ማ ማ ስ ቀ መ ጥ ይ ጠ በ ቅ ዎ ታ ል ፡ ፡

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በ ዚ ህ ጥ ና ት መ ሳ ተ ፍ የ ሚ ያ ስ ከ ት ላ ቸ ዉ ች ግ ሮ ች ም ን ድ ን ና ቸ ዉ?

ና መ ኖ በ ሚ ሰ በ ሰ ብ በ ት ወ ቅ ት ም ን ም አ ይ ነ ት የ ከ ፋ ች ግ ር አ ያ ጋ ጥ ም ዎ ት ም ፡ ሆ ኖ ም ግ ን ና መ ኖ ዉ ን ለ መ ሳ ብ ሰ ብ ል ም ድ ያ ለ ዉ ባ ለ ሞ ያ ስ ለ ሚ ሞ ጠ ብ ና አ ስ ፈ ላ ጊ ዉ የ ጥ ን ቃ ቄ እ ር ም ጃ ስ ለ ሚ ወ ሰ ድ የ ሀ ም ም ስ ጫ ም አ ይ ኖ ር ም ፡

የ ህክምና ሚጃ በሚከጥር ተጠበቆ ሜቆየ ት የ ሜቹለዉ እ ንዴት ነ ዉ?

ስለራስዎ የ ሰጡት ማንኛዉም ሚጃና ከተወሰደዉ ናሜኖ ላይ የ ተገ ኘዉ የ ላቦራቶሪ ዉጤት የ ሚዉለዉ ለጥና ቱ አ ላማ ብቻ ነ ዉ፡ ፡ ይህን ሜህደር ሊያገ ኙ የ ሜቹሉት የ ተወሰኑ የ ጥና ቱ ተባባሪ ሰዎች ብቻ ና ቸው፡ ፡ ከዚያም በላይ ስለ እርስዎ ያለውን ማንኛውንም ሚጃ የ ተለየ የ ይለፍ ቃል ባለው የ ኮምፒውተር የ ሚጃ ሜህደር ውስጥ እ ንዲቀሜጥ ይደረ ጋል ፡ ፡

በዚህ ጥና ት ሜሳ ተፍ የ ሚያስገ ኛ ቸውጥቅሜች ምን ድን ና ቸው?

ይህ ጥና ት የ ሜስተርስ ዲግሪ ሜሚ ቂያ እ ንደሚሆኑ ሜጠን በዚህ ጥና ት በሜሳ ፈልዎ በገ ንዘብ የ ሚያገ ኙት ጥቅም ባይኖርም ከጥና ቱ በሚ ኝዉ ዉጤት ግን ተጨ ቃሚ ነ ዎት፡ ፡ የ እርሶዎ ተሳትፎ የ እርስዎንና የ ወገ ንዎትን የ ኩሊሉት ለ ሜወቅና ለ ሜከ ታተል ከፍተኛ ጥቅምይኖረዋል፡ ፡

በዚህ ጥና ት ተሳ ታፊ የ ሚሆን ዎ ሜበቶች ምን ድን ና ቸው?

በዚህ ጥና ት ሜሳ ተፍ ሜሉ በ ሜሉ በእርስዎ ፈቃደኝነ ት የ ተሜሳ ረተ በሚሆኑ በሜንኛዉም ሰዓትና ቦታ የ ሜቋ ረጥ ሜሉ ሜብት የ ተጠበቀ ከሚሆኑ ምበላይ እራስዎን ከጥና ቱ በሜገ ለልዎ ምክ ንያት የ ሜቋ ርጠብዎት ምን ምአይነ ት የ ሆስፒታል አ ገ ልግሎት አይኖር ም፡ ፡ ከዚህ ምበተጨሜሪ ጥና ቱን በተሜላ ከተ ሜንኛውን ም አይነ ት ጥያቄ የ ሜከየ ቅና ገ ለጻ የ ሜገ ኘት ሜብት አ ለብዎት፡ ፡ የ ላብራቶሪ ምር ሜራ ዉጤቱን ም በነ ጻ ሜገ ኘት ይችላ ሉ፡ ፡ ነ ገ ር ግን እ ርስዎ በሚሰጡን ሚጃ የ ችግሩን ስፋት ለ ሜላ ለከል እና ለ ሜቆጣጠር ጠቃሚስለሆነ ለ ሜቋ ርጠብልዎት ጥያቄ ቀጥተኛ ሜልስ ይሰጡን ዘ ንድ በታላቅ አ ክብሮት እ ንጠይቃለን፡ ፡

