MAGNITUDE, PATIENT AWARENESS, AND ASSOCIATED FACTORS OF CHRONIC KIDNEY DISEASE AMONG MEDICAL WARD ADMITTED PATIENTS IN WOLKITE UNIVERSITY SPECIALIZED HOSPITAL, SOUTH NATION, NATIONALITIES AND PEOPLE, ETHIOPIA

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ABSTRACT

Background *Kidneys are vital organs that play a vital role in maintaining an optimum internal environment. This normal kidney function can be altered by physical injury or disease. Currently, chronic kidney disease (*CKD) *is an increasing major health problem worldwide. In 2017, it was ranked as the 12th leading cause of death and is expected to rise to the 5th ranked cause of death by 2040. Therefore, early detection, understanding of patients' awareness and treatment of CKD are required to hold the problem. However, despite its higher prevalence of hospitalized morbidity and mortality, little is known about the magnitude and risk factor of CKD in Ethiopian hospitalized patients, especially in the study area. Hence this study aims to determine the magnitude, awareness, and associated factors of CKD.*

Objective: *To determine the magnitude, patient awareness, and associated factors of CKD among medical ward admitted adult patients in Wolkite University specialized teaching hospital (WKUSTH) from November 15, 2021 to February 28, 2022.*

Method: *Institutional based cross-sectional study was conducted from November 15, 2021 to February 28, 2022 at WKUSTH. 345 medical ward admitted patients were selected by a convenient sampling technique. Creatinine and urea* were *measured using cobas311 chemistry analyzer and estimated glomerular filtration rate (eGFR) was calculated using Modification of Diet in Renal Disease (MDRD) formula. CKD was defined as eGFR<60 ml/min/1.73m^2. Socio-demographic, clinical, and patient awareness data were collected by using a pretested questionnaire. To determine associated factors, bivariate and multivariable analysis was conducted.*

Results*: Of the total 345 study participants, 51.01% were males and the mean age was 51.64 ± 17.73 years and* 54 (15.7%) (95% CI: 11.6%–19.4%) *of them had CKD. Only 91(26.38%) of them had good knowledge about CKD. In multivariable analysis, older age (AOR 3.87, 95% CI; 1.56, 9.60), hypertension (AOR 8.38, 95% CI; 3.60, 19.51), DM (AOR 5.94, 95% CI; 2.17, 16.27), high BMI (AOR 4.20, 95% CI; 1.74, 10.12), and proteinuria (AOR 2.82, 95% CI; 1.17, 6.79)* were *independently associated with CKD.*

Conclusions *The magnitude of CKD among adult patients admitted to a medical ward of WKUSTH was high and Patients have low level of knowledge about CKD. Patient education, early detection of CKD, might help to prevent complications.*

Keywords*: CKD, eGFR, patient awareness, magnitude, associated factor*

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ACRONYMS AND ABBREVIATIONS

AOR……Adjusted Odds Ratio

BMI…….Body Mass Index

COR……Crude Odds Ratio

CKD……Chronic kidney disease

CVD…….Cardiovascular disease

DM……Diabetic Mellitus

eGFR…….Estimated glomerular filtration rate

ESRD…….End-stage renal disease

GFR……....Glomerular filtration rate

HIV……. Human immunodeficiency virus

MDRD ……...Modification of Diet in Renal Disease

NCD……. …….Non-Communicable Diseases

USA…….. United State of America

WKUSTH…….Wolkite university specialized teaching hospital

OPERATIONAL DEFINITIONS

Chronic kidney disease is defined as eGFR<60 ml/min/1.73 m^2 with or without proteinuria (1-3).

Positive proteinuria is defined as those individuals having a dipstick value of >=1+ (4).

Alcohol consumption: - An individual having more than 7 drinks for women and more than 14 drinks for men per week. One drink equals about one bottle of beer, one glass of wine or local drinks like teji or tela, or one shot of areke (5).

Good knowledge: out of seven knowledge assessment questions if at least four (>=50%) questions were correctly answered, they are considered as having good knowledge (6, 7).

Good preventive practice: out of the seven preventive practice assessment questions, if patients had at least four (>50%) habit of preventive practice they are considered as having good preventive practice (6).

Physical activity: those perform any types of physical activity at least 30 minutes at least every other day (8).

Cigarette smoking: those who had a habit of smoking in the past six month or active smoker at the time of data collection (9).

Hypertension was defined as being on antihypertensive medication or having a systolic and /or diastolic blood pressure > = 140 /90 mm of Hg (10, 11).

All comorbidities were defined as present if they were documented in the medical records.

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND INFORMATION

Kidneys are metabolically very active organs that play a vital role in maintaining an optimum internal environment. The maintenance of fluid and electrolyte composition of the body by filtration, reabsorption, and excretion of waste materials are the major function of the kidney (12). The excretory function of the kidney gets rid of non-protein nitrogenous compounds like urea, creatinine, and uric acid, as well as excess inorganic substances ingested in the diet. The kidneys produce urine by the processes of glomerular filtration followed by tubular reabsorption of solutes and water. This normal kidney function can be altered by physical injury or disease and leads to acute or chronic kidney disease (13).

Acute kidney injury is a sudden, sharp decline in renal function and is characterized by an increased serum creatinine and reduced urinary output (12). Depending on the location of the precipitating defect it can be subdivided into prerenal, which occurs due to a sudden blood flow reduction to the kidney, intrarenal, which occurs due to intrinsic kidney disease like glomerulonephritis, or postrenal diseases, which occurs due to the lower urinary tract diseases (14). However, slow decline of kidney function or persistent kidney dysfunction can lead to Chronic kidney disease (CKD) (15).

Chronic kidney disease is defined as kidney damage or glomerular filtration rate (GFR) less than 60 mL/min/1.73 m^2 for at least three months (16). Once kidneys are damaged, they cannot filter blood or unable to remove waste from the body, and leads to accumulation of toxic waste and extra fluid in the body (17). This is also associated with a reduction in GFR and proteinuria (18). The primary biomarker for abnormal kidney function is GFR of <60 mL/min/1.73 m^2 and for kidney damage is urine albumin-to-creatinine ratio (ACR) of >30 mg/g. In addition, urine sediment, electrolyte, and tubular disorders may indicate kidney abnormality (16).

The GFR is the volume of plasma from which a given substance is absolutely removed from the plasma by glomerular filtration in a unit time (13). It is usually accepted as the best overall index of kidney function. Normal GFR in healthy adults is about 120-130 mL/min/ 1.73 m^2 but it varies with body weight, age, and sex. A GFR of less than 60 mL/min/1.73 m^2 represents the loss of half or more of kidney function and is associated with increased systemic complications (19,

20). Hence measuring GFR is useful in the early detection of renal impairment and for monitoring renal functions and also guides the dosing of drugs (21). Determination of the clearance of exogenous or endogenous substances in the serum is the accepted gold standards for measuring GFR (22).

Creatinine is the most widely used endogenous substance for the measurement of kidney function which is synthesized at a constant rate and freely filtered in the glomerulus. It is not reabsorbed and is only slightly secreted by the proximal tubule (23). creatinine clearance is the typical method for determining GFR, which is calculated from serum creatinine concentration, a 24 hours collected urine creatinine concentration, and a 24 hours measured urine volume. However, the feasibility of precise urine collection is a major limitation of creatinine clearance as a measure of GFR; hence, GFR is mathematically estimated (21).

The Cockroft-Gault, Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI), and the Modification of Diet in Renal Disease (MDRD) equations are used to estimate GFR (24). The four-variable version MDRD equation is the most commonly used equation to estimate GFR by using the formula, GFR (mL/min/1.73 m^2) = 186 x $(SCr)^{-1.154}$ x $(Age)^{-0.203}$ x (0.742 if female) x (1.210 if African-American). Where age is in year and (SCr) is serum creatinine in mg/dl (21).

According to kidney disease improving global outcome (KDIGO) guidelines, CKD is classified into five stages: stage 1: having kidney damage with normal GFR (GFR ≥90 mL/min/1.73 m^2), stage 2: kidney damage with mild decrease in GFR (GFR 60–89 mL/min/1.73 m^2), stage 3, further divided in to stage 3a and 3b is moderate decrease in GFR: 3a: (45–59 mL/min/ 1.73 m^2), stage 3b: (30–44 mL/min/1.73 m^2), stage 4: severe decrease in GFR (15–29 mL/min/1.73 m^2), and stage 5: End-Stage Renal Disease (ESRD) (<15 mL/min/1.73 m^2) (25). For patients with ESRD, dialysis and transplantation are the only two therapeutic options (26, 27).

Poor glycemic control, high blood pressure, older age, family history of CKD, smoking, and high body-mass index are some of the risk factors contributing to CKD (6). Poor knowledge and practice of the patient about CKD and its risk factors are associated with a lower understanding of susceptibility to CKD (28). Good knowledge and practice about CKD and its risk factors enhances risk perception and availability for screening to make an early diagnosis. This gives an opportunity for early treatment, decrease morbidity, mortality, and health care costs (6).

Hematuria, nocturia, decreased urine output, tiredness, loss of appetite, vomiting, metallic taste, weight loss, pruritus, shortness of breath, or peripheral edema are some of the symptoms of CKD (26). But most patients with kidney disease are asymptomatic and unaware of their condition until they become with ESRD. Therefore, assessing the filtering capabilities of the kidney and awareness of the patient is essential, especially for hospitalized patients (4).

1.2 STATEMENT OF THE PROBLEM

Globally, the burden of CKD is increasing and resulting in an increased hospitalized morbidity and mortality (29). In 2017, the mortality rate of CKD was ranked as the 12th leading cause of death and is expected to rise to 5th ranked by 2040. In 2017, about 1·2 million people were died by CKD, in 2040, this number is anticipated to rise up to 2·2 million in a best-case scenario and up to 4·0 million in a worst-case scenario (30).

The prevalence of all-stage CKD reached almost 700 million in 2017 (31, 32). In central and Latin America, CKD mortality was increased by around 60%. This accounts for the second and fifth-ranked cause of death respectively (32). CKD is also associated with an independent risk factor for morbidity and premature mortality of cardiovascular disease (CVD). Globally, from 1·4 million deaths due to CVD, CKD was attributed to represent 7·6% of deaths (33). The prevalence of CVD among individuals with CKD ranges from 17% to 21% (34). Additionally all stages of CKD are associated with increased risk of all-cause morbidity, mortality, and hospitalization in cardiovascular patients (35). The complications of CKD are not restricted to CVD but also include hypertension, anemia, malnutrition, and mineral and bone disorders (24). These makes the management of CKD challenge full especially if they are present in advanced stages and cause a potential medical error for undiagnosed CKD in hospitalized patients (24, 36).

Chronic kidney disease is not only an important public health problem; rather, it also has a big economic burden. It is associated with increased hospitalization, productivity loss for patients and their caregivers, morbidity, and early mortality (37, 38). The rates of hospitalization among CKD patients are more common when compared with those without CKD. It also leads to further complications, like more re-hospitalization, drug toxicity, longer hospital stay, greater mortality, and morbidity when compared with patients without CKD (38, 39).

Patients with CKD also have a high risk of progression to ESRD. The cost of ESRD management is very high because it requires either dialysis or kidney transplantation (2). Subsequent dialysis leads to a huge burden in terms of poor quality of life and economical costs (40). In developed countries treatment of ESRD shares more than 2–3% of their annual healthcare budget (7). There are about $100,500 annual medical costs per patient per year for ESRD management in developed countries (37). Therefore with the increasing prevalence of

CKD and ESRD, the economic burden is also a burning concern to patients, their caregivers, and payers (41).

Currently, most of African countries are challenged with the dual burden of non-communicable and communicable diseases. This dual burden has led to a significant rise of CKD on the African countries (42). Even though both the incidence and prevalence of CKD appears to be increasing globally, the rate of increase is much higher in African countries; this is probably a result of poverty, high incidence of non-communicable and communicable diseases, hazardous work, poor education, and inaccessible or unaffordable treatment (7, 43).

Chronic kidney disease is one of the predominant and potentially accelerating diseases across sub-Saharan Africa (44). About 12–23% of sub-Saharan African adults had CKD and at risk of developing ESRD. Since most victims are asymptomatic or have non-specific symptoms, diagnosis of CKD at an early treatable stage is easily missed which leads to kidney failure. Once the kidneys are failed, either dialysis or transplantation is the only means of survival. However, Due to lack of access and higher costs of dialysis and transplantation, from renal replacement therapy requiring sub-Saharan African patients, only 1·5% of them get access (45). This leads to high morbidity and mortality rate, low life expectancy, poor quality of life, and overburdening health care costs in sub-Saharan Africa (42).

Like other low-income countries, CKD is also a growing problem in Ethiopia due to the rising risk factors such as high blood pressure and diabetes mellitus (46). Especially it is increasingly common in hospitalized patients. But due to its asymptomatic nature and low disease awareness, it is not frequently detected until its late stages. It is associated with an increased hospital stay, in-hospital mortality, health-related expenditure, and progression to ESRD (4, 47). However, despite its high prevalence and its subsequent increased hospitalized morbidity and mortality, little is known about the magnitude, risk factor, and awareness of CKD in Ethiopian hospitalized patients, especially in the study area. Therefore early detection, understanding of patients' awareness and treatment of CKD are required especially in this resource-limited county, where access to renal replacement therapy is strictly limited to prevent or delay its progression to ESRD, to reduce the risk of in-hospital morbidity and mortality.

1.3 SIGNIFICANCE OF THE STUDY

Most patients with kidney disease are unaware of their condition until they become with ESRD. If the patient reaches ESRD, family face challenge due to renal transplantation and dialysis fee. But early identification and assessment of the magnitude, stages, awareness, and risk factors of CKD will help to hold the problem. Therefore, this study will provide information on the current prevalence, stages, and associated factors of CKD among medical ward admitted patients. This study also provides information about the knowledge and practice of patients. Additionally the study will also help the study participant to know their status and to minimize deaths from this complication. Moreover, the finding of this study will also serve as a baseline for other researchers and different stakeholders for further work.

CHAPTER 2: LITERATURE REVIEW

2.1 PREVALENCE OF CKD

Globally, there is an increasing of CKD prevalence, morbidity, and mortality mainly due to the increasing prevalence of NCDs (48). According to a systematic analysis on the Global Burden of Disease (GBD) from 1990 to 2017 from 195 countries, in 2017, around 700 million cases in all-stage CKD were recorded globally. According to this data, the overall prevalence of CKD was 9·1%.with 5·0%, 3·9%, 0·16%, and 0·07% were accounting for CKD stages 1 and 2, stage 3, stage 4, and stage 5 respectively (30). When compared with 1990, the prevalence of CKD in 2017 has increased by 29·3% (4). Another systematic review and meta-analysis conducted on the global Prevalence of CKD revealed that, the prevalence of stage-1, 2, 3, 4, and 5 CKD were: 3.5%, 3.9%, 7.6%, 0.4%, and 0.1% respectively (49).

According to the national chronic kidney disease fact sheet of 2017, 30 million United State of America (USA) people, which is about 15% of USA adults were estimated to have CKD (50). Other observational data from the USA suggest that the prevalence of CKD among patients with mild (stages 1 and 2) was 7%, and patients with stage 3 comprise 12%, patients with advanced stages 4 to 5 involve less than 1% of the US population (41).

A cross-sectional study conducted in Brazil among hospitalized patients revealed 12.7% CKD cases (51). According to a cohort study conducted in Canada among hospitalized patients, the prevalence of CKD was 8.5 (39). Moreover a retrospective study conducted among 101817 Australia tertiary referral hospital admitted patients showed 6.4% prevalence of CKD (52). Another study conducted in Germany hospitalized patients revealed 27.5% CKD cases (53).

In Africa, CKD is becoming a major public health problem, mainly due to high-risk conditions like hypertension, diabetes, and smoking or probably due to soil pollution with heavy metals and pesticides and excessive use of herbal-based traditional medicines (54). According to a systematic review conducted in Egypt by Abd ElHafee which includes 152 articles published between 1 January 1995 and 7 April 2017, the pooled Prevalence of CKD in sub-Saharan Africa was 14.02% (44). In this study the pooled Prevalence of CKD among HIV, diabetes, and hypertensive was 5.6%, 24.7%, and 34.5%, respectively (44). In line with this study, another

systematic review and meta-analysis conducted on the burden of chronic kidney disease on the African continent by Arnaud D. Kaze revealed the overall prevalence of CKD for all stages of CKD as 15.8% and for stages 3–5 CKD was 4.6% (55). In addition to the above study another systematic review and meta-analysis conducted in sub-Saharan Africa revealed a pooled prevalence of CKD as 13·9% (56).

In Guinea, the prevalence of CKD was increased from 41% to 60% from 2001 to 2010. A prospective study conducted among Conakry Medical ward admitted patients in Guinea revealed that from 185 hospitalized patients, 61 (33%) had CKD, and of them 35 (57%) were male. The Prevalence of CKD in Stages 1, 2, 3, and 4 was 21%, 31%, 33%, and 15% respectively (57). A case-control study conducted in Botswana, among 550 medical ward admitted patients; revealed 16.3% CKD cases and 53.5% of them were not aware of their CKD status (47).

According to a cross-sectional study conducted in Uganda on 372 medical ward admitted patients, the prevalence of CKD was 15.3% (1). In line with this study another cross-sectional study conducted in Kenya to determine the prevalence and factors associated with chronic kidney disease among medical inpatients revealed that from 306 inpatients, 118 patients (38.6%) had CKD. Of them, 56 (47.5%) of the patients had either stage 1 or stage 2, and 17 (14.4%) had ESRD (58).

In Ethiopia, CKD is also becoming a major public health problem. A cross-sectional study conducted in Tigray teaching hospitals of Ethiopia, showed that, out of 578 hypertensive patients 128 (22.1%) had CKD (59). Another cross-sectional study conducted in Gondar Hospital, Northwest Ethiopia, revealed 17.3% CKD cases (60). According to a cross-sectional study conducted in Dessie referral hospital admitted patients, the Prevalence of CKD based on impaired eGFR was 19.0% while the overall prevalence was 33.9%. The Prevalence of this CKD in Stage 1, 2, 3a, 3b, 4, and 5 was 11 (3.0%), 44 (11.9%), 35 (9.5%), 15 (4.1%), 14 (3.8%), and 6 (1.6%) respectively (4). In line with this study another cross-sectional study conducted in Jimma University Medical Center among adult admitted patients also revealed that, out of 422 patients, 19.2% had an impaired estimated glomerular filtration rate (8). In line with this study another study conducted in this area also revealed 26% CKD cases (7) .

2.2 FACTORS ASSOCIATED WITH CKD

Different literatures revealed a significant association between hypertension and CKD. it causes CKD due to the damaging effects that high blood pressure has on kidney vasculature (61, 62). According to a cross-sectional study conducted among hospital-admitted patients in Brazil (51), Uganda (1), Kenya (58), Guinea (57), Tigray teaching hospitals (59), Gondar Hospital (60), Dessie referral hospital (4), and Jimma University Medical Center hypertension was significant associated with CKD. DM is the other risk factor for the development of CKD (63). About 20 to 30% of DM patients have diabetic nephropathy (64). A cross-sectional study conducted in Brazil (51), Uganda (1), Guinea (57), Tigray teaching hospitals (59), Gondar Hospital (60), and Dessie referral hospital (4) indicated a significant association between DM and CKD.