ጥያቄ ካለኝ ወይምችግር ቢያ ጋጥሜኝ ምን ሜድረ ግ ይገ ባል?

ይህን ን ጥና ት በተሜላ ከተ ወይም ከዚህ ጥና ት ጋር በተዛ ሜደ ሜልኩ ስለሚያ ጋጥሙድን ገ ተኛ አ ደጋዎች ወይምጥያቄ ካለዎት በሚሜላ ከተውአ ድራሻ ይጠቀሙ ፡

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Annex III Informed consent form in English version

Card no…..……

I had been informed that the objective of this study is Assessment of effective dialysis treatment and associated factors among Chronic Kidney Disease patients at three selected governmental dialysis treatment center Addis Ababa, Ethiopia".To treat me and other patients, and to be used as an input for the future development of strategies or guidelines for diagnosing of chronic kidney diseases in Ethiopia. I had been also informed about the confidentiality of this study. The principal investigator requested me to participate in the study that would require my willingness to provide the required data that include blood and urine sample, and filling questionnaire. Therefore, with full understanding of the importance of the study, I agreed voluntarily to provide the requested samples and my benefit will be only from the free laboratory investigation result/s.

I_____ hereby give my consent for providing the requested information and specimens as the doctors find best for me.

Signature: _____ Date_____

Annex V. Informed consent form in Amharic version

የ ተሳ ታፊዎች ስ ምም ት ሚ ጋ ገ ጫ

የ ሚ ስ ጥር ቁ ጥር ----------

እ ኔ ስ ሜ ከ ላ ይ የ ተ ጠ ቀ ሰ ው ተ ሳ ታ ፊ “Assessment of effective dialysis treatment and associated factors among Chronic Kidney Disease patients at three selected governmental dialysis treatment center Addis Ababa, Ethiopia”. ጥ ና ት ላ ይ በ ቂ ገ ለ ጻ ተ ደ ር ጎ ል ኛ ል ፡ ፡ ለ ጥ ና ቱ ም ደ ም ና የ urine ና ሙ ና እ ን ደ ሚ ሠ ስ ፈ ል ግ ተ ገ ል ጾ ል ኛ ል ፡ ፡ የ ጥ ና ቱ ን ም አ ላ ማ ም ች ም ተ ረ ድ ቻ ለ ሁ ፡ ፡

በ ቃ ለ ማ ኪ ይ ቁ ላ ይ የ ገ ለ ጽ ኳ ቸ ው ሚ ጃ ዎ ች በ ሙ ሉ በ ሚ ስ ጥ ር የ ተ ጠ በ ቁ እ ን ደ ሚ ሆ ኑ ተ ነ ግ ሮ ኛ ል ፡ ፡ በ ጥ ና ቱ ላ ይ ያ ለ ማ ካ ተ ፍ ና ማ ን ኛ ው ን ም ሚ ጃ ያ ለ ማ ስ ጠ ት እ ን ዲ ሁ ም በ ማ ን ኛ ው ም ጊ ዜ ከ ጥ ና ቱ ራ ሴ ን የ ማ ገ ለ ል ሙ ብ ቴ የ ተ ጠ በ ቀ እ ን ደ ሆ ነ ተ ገ ል ጾ ል ኛ ል ፡ ፡