The kidney and heart are interlinked to maintain water and salt homeostasis and normal blood pressure (65). The disease of the heart causes dysfunction of the kidney and vice versa (35). A meta-analysis revealed that 49% of CVD patients were suffered from CKD (66). A cross-sectional study conducted among hospital-admitted patients in Brazil (51), Guinea (57), and Tikur- Anbessa Specialized Hospital (35) also indicated as CVD is independently associated with CKD. CKD is also frequently observed in HIV-positive patients (67, 68). The risk of CKD among HIV-positive patients is about four times higher than HIV negative patients (69). A cross-sectional study conducted in Dessie referral hospital (4) and Botswana among medical ward admitted patients revealed a significantly association between HIV and CKD (47).

Some studies also reported that individuals who have a family history of CKD have an increased risk of developing CKD (70, 71). The risk of CKD among those having a family history of kidney disease is three times higher than those without a family history of kidney disease (72). A cross-sectional study conducted in Dessie referral hospital also indicated an association between family history of kidney disease and CKD (4). The filtering capacity of the kidneys declines with increasing age. GFR is declining approximately in 1 mL/min/1.73 m^2 per year starting from 30 years (73-75). Different studies indicated a significant association between age and CKD. A cross-sectional study conducted in Brazil (51), Guinea (57), Tigray teaching hospitals (59), Gondar hospital (60), Dessie referral hospital (4), and Jimma University Medical Center (8) indicated that increase in age is asso;ciated with a higher risk of CKD.

Different literatures also revealed a significant association between obesity and CKD. A cross-sectional study conducted in Guinea (57), Tigray teaching hospitals (59), Dessie referral hospital (4), and Jimma University Medical Center (8) indicated obesity as significantly associated with CKD. it may contribute to kidney damage through oxidative stress, inflammation, and endothelial dysfunction or by increasing the risk factors, like hypertension and diabetes (76, 77). Modifiable lifestyle factors like excessive alcohol consumption and cigarette smoking also contribute to CKD development (78). A cross-sectional study conducted in Korea showed an association between excessive alcohol consumption and the prevalence of CKD (79). However, some studies indicated drinkers had a significantly decreased risk of CKD (80, 81). Different studies have also reported an association between cigarette smoking and CKD (9, 82-84).

2.3 KNOWLEDGE AND PRACTICES TOWARDS PREVENTION AND EARLY DETECTION OF CKD

Patient awareness about CKD complications, prevention, and early detection is important because the progression of kidney disease to ESRD and complications associated with CKD can be prevented or minimized by early detection and treatment; however, majority of CKD cases were not known until they came with ESRD mainly because of the lack of patients' awareness about CKD and associated risk factors (7). According to a retrospective study conducted in Chicago on hospitalized patients, only 32% of hospitalized patients had awareness about CKD and its risk factors (85). A cross-Sectional study conducted in Pakistan DM patients revealed that, only 47.4% of the study participants had adequate knowledge about CKD (86). Another cross-sectional study conducted in Palestine on 374 hypertensive patients showed that, 61.2% of study participants had good knowledge about CKD (87).

Especially in low-income countries, knowledge of the patient about CKD and its risk factors may play a vital role in increasing risk awareness and early diagnosis. This will leads to early treatment; reduce morbidity, mortality, and health care costs. However, despite its known adverse consequences, the majority of the people especially in low-income countries have low awareness about kidney disease (7, 88).

A cross-sectional descriptive study conducted in South-West Nigeria on knowledge and perception of CKD in a rural community revealed that, from a total of 454 participants, only

27.1% of them had good knowledge about CKD and 33.7% had heard about kidney disease. About 38.3%, 43.6%, and 11.1% of them knew diabetes, hypertension, and family history of CKD could cause CKD respectively. Cigarette smoking and abdominal obesity were seen in 16.6% and 14.6% respectively. (88). A community -based Study conducted on 606 participants in northern Tanzania revealed an overall weighted mean knowledge score of 3.28 (28).

According to a cross-sectional study conducted in Gondar town, showed that 298 (68.7%) and 210 (48.4%) of study participants had good knowledge and good preventive practice towards CKD respectively. In this study 63.4% of the participant correctly replied the signs and symptoms of CKD and 64.3% of the participant correctly answered the risk factors of CKD (6). In line with this study, another cross-sectional study conducted in Jimma University Medical Center, Only 59 (28.4%) of the study participant had awareness about CKD and its risk factors and 36.5% of them had average knowledge ;about CKD. Only 44.2% and 38.5% of the respondents knew that DM and hypertension are risk factors for CKD, respectively. Poor knowledge was also independently associated with CKD (7).

According to a study conducted in dessie referral hospital, from 33.9% CKD patients, only 21.6% of them were aware of their renal disease (4). Hence in Ethiopia, a critical challenge of CKD patients is the late presentation of the patients especially in advanced stages. This is due to a poor knowledge and awareness about the disease. Having a good knowledge about CKD and its risk factors improves health-seeking behavior (4). Therefore for early identification and treatment of CKD, good knowledge and awareness towards CKD is very important to reduce the associated morbidity, mortality, public health and economic burden (89, 90). However, the information about knowledge and preventive practice towards CKD among hospitalized patients in Ethiopia is unknown.

2.4 CONCEPTUAL FRAMEWORK OF THE STUDY

This study assessed the magnitude and risk factors of CKD. Socio-demographic factors, lifestyle-related factors, comorbidities, and knowledge and preventive practice of the patients towards CKD were variables selected from different articles.

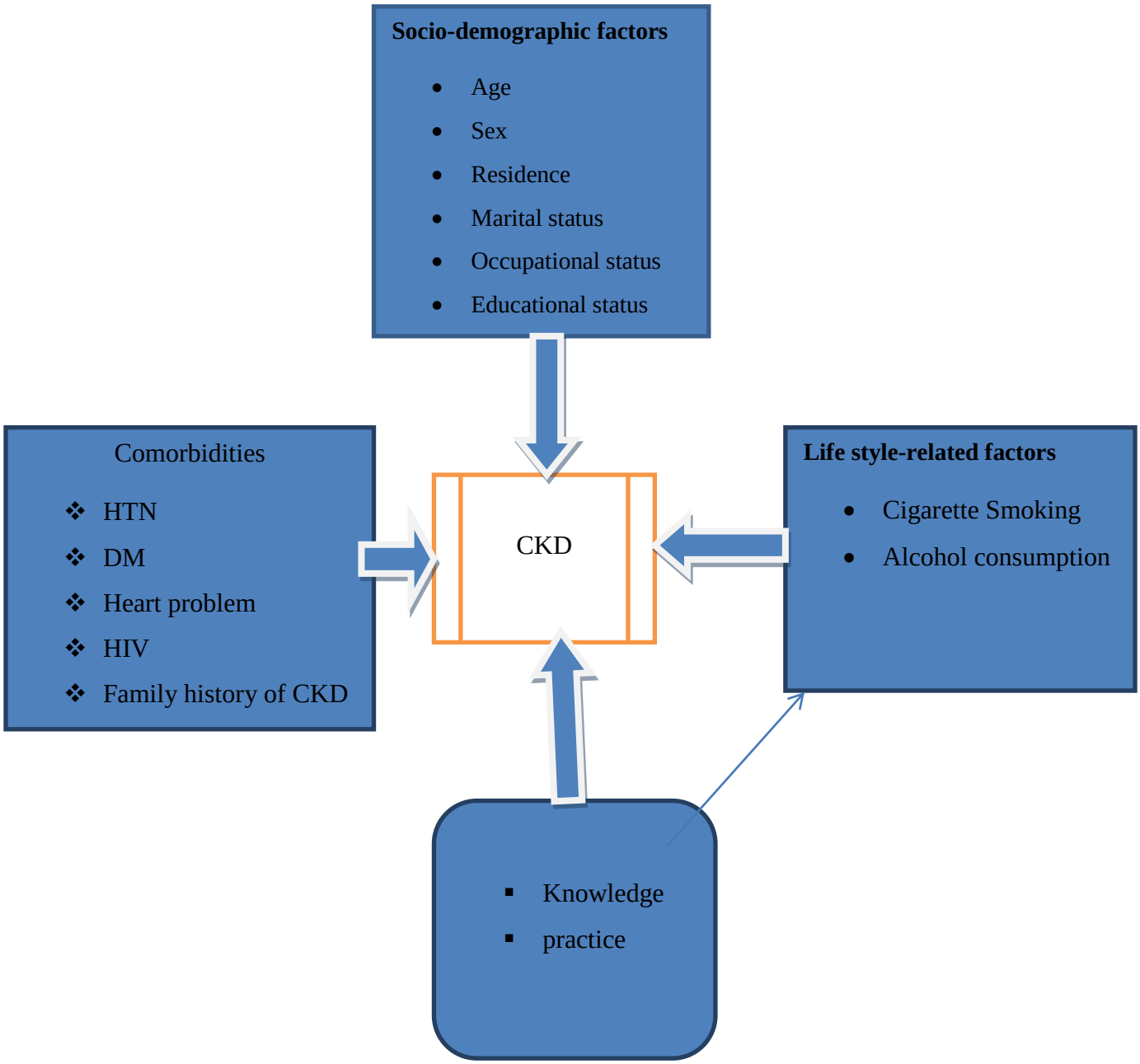

Figure 1: Conceptual framework which is adopted from different literature for the assessment of CKD among medical ward admitted patients at Wolkite University specialized hospital from November 2021 to February 2022.

CHAPTER 3: OBJECTIVES

3.1 GENERAL OBJECTIVE

- To determine the magnitude, patient awareness, and associated factors of CKD among medical ward admitted adult patients at Wolkite University specialized teaching hospital (WKUSTH) from November 15, 2021 to February 28, 2022.

3.2 SPECIFIC OBJECTIVES

- To determine the Magnitude of CKD among medical ward admitted adult patients at WKUSTH from November 15, 2021 to February 28, 2022.
- To identify the associated factors of CKD among medical ward admitted adult patients at WKUSTH from November 15, 2021 to February 28, 2022.
- To determine the level of patients' awareness towards CKD among medical ward admitted adult patients at WKUSTH from November 15, 2021 to February 28, 2022.

CHAPTER 4: METHOD AND MATERIAL

4.1 STUDY AREA AND PERIOD

The study was conducted from November 15, 2021 to February 28, 2022 in WKUSTH, which is located in the Southern Nation Nationalities Regional State, in Gurage zone, 158 km southwest of the capital city, Addis Ababa, on the way to Jimma. It is situated at Gubreye sub-city, 14 km away from Wolkite town of the Gubreye Butajira road. It was established in May 2019 and it has 112 nurses (10 clinical and 102 BSC nurses), 21 medical laboratory professionals (9 technicians and 12 technologists), and a total of 30 specialists**.** Currently, WKUSTH is offering outpatient, inpatient, surgical, gynecological, and pediatric services for about 28,866 catchment populations those are 15,074 male and 13792 female. There are 22 medical ward rooms containing a maximum of five and a minimum of one bed.

4.2 STUDY DESIGN

Institutional based cross-sectional study was conducted from November 15, 2021 to February 28, 2022 in WKUSTH

4.3 POPULATION

4.3.1 SOURCE POPULATION

All adult patients admitted to medical wards of WKUSTH

4.3.2 STUDY POPULATION

All adult patients admitted to medical wards of WKUSTH those available during the time interval of the study period.

4.4 ELIGIBILITY CRITERIA

4.4.1 INCLUSION CRITERIA

All adult (age >18) patients admitted to medical wards of WKUSTH during the study period were included in the study.

4.4.2 EXCLUSION CRITERIA

Patients those who were repeatedly admitted more than once within the study period, on intensive care unit and unconscious were excluded.

4.5 SAMPLE SIZE AND SAMPLING TECHNIQUE/SAMPLING PROCEDURES

4.5.1 SAMPLE SIZE DETERMINATION

The sample size is calculated using the sample size determination formula for a single population proportion.

$N = (Z\alpha/2)^2 P (1-P) /d^2$

Where n = Minimum sample size, z = 1.96 at 95% confidence interval (CI), d = margin of error (5%), p = 33.9% which is taken from a study conducted in dessie referral hospital (4).

$n= (1.96)^2 \times 0.339(0.661)/ (0.05)^2$

n=345

4.5.2 SAMPLING TECHNIQUE

Convenient sampling technique was applied to select the study participant among medical ward admitted patients during the study period. During the study period about 630 patients were admitted in the adult medical ward and 345 patients were selected based on convenient sampling technique.

4.6 STUDY VARIABLE

4.6.1 DEPENDENT VARIABLE

Chronic kidney disease

4.6.2 INDEPENDENT VARIABLE

- Socio-demographic variables: age, occupation, educational status, marital status, and sex
- Lifestyle-related factors; Cigarette smoking, alcohol consumption.
- Known comorbidity: such as hypertension, DM, CVD, HIV
- Family history of CKD
- Knowledge and preventive practice of the participant about CKD

4.7 DATA COLLECTION PROCEDURES (INSTRUMENT, PERSONNEL, DATA COLLECTION TECHNIQUE)

4.7.1 INSTRUMENTS

Table 1: Data collection instrument for the assessment of the magnitude of CKD and associated factors among medical ward admitted patients at WKUSTH from November 15, 2021 to February 28, 2022.

Items	Description
Questionnaires	For socio-demographic, KAP, and clinical data collection
Cobas 311 automated clinical chemistry analyzer	To analyze biochemical tests
Creatinine and urea reagent	for RFT determination
Calibrator	A calibrator for calibrating the clinical chemistry analyzer
Controls	Normal and pathological controls for checking the analyzer before processing the test samples
Plastic bulb pipette	For pipetting serum after centrifuging the sample
Serum separator tube (plain tube)	Used for blood sample collection for clotting
Cuvette	For sample and reagent mixing, incubation, and absorbance reading in the analyzer
Dipstick	For detecting proteinuria.
Blood pressure apparatus	For measuring the blood pressure of the respondents
Bench top centrifuge	For separating serum from whole blood
70% alcohol, disposable syringe with needle, cotton, tourniquet, examination glove	For venous blood collection from each study participant
Safety box	For disposing of used syringes and gloves
Sample rack	For transporting & placing of samples

4.7.2 DATA COLLECTION TECHNIQUE AND PERSONNEL

4.7.2.1 Data collection using questionnaire

Experienced nurses and laboratory professionals were trained on the study protocol and data collection format. After detailed information about the study was given, written consent was obtained from all subjects who were included in the study. Data were collected from patients and

their medical chart using a pretested semi-structured face to face interviewing questionnaire which was developed from WHO STEPS surveillance manual (91). The data collection tool contain socio-demographic, clinical information, lifestyle behaviors, Anthropometric and blood pressure measurements, knowledge assessment questions, preventive practice assessment questions, and laboratory finding parts. Patients were interviewed to collect data on socio-demographic characteristics, clinical information, lifestyle behaviors, knowledge and preventive practice by trained nurse. The clinical information of the patient or comorbidities, like hypertension, diabetes mellitus, cardiovascular disease, and HIV/AIDS information was confirmed by reviewing their medical chart.

The knowledge and preventive practice of the patient was assessed using 14 questions that are adopted from previous study done in Gondar town. The tool was translated to Amharic languages. Knowledge assessing tools contain seven yes or no type questions and those responding greater than three correct answer were considered as having good knowledge, moreover preventive practice assessing tools also contain seven yes or no type questions and those responded having a habit of preventive practice in more than three preventive practice assessment questions were considered as having good preventive practice. Lastly patients are considered as having awareness about CKD if they have both good knowledge and good preventive practice.

4.7.2.2 Anthropometric and blood pressure measurement

Anthropometric and blood pressure were measured by trained clinical nurses. Patient‘s weight was measured using a standard balance, and height was measured using a height measuring device attached to the balance. BMI for each subject was calculated by dividing the value of weight in kilograms (kg) by the square of the height in meters (m^2) or wt/ht^2. High BMI was defined as BMI $\geq$ 25 kg/m^2.

Blood pressure was measured using a digital blood pressure apparatus on his or her right arm after the patient had rested for five minute in the sitting position. Three readings were taken at intervals of at least 2 min and then averaged was calculated. Lastly those having a Blood Pressure ≥140/90mmHg were diagnosed as hypertensive case.

4.7.2.3 Laboratory specimen collection and analysis

Random urine and five mL of venous blood sample were collected by trained laboratory professional following SOP. The blood was collected in sterile serum-separating tubes and left to form a clot at room temperature for 30 minutes, then centrifuged. Biochemical tests such as creatinine and urea levels were analyzed by using cobas c 311 analyzer (cobas-roche Company, Germany) automated clinical chemistry analyzer according to the manufacturer's instructions and procedures in the laboratory. Serum creatinine which was measured using the Jaffe kinetic method, sex, and age was used to estimate the GFR. Then eGFR was calculated using the MDRD equation. CKD was defined as eGFR <60 ml/min/1.73 m^2. The CKD stages were classified into stage 3a (eGFR 45–59.9 ml/min/1.73 m^2), 3b (eGFR 30–44.9 ml/min/1.73 m^2), 4 (eGFR 15–29.9), and 5 (eGFR < 15 ml/min/1.73 m^2). Proteinuria was determined using rapid dipstick test strips and all laboratory measurements were done following the standard procedures recommended by the manufacturer.

4.8 DATA QUALITY CONTROL

Questionnaire data quality control was assured by reviewing and checking for errors, completeness, accuracy, and consistency during data collection and before entry into Epidata, and corrective measures were taken. A pretest was done on 5% of the sample size in Butajira hospital. The expiration date of the reagents and lipemic and hemolysis of every sample were checked. Both normal and pathological control was done every day before sample analysis.

4.9 STATISTICAL ANALYSIS AND PROCEDURE

Data were coded and entered into epidata version 3.1 for further data cleaning and to allow consistency and eliminate discrepancies. Then after, it was exported to STATA version14 software for analysis. Both bivariate and multivariate logistic regression was done. All Variables with a p-value < 0.25 in the bivariate analysis were included in multivariate logistic regression. A p-value < 0.05 was considered statistically significant. Finally, the result was presented using figures, charts, and table.

4.10 ETHICAL CONSIDERATIONS

Ethical clearance was obtained from the ethical review board of Jimma University Institute of Health (IRHPGn/576/). A supportive letter was also obtained from Jimma University School of

medical laboratory to WKUSTH. The medical director of WKUSTH wrote a permission letter to medical ward nurse case team leader and the case team leader announces the other nurse. Then both written and oral consent was obtained from all selected medical ward admitted adult patients. The name of the study participant was omitted from the questionnaire and the code number was used instead of the name to ensure confidentiality. The collected clinical specimens were used for the stated objectives only. Abnormal finding were reported back to the physicians/Nurse for decision making.