ስ ለ ዚ ህ ለ ዚ ህ ጥ ና ት ሚ ጃ ና የ ስ ምም ት ቃ ሌ ን የ ሰ ጠ ሁ ት በ አ ጠ ቃ ላ ይ ሁ ኔ ታ ው ን በ ሚ ዳ ት ና በ ፍ ጹ ም ፍ ቃ ደ ኝ ነ ት ነ ው ፡ በ ተ ጨ ማ ሪ ም ጥ ያ ቄ ለ ማ ቅ የ ቀ ረ ቡ ልኝ ለ ማ ወ ቅ የ ፈ ለ ኩ ት ን ያ ህ ል ማ ብ ራ ሪ ያ አ ግ ኝ ቻ ለ ሁ ፡ ፡ የ ዚ ህ ጥ ና ት ተ ሳ ታ ፊ በ ሚ ሆ ኔ የ ማ ኝ ው ጥ ቅ ም የ ሁ ሉ ን ም ም ሚ ሙ ው ጤ ት በ ነ ጻ ማ ኝ ት እ ን ደ ሆ ነ ተ ረ ድ ቻ ለ ሁ ፡ ፡

በ አ ጠ ቃ ላ ይ እ ኔ ከ ላ ይ በ ሙ ላ ሞ ኛ ቅ ፅ የ ተ ጠ ቀ ሱ ት ን ሁ ሉ በ ሚ ባ ና በ ተ ረ ጋ ጋ ማ ፈ ስ አ ን ብ ቤ ዋ ለ ሁ ኝ ፡ ፡ ስ ለ ዚ ህ በ ዚ ህ ጥ ና ት ለ ማ ካ ተ ፍ ፈ ቃ ደ ኛ ሚ ሆ ኔ ን በ ፊ ር ሜ አ ረ ጋ ግ ጣ ለ ሁ ፡ ፡

ፊ ር ማ---------- ቀ ን ----/---/----------

(የ ስ ምም ት ቅ ጹ ን ማ ን በ ብ ለ ሚ ይ ች ሉ ተ ሳ ታ ፊ ዎ ች)

የ አ ማ ካ ሪ ነ ር ስ ስ ም---------- ፊ ር ማ----------

ቀ ን ----------

Annex VI Declaration

I, the undersigned declare that this proposal complies with the regulation of the University and meets the accepted standards with respect to originality and quality. I also agree to accept responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports.

M.Sc. candidate: **Simegn Mebratie (B.Sc.)**

Signature: _____

Date of submission: _____

This proposal has been submitted with our approval as advisors.

Advisor: **Mistre Wolde (MSc, PhD)**

Signature: _____

Date: _____

Place: Addis Ababa, Ethiopia.

Advisor: **Tatek G/ Egziabher (MSc, PhD fellow)**

Signature: _____

Date: _____

Place: Addis Ababa, Ethiopia.

Annex VII English Version Questionnaire

Questionnaire on assessment of effective dialysis treatment among chronic kidney patients and associated factors in dialysis treatment center St. Paul's HMMC, Zewditu Memorial hospital Minilik referral hospital Addis Ababa Ethiopia 2021

I. Socio demographic information

01. Identification number of respondents----------

101. Age 1. 18-31, 2. 32- 48, 3. 49- 64, 4. Above 64

102. Sex 1. Male 2.female

103 Marital statuses 1.Single 2.Married 3.Divorced 4.widowed

104. Educational status 1) Illiterate 2) Read& write 3) primary school 4) secondary school

5) Collage and above

105. Residence 1. Urban 2. Rural

106. Occupation 1. Merchant 2. Government employee 3. Farmer 4. Student 5. Other

II). History of comorbidity and treatment

201. Duration of dialysis treatment …….

202. Duration of one session of hemodialysis……

203. Number of dialysis per week…….

204. Comorbidities 1) Diabetes mellitus 2) Hypertension 3) both 4) other

III) Laboratory Examination for dialysis patient

301. Before HD ……. & after HD urea count …….

302. Kt/v ____ …… ……

303. Urea redaction ratio (URR) _____ ……

304. eGFR _____ …….. …

305. Wt. ----------

306. Age ----------

307. Pre serum creatinine ---------- & Post serum creatinine ----------

THANK YOU