CHAPTER 5: RESULT

5.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE STUDY PARTICIPANTS

This study enrolled a total of 345 adult medical ward admitted patients, with a response rate of 100%. Out of 345 participants, 176 (51.01%) were male. A large proportion of the participants 154 (44.64%), were in the age group above 59 years. The mean age of the study participant was 51.64 ± 17.73 years and 18 and 95 was the minimum and maximum ages of the respondent respectively. Majority (62.61% and 72.17%) of the study participants were living in rural areas and married respectively. Regarding educational status, 160 (46.38%) of the study participants had no formal education (table 2 and figure 3).

Table 2 Socio-demographic characteristics of the study participant (n = 345), at WKUSTH from November 15, 2021 to February 28, 2022.

Variable	Category	Frequency	Percent
Sex	Male	176	51.01
	Female	169	48.99
Residence	Rural	216	62.61
	Urban	129	37.39
Marital status	Married	249	72.17
	Single	96	27.83
Educational status	Illiterate	160	46.38
	Primary	84	24.35
	Secondary	69	20.00
	>=Diploma	32	9.28
Religion	Muslim	134	38.84
	Orthodox	157	45.5
	Protestant	39	11.30
	Catholic	15	4.35
Occupation	Unemployed	37	10.72
	Government	34	9.86
	Private	92	26.67

	Farmer	149	43.19
	Daily labor	15	4.35
	Housewife	18	5.22

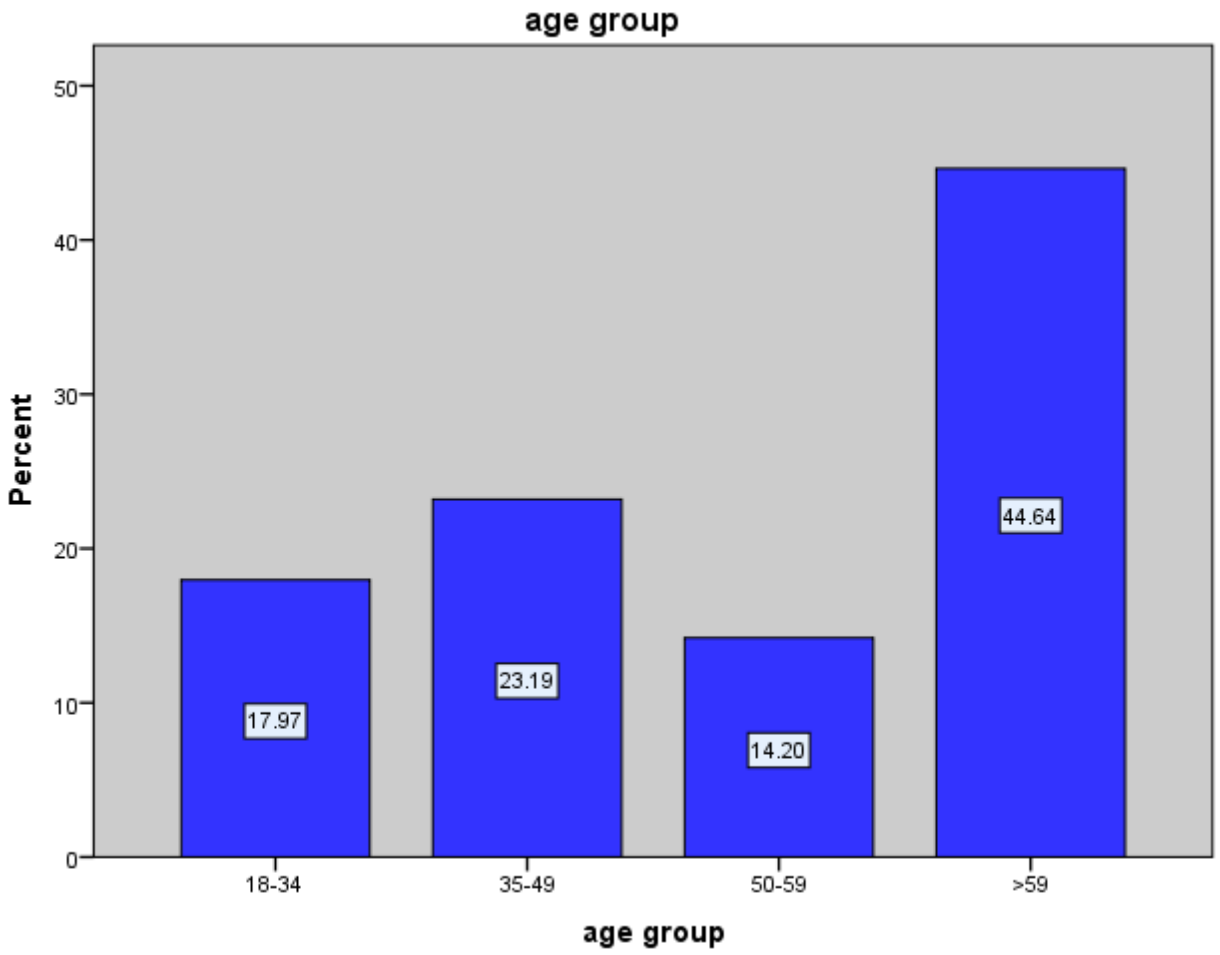

Figure 2: Age distribution of the study participant at WKUSTH medical ward admitted patients

5.2 CLINICAL AND BEHAVIORAL CHARACTERISTICS OF STUDY PARTICIPANTS

In this study, from 345 study participants, 2.9% were HIV patients and 2.61% had a family history of CKD. The main clinical diagnosis for admission was hypertension 24.97% followed by diabetes 15.36% and cardiac problem 11.01%. The mean systolic and diastolic blood pressure of the patients was 117.18±19 and 73.13±12 mm Hg, respectively (table 3).

Table 3 Clinical and behavioral characteristics of the study participant (n = 345) at WKUSTH from November 15, 2021 to February 28, 2022.

Variable	Category	Frequency	Percent
Family history of CKD	Yes	9	2.61
	No	336	97.39
Hypertension	Yes	86	24.97
	No	259	75.07
DM	Yes	53	15.36
	No	292	84.64
cardiac problem	Yes	38	11.01
	No	307	88.99
HIV status	Yes	10	2.9
	No	335	97.1
Alcohol consumption	Yes	31	8.99
	No	314	91.01
Cigarette smoking	Yes	19	5.51
	No	326	94.49
BMI	<25	266	77.10
	>=25	79	22.90
Proteinuria	Yes	117	33.91
	No	228	66.09
mean systolic blood pressure	117.18±19 mm Hg		
mean diastolic blood pressure	73.13±12 mm Hg		

5.3 PATIENT AWARENESS OF CHRONIC KIDNEY DISEASE

Of a total of 345 participants, 91(26.38%) had good knowledge about CKD. About two-third of the participants, 217(62.9%), responded that they heard of CKD. However, regarding knowledge of the participants about risk factors of CKD, only 20.29%, 18.84%, and 11.01% of them knew high blood pressure, high blood sugar, and heart problem could cause CKD respectively. Only about one-fourth of the participants, 84(24.35%), correctly responded the symptoms of CKD. Regarding practices, more than half, 206(59.71%), of participants had good practice towards CKD. Regarding physical exercise only 136(39.42%) had a habit of physical activities. Cigarette smoking and alcohol consumption accounts 19 (5.51%) and 31(8.99%) respectively (table 4).

Table 4: Knowledge and practice characteristics of the study participant among medical ward admitted patients at WKUSTH from November 15, 2021 to February 28, 2022.

Knowledge assessment	Yes n (%)	No n (%)
Have you ever heard about CKD	217 (62.90)	128 (37.10%)
Do you know the risk factors of CKD	69 (20.00)	276(80%)
Do you know HBP can cause CKD	70(20.29)	275(79.71%)
Do you know DM can cause CKD	65(18.84)	280(81.16%)
Do you know CVD can cause CKD	38(11.01)	307(88.99%)
Do you know the advantage of early detection of CKD	79(22.9)	266(77.1)
Mentioned at least one sign & symptom of CKD	84(24.35)	261(75.65%)
Level of Knowledge	Good(> =50)	91(26.38%)
	Poor(<50)	254(73.62%)

Practice assessment	Yes n (%)	**No n (%)**
Cigarette smoking	19(5.51)	326 (94.49%)
Drinking alcohol	31(8.99%)	314(91.01%)

Regular BP check up	73(21.16)	272(78.84%)
Taking medication without order	87(25.22)	258(74.78%)
Regular CKD check-up	21 (6.09)	324 (93.91%)
Normal BMI	250(72.46)	95(27.54%)
Regular exercise	136(39.42)	209(60.58%)
Level of practice	Good(> =50)	206(59.71%)
	Poor(<50)	139(40.29%)

5.4 MAGNITUDE OF CKD

In this study, out of 345 patients, 70 patients had eGFR < 60 mL/min/1.73 m^2. For these patients, their chart was reviewed to see whether there is any creatinine measurement during or before admission. Accordingly from these 70 patients, 68 patients have at least one recorded creatinine measurement on their life and for those having more than one creatinine measurement, one creatinine was taken based on the time and eGFR was calculated. Finally only 54 have eGFR < 60 mL/min/1.73 m^2. Therefore, the magnitude of CKD was 54 (15.7%) (95% CI: 11.6%–19.4%) (Figure3). When Classified by disease stage, the proportion of stage 3a, 3b, 4, and 5 CKD were 11 (20.37%), 22 (40.74%), 20 (37.04%) and 1 (1.85%) respectively (Figure 4). In this study, CKD was more prevalent among older patients especially aged >=60 years (27.27%) when compared with those age < 60 years patients (6.28%). The prevalence of CKD in male (16.48%) was a little bit greater than female (14.79%). Hypertension 39(45.35%), diabetes 21(39.62%) and cardiac problem 13(34.21%) were the main etiology for CKD.

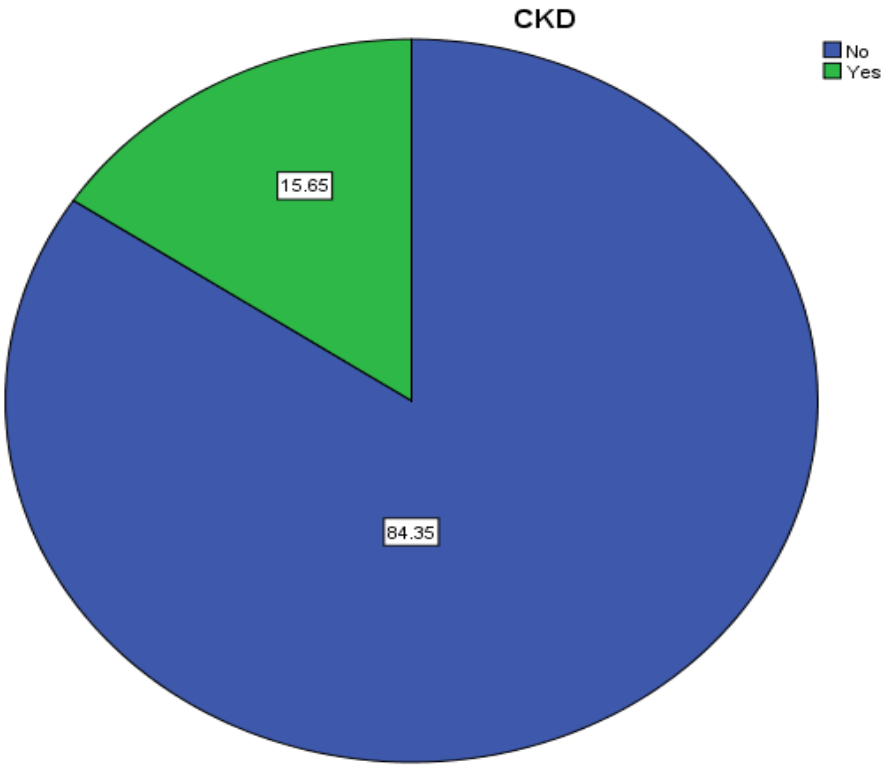

Figure 3: Prevalence of CKD among medical ward admitted patients at WKUSTH

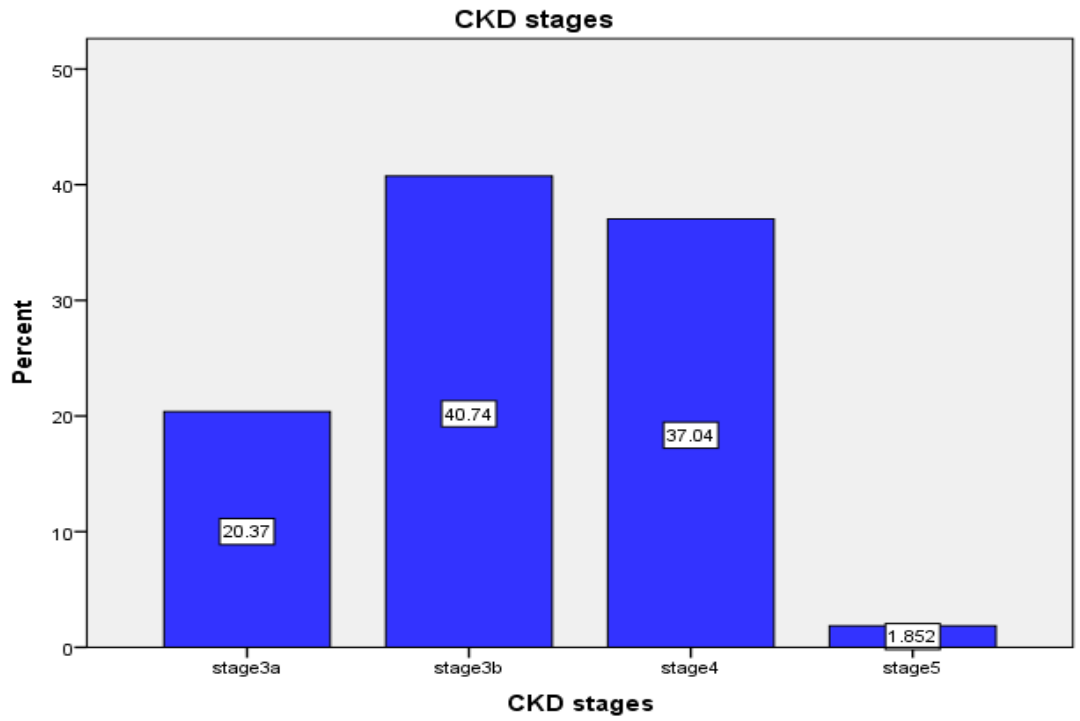

Figure 4: Stage of CKD among medical ward admitted patients at WKUSTH.

5.5 FACTORS ASSOCIATED WITH CKD USING BINARY AND MULTIPLE LOGISTIC REGRESSION

Bivariate and multivariable analysis was conducted to see the association between dependent and independent variables. Accordingly, on bivariate analysis variables like, participants with age >= 60 years (COR 5.59, 95% CI; 2.82,11.08), family member having CKD (COR, 7.32, 95% CI; 1.89,28.22) hypertension (COR 13.49, 95%; 95% CI; 6.89,26.44), Diabetes Mellitus (COR 5.15, 95% CI; 2.66,9.95), heart problem (COR 3.37, 95% CI; 1.59,7.11), alcohol consumption (COR 2.92, 95% CI; 1.28, 6.61), cigarette smoking (COR 3.46, 95% CI; 1.29,9.24), participants who had BMI >=25 (COR,3.78 , 95% CI; 2.05,6.97) Poor knowledge (COR 1.96, 95% CI 0.91,4.19), poor practice (COR 2.08, 95% CI 1.16,3.75), and proteinuria (COR 8.92, 95% CI 4.53,17.54) were significantly associated with CKD at $P < 0.25$ and entered into multivariable analysis (table 5). Lastly in multivariable analysis older age (AOR 3.87, 95% CI; 1.56, 9.60), history of hypertension (AOR 8.38, 95% CI; 3.60, 19.51), DM (AOR 5.94, 95% CI; 2.17, 16.27), high BMI (AOR 4.20, 95% CI; 1.74, 10.12), and proteinuria (AOR 2.82, 95% CI; 1.17, 6.79) were independently associated with CKD (table 6).

Table 5: Socio-demographic factors associated with CKD among medical ward admitted patients using binary logistic regression in WKUSTH, southwest Ethiopia, 2022.

Variable	Category	CKD		COR	95% CI COR	P-value
		Yes=54	No=291			
Sex	Male	29(16.48%)	147(83.52%)	1.13	0.63,2.03	0.667
	Female	25(14.79%)	144(85.21%)	1		
Age group	<60	12(6.28%)	179(93.72%)	1		
	>=60	42(27.27%)	112(72.73%)	5.59	2.82,11.08	0.000*
Place of residence	Urban	18(13.95%)	111(86.05%)	1		
	Rural	36(16.67%)	180(83.33%)	1.23	0.67,2.27	0.503
Marital status	Single	14(14.58%)	82(85.42%)	1		
	Married	40(16.06%)	209(83.94%)	1.12	0.57,2.16	0.735
Religion	Muslim	29(21.64%)	105(78.36%)	3.86	0.48,30.64	0.260
	Orthodox	21(13.38%)	136(86.62%)	2.16	0.27,17.30	0.468
	Protestant	3(7.69%)	36(92.31%)	1.16	0.11,12.18	0.898
	Catholic	1(6.67%)	14(93.33%)	1		
Educational level	Illiterate	33(20.63%)	127(79.38%)	1.682	0.72,8.75	0.288
	Primary	8(9.52%)	76(90.48%)	0.8136	0.25,4.10	0.980
	Secondary	10(14.49%)	59(85.51%)	1.630	0.41,6.41	0.478
	College/university	3(9.38%)	29(90.63%)	1		
Occupation	Unemployed	6(16.22%)	31(83.78%)	1.25	0.22,7.07	0.794
	Government	5(14.71%)	29(85.29%)	1.68	0.30,9.27	0.549
	Private	11(11.96%)	81(88.04%)	1.69	0.35,8.14	0.512
	Farmer	29(19.46%)	120(80.54%)	1.99	0.42,9.27	0.378
	Daily labor	2(13.33%)	13(86.67%)	0.38	0.31,4.68	0.452
	Housewife	1(5.56%)	17(94.44%)	1		

Table 6: Clinical and behavioral related factors associated with CKD using binary logistic regression among medical ward admitted patients in WKUSTH, southwest Ethiopia, 2022

Variable	Category	CKD		COR	95% CI for COR	P-value
		Yes=54	No=291			
Family member having CKD	Yes	5(55.56%)	4(44.22%)	7.32	1.89,28.22	0.004*
	No	49(14.58%)	287(85.42%)	1		
History of HTN	Yes	39(45.35%)	47(54.65%)	13.49	6.89,26.44	0.000*
	No	15(5.79%)	244(94.21%)	1		
History of DM	Yes	21(39.62%)	32(60.38%)	5.15	2.66,9.95	0.000*
	No	33(11.30%)	259(88.70%)	1		
History of heart problem	Yes	13(34.21%)	25(65.79%)	3.37	1.59,7.11	0.001*
	No	41(13.36%)	266(86.64%)	1		
HIV status	Yes	2(20.00%)	8(80.00%)	1.36	0.28,6.58	0.702
	No	52(15.52%)	283(84.48%)	1		
Alcohol consumption	Yes	10(32.26%)	21(67.74%)	2.92	1.28,6.61	0.010*
	No	44(14.01%)	270(85.99%)	1		
Cigarette smoking	Yes	7(36.84%)	12(63.16%)	3.46	1.29,9.24	0.013*
	No	47(14.42%)	279(85.58%)	1		
BMI	<25	29(10.90%)	237(89.10%)	1		
	>=25	25(31.65%)	54(68.35%)	3.78	2.053,6.97	0.000*
Level of knowledge	Good	9(9.89%)	82(90.11%)	1		
	Poor	45(17.72%)	209(82.28%)	1.96	0.91,4.19	0.082*
Level of practice	Good	24(11.65%)	182(88.35%)	1		
	Poor	30(21.58%)	109(78.42%)	2.087	1.16,3.75	0.014*
Proteinuria	Yes	41(35.04%)	76(64.96%)	8.92	4.53,17.54	0.000*
	No	13(5.70%)	215(94.30%)	1		

Table 7: Socio-demographic, clinical, and behavioral related factors associated with CKD among medical ward admitted patients using multiple logistic regression in WKUSTH, southwest Ethiopia, 2022

Variable	Category	AOR	95% CI AOR	P-value
Age group	<60	1		
	>=60	3.87	1.56,9.60	0.003*
Family member having CKD	Yes	5.32	0.86,32.82	0.072
	No	1		
History of HTN	Yes	8.38	3.60,19.51	0.000*
	No	1		
History of DM	Yes	5.94	2.17,16.27	0.001*
	No	1		
History of heart problem	Yes	1.70	0.58,4.99	0.330
	No	1		
Alcohol consumption	Yes	1.42	0.46,4.31	0.533
	No	1		
Cigarette smoking	Yes	2.04	0.38,8.12	0.457
	No	1		
BMI	<25	1		
	>=25	4.20	1.73,10.12	0.001*
Level of knowledge	Good	1		
	Poor	2.23	0.68,7.26	0.181
Level of practice	Good	1		
	Poor	1.66	0.70,3.93	0.241
Proteinuria	Yes	2.82	1.17,6.79	0.020*
	No	1		

CHAPTER 6: DISCUSSION

Currently, due to different factors like lifestyle changes and the increasing of non-communicable chronic diseases like hypertension and DM, CKD has become one of the major public health problems worldwide. Especially because of the huge economic burden of ESRD, early detection and prevention of CKD is a critical issue. However, the advantage of early detection and prevention of CKD has not been sufficiently noted by the patient and even by the stakeholders. From now it is commonly unrecognized and leads to further complication especially in the hospitalized patients. Hence this study aimed to determine the magnitude and associated factors of CKD in adult patients admitted to medical ward in WKUSTH. Our study indicated that 54 (15.7%) participant with 95% CI: (11.6%–19.4%) had CKD. This finding was comparable with a study conducted in Botswana 16.3% (47), Uganda 15.3% (1), and London (17.7%) (92) by using MDRD equation.

However, the result of our finding was higher compared to a study conducted in Canada 8.5% (39) and Brazil 12.7% (51) by using the same MDRD equation. This difference might be due to population characteristics or there might be due to more complex medical patients. Other studies conducted in Spain (28.3%) (93), Germany (27.5%) (53), Kenya (38.6%) (58), Conakry in Guinea (33%) (57), and Jimma University Medical Center (19.2%) (8) had reported a higher prevalence of CKD compared to our study. This difference might be due to differences in sample size, and/or population characteristics. There were more elderly study participants in Spain (mean age of 63.2) than our study (mean age of 51) (93). Unlike the other studies like conducted in Kenya, Spain, and Conakry in Guinea, we check for serum creatinine of the patients for those having eGFR <60 mL/min/1.73 m^2, this may reduce the over estimation of CKD in our study.

In the present study, factors associated with CKD were older age, history of hypertension, DM, BMI, and proteinuria. Accordingly, our results reveal that, hypertensive patients had about eight times more likely increased risk of having CKD when compared to patients without history of hypertension. This finding was in line with a study conducted in Uganda (1), Botswana (47), Kenya (58), northwest Ethiopia (18), Dessie referral hospital (4), and Jimma University Medical Center (8). This indicates that patients with previously known hypertensions have higher rates of renal complications.

According to our study DM was also a risk factor for CKD. Those having DM have about six times more likely increased risk of developing CKD when compared to patients without a history of DM. Our finding was consistent with a study conducted in Brazil (51), Uganda (1), North-Central Nigeria(94), and Dessie referral hospital (4). However, it was inconsistent with a study conducted in Botswana (47), Kenya (58), and Jimma University Medical Center (8). The possible reason for this might be our patients might be diagnosed after already developing complications like diabetic nephropathy.

In the present study, older age was also independently associated with CKD. This finding was consistent with other findings in Brazil (51), Kenya (58), Dessie referral hospital (4), northwest Ethiopia (18), and Jimma University Medical Center (8). This is probably due to increased renal risk factors such as diabetes, hypertension, and heart problem or structural and functional changes in the aging kidneys.

High BMI was associated with CKD which showed that patients with BMI > 25 were about four times more likely to develop CKD as compared to their counterparts. This finding was similar with a study conducted in Cameroon (95), North-Central Nigeria(94), and Tigray teaching hospitals (59). This is most probably due to as BMI increases; renal risk factors such as diabetes, hypertension, and heart problem will be also increased.

Proteinuria was also independently associated with CKD. This is in line with study conducted in Kenya (58), Uganda (1), North-Central Nigeria(94), Tigray teaching hospitals (59), and northwest Amhara referral hospitals (96). Other factors like family history of kidney disease, history of heart problem, alcohol consumption, cigarette smoking, poor knowledge, and poor practice were significant in the crude analysis only.

In our study, we also assessed patient's knowledge and practice about CKD in adult medical ward admitted patients. Generally, knowledge of the participant about CKD was low: only 26% of the participants have good knowledge. This finding is consistent with a study conducted in South-West Nigeria (27.1%) (88). However, our finding was lower compared to a study conducted in Bangladesh (69.6%) (97), Malaysia (30.1%,) (98), Northern Tanzania 38.5% (28), Gondor town (68.7%) (6), Jimma University Medical Center (36.5%) (7), Chronic Illness Clinic of Jimma Town Public Hospitals (47.9%) (20).

This difference might be due to difference in the educational level of the participant; in the present study majority of the study participants were illiterate and from rural areas. In our study 62.61% of the study participants were from rural areas where as in Jimma University Medical Center, Gondor town, and Northern Tanzania, 68.3 % (7), 82.7% (6), and 76.4% (28) of their study participants were from urban areas respectively. Urban dwellers have a better chance of getting information in different ways compared to rural dwellers.

Regarding knowledge of the participant about CKD risk factors, only 20.29% and 18.84% of them knew high blood pressure and high blood sugar could cause CKD respectively. This finding was comparable with a study conducted in Gondor town 17% (6). However, lower than a study conducted in Jimma University Medical Center which was 38.5% and 44.2% respectively (7). This difference might be due to difference in the educational level of the participant; in the present study 46.38% of the study participants were illiterate while in Jimma University Medical Center was 34.6% (7).

Of the total participants, 206 (59.71%) had good preventive practice towards CKD. This finding was higher compared to the studies conducted in Gondar town of northwest Ethiopia (48.4%) (6). This may be due to difference in the health education practice about CKD. However, this finding was lower than a study conducted in a tertiary teaching hospital in Malaysia (88.3%) (98) and Bangladesh (89%) (97). This difference might be due to difference in educational level of the study participant and health education practice about CKD in the study area. Majority of the study participants 209 (60.58%) did not exercise regularly. This is comparable with a study conducted in Gondor town in which 92.6% did not exercise regularly (6). Finally about 81 (23.5%) of the study participants had awareness about CKD (i.e. they have both good knowledge and good preventive practice towards CKD). This finding was lower compared to a study conducted in Jimma University Medical Center, in which about 59 (28.4%) of the study participants had awareness about CKD (7).

Limitation:

Since the study design was cross-sectional, causal relationships between assessed risk factors and renal disease cannot be drawn.

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

The magnitude of CKD among adult patients admitted to a medical ward of WKUSTH was high and patients have low level of knowledge and preventive practices towards CKD. Older age, high BMI, proteinuria, and having comorbidity diseases like hypertension and diabetes mellitus, were found to be significantly associated with CKD. Patient education, early detection of chronic kidney disease, might help to prevent complications.

7.2 RECOMMENDATIONS

- For health professionals
  - ✓ We recommend the health professionals to implement eGFR in routine diagnosis and monitoring of patients.
  - ✓ We recommend delivering health education about risk factors of CKD and the advantage of early detection of CKD
  - ✓ To screen high-risk populations (hypertensive, aged, diabetics, and obese/overweight)
- For Researchers
  - ✓ We recommend doing a population-based study on the Magnitude of CKD, associated factors, and knowledge about kidney disease.

REFERENCES

1. Kalima N, Gabriel B, Muhindo R, Muyingo A. Chronic kidney disease in patients admitted to the medical ward of Mbarara Regional Referral Hospital in southwestern Uganda: prevalence and associated factors. International Journal of Medicine and Biomedical Research. 2015;4(2):107-16.
2. Gbaguidi GN, Houehanou CY, Amidou SA, Vigan J, Houinato DS, Lacroix P. Prevalence of abnormal kidney function in a rural population of Benin and associated risk factors. BMC nephrology. 2021;22(1):1-9.
3. Miller AC, Tuiz E, Shaw L, Flood D, Garcia P, Dhaenens E, et al. Population estimates of GFR and risk factors for CKD in Guatemala. Kidney international reports. 2021;6(3):796-805.
4. Fiseha T, Ahmed E, Chalie S, Gebreweld A. Prevalence and associated factors of impaired renal function and albuminuria among adult patients admitted to a hospital in Northeast Ethiopia. Plos one. 2021;16(2):e0246509.
5. Arnold MJ, Harding MC, Conley AT. Dietary Guidelines for Americans 2020-2025: Recommendations from the US Departments of Agriculture and Health and Human Services. American Family Physician. 2021;104(5):533-6.
6. Asmelash D, Chane E, Desalegn G, Assefa S, Fasil A. Knowledge and Practices towards Prevention and Early Detection of Chronic Kidney Disease and Associated Factors among Hypertensive Patients in Gondar Town, North West Ethiopia. International journal of hypertension. 2020;2020.
7. Kumela Goro K, Desalegn Wolide A, Kerga Dibaba F, Gashe Fufa F, Wakjira Garedow A, Edilu Tufa B, et al. Patient awareness, prevalence, and risk factors of chronic kidney disease among diabetes mellitus and hypertensive patients at Jimma University Medical Center, Ethiopia. BioMed research international. 2019;2019.
8. Adugna T, Merga H, Gudina EK. Impaired glomerular filtration rate, high grade albuminuria and associated factors among adult patients admitted to tertiary Hospital in Ethiopia. BMC nephrology. 2018;19(1):1-11.
9. Xia J, Wang L, Ma Z, Zhong L, Wang Y, Gao Y, et al. Cigarette smoking and chronic kidney disease in the general population: a systematic review and meta-analysis of prospective cohort studies. Nephrology Dialysis Transplantation. 2017;32(3):475-87.

10. Singh AK, Farag YM, Mittal BV, Subramanian KK, Reddy SRK, Acharya VN, et al. Epidemiology and risk factors of chronic kidney disease in India–results from the SEEK (Screening and Early Evaluation of Kidney Disease) study. BMC nephrology. 2013;14(1):1-10.
11. Kebede KM, Abateneh DD, Teferi MB, Asres A. Chronic kidney disease and associated factors among adult population in Southwest Ethiopia. PloS one. 2022;17(3):e0264611.
12. Bishop ML, Fody EP, Schoeff LE. Clinical Chemistry: Techniques, Principles, and Correlations. Eighth Edition: Wolters Kluwer; 2018:557-572.
13. Tanner GA. Kidney function. Medical Physiology-Principles for Clinical Medicine 3rd ed Philadelphia: Lippincott Willams and Wilkins. 2009:391-418.
14. Makris K, Spanou L. Acute kidney injury: definition, pathophysiology and clinical phenotypes. The clinical biochemist reviews. 2016;37(2):85.
15. Kellum JA, Romagnani P, Ashuntantang G, Ronco C, Zarbock A, Anders H-J. Acute kidney injury. Nature Reviews Disease Primers. 2021;7(1):1-17.
16. Johnson CA, Levey AS, Coresh J, Levin A, Eknoyan JGL. Clinical practice guidelines for chronic kidney disease in adults: part 1. Definition, disease stages, evaluation, treatment, and risk factors. American family physician. 2004;70(5):869-76.
17. CDC. Chronic kidney disease in the United States, 2021. US Department of Health and Human Services, Centers for Disease Control and Prevention. 2021.
18. Damtie S, Biadgo B, Baynes HW, Ambachew S, Melak T, Asmelash D, et al. Chronic kidney disease and associated risk factors assessment among diabetes mellitus patients at a tertiary hospital, Northwest Ethiopia. Ethiopian journal of health sciences. 2018;28(6).
19. Girum T, Mesfin D, Bedewi J, Shewangizaw M. The burden of noncommunicable diseases in Ethiopia, 2000–2016: analysis of evidence from global burden of disease study 2016 and global health estimates 2016. International journal of chronic diseases. 2020;2020.
20. Tegegne B, Demeke T, Amme S, Edmealem A, Ademe S. Knowledge towards Prevention and Early Detection of Chronic Kidney Disease and Associated Factors among Hypertensive Patients at a Chronic Illness Clinic of Jimma Town Public Hospitals. BioMed Research International. 2020;2020.
21. McPherson RA, Msc M, Pincus MR. Henry's clinical diagnosis and management by laboratory methods E-book: Elsevier Health Sciences; 2021:173-192..

22. Jones GR, Lim E-M. The National Kidney Foundation guideline on estimation of the glomerular filtration rate. The Clinical Biochemist Reviews. 2003;24(3):95.

23. Burtis CA, Bruns DE. Tietz fundamentals of clinical chemistry and molecular diagnostics-e-book: Elsevier Health Sciences; 2014:652-673.

24. Clarke W, Marzinke M. Contemporary practice in clinical chemistry: Academic Press; 2020.

25. Levey AS, Coresh J, Bolton K, Culleton B, Harvey KS, Ikizler TA, et al. K/DOQI clinical practice guidelines for chronic kidney disease: evaluation, classification, and stratification. American Journal of Kidney Diseases. 2002;39(2 SUPPL. 1):i-ii+ S1-S266.

26. Chen TK, Knicely DH, Grams ME. Chronic kidney disease diagnosis and management: a review. Jama. 2019;322(13):1294-304.

27. Tolossa T, Fetensa G, Regassa B, Tigistu M, Fekadu G, Besho M, et al. Burden and determinants of chronic kidney disease among diabetic patients in Ethiopia: A systematic Review and Meta-analysis, 2020. 2020.

28. Stanifer JW, Turner EL, Egger JR, Thielman N, Karia F, Maro V, et al. Knowledge, attitudes, and practices associated with chronic kidney disease in northern Tanzania: a community-based study. PloS one. 2016;11(6):e0156336.

29. Haileamlak A. Chronic kidney disease is on the rise. Ethiopian journal of health sciences. 2018;28(6):681.

30. Bikbov B, Purcell CA, Levey AS, Smith M, Abdoli A, Abebe M, et al. Global, regional, and national burden of chronic kidney disease, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet. 2020;395(10225):709-33.

31. Coresh J. Update on the burden of CKD. Journal of the American Society of Nephrology. 2017;28(4):1020-2.

32. Cockwell P, Fisher L-A. The global burden of chronic kidney disease. The Lancet. 2020;395(10225):662-4.

33. Luyckx VA, Tonelli M, Stanifer JW. The global burden of kidney disease and the sustainable development goals. Bulletin of the World Health Organization. 2018;96(6):414.

34. House AA, Wanner C, Sarnak MJ, Piña IL, McIntyre CW, Komenda P, et al. Heart failure in chronic kidney disease: conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference. Kidney international. 2019;95(6):1304-17.

35. Chala G, Sisay T, Teshome Y. Chronic Kidney Disease And Associated risk factors among cardiovascular patients. International Journal of Nephrology and Renovascular Disease. 2019;12:205.

36. Seliger SL, Zhan M, Walker LD, Fink JC. Chronic kidney disease adversely influences patient safety. Journal of the American Society of Nephrology. 2008;19(12):2414-9.

37. Elshahat S, Cockwell P, Maxwell AP, Griffin M, O'Brien T, O'Neill C. The impact of chronic kidney disease on developed countries from a health economics perspective: a systematic scoping review. PloS one. 2020;15(3):e0230512.

38. Schrauben SJ, Chen H-Y, Lin E, Jepson C, Yang W, Scialla JJ, et al. Hospitalizations among adults with chronic kidney disease in the United States: A cohort study. PLoS medicine. 2020;17(12):e1003470.

39. Bohlouli B, Tonelli M, Jackson T, Hemmelgam B, Klarenbach S. Risk of hospital-acquired complications in patients with chronic kidney disease. Clinical Journal of the American Society of Nephrology. 2016;11(6):956-63.

40. Wagnew F, Eshetie S, Kibret GD, Zegeye A, Dessie G, Mulugeta H, et al. Diabetic nephropathy and hypertension in diabetes patients of sub-Saharan countries: a systematic review and meta-analysis. BMC research notes. 2018;11(1):1-7.

41. Wang V, Vilme H, Maciejewski ML, Boulware LE, editors. The economic burden of chronic kidney disease and end-stage renal disease. Seminars in nephrology; 2016: Elsevier.

42. Adjei DN, Stronks K, Adu D, Beune E, Meeks K, Smeeth L, et al. Chronic kidney disease burden among African migrants in three European countries and in urban and rural Ghana: the RODAM cross-sectional study. Nephrology Dialysis Transplantation. 2018;33(10):1812-22.

43. Arogundade FA, Omotoso BA, Adelakun A, Bamikefa T, Ezeugonwa R, Omosule B, et al. Burden of end-stage renal disease in sub-Saharan Africa. Clinical nephrology. 2020;93(1):3-7.

44. Abd ElHafeez S, Bolignano D, D'Arrigo G, Dounousi E, Tripepi G, Zoccali C. Prevalence and burden of chronic kidney disease among the general population and high-risk groups in Africa: a systematic review. BMJ open. 2018;8(1):e015069.

45. Ashuntantang G, Osafo C, Olowu WA, Arogundade F, Niang A, Porter J, et al. Outcomes in adults and children with end-stage kidney disease requiring dialysis in sub-Saharan Africa: a systematic review. The Lancet Global Health. 2017;5(4):e408-e17.

46. Kore C. The magnitude of chronic kidney disease and its risk factors at Zewditu Memorial Hospital, Addis Ababa, Ethiopia. Nephrology. 2020.

47. Rwegerera G, Bayani M, Taolo E, Habte D. The prevalence of chronic kidney disease and associated factors among patients admitted at princess marina hospital, Gaborone, Botswana. Nigerian journal of clinical practice. 2017;20(3):313-9.

48. Neuen BL, Chadban SJ, Demaio AR, Johnson DW, Perkovic V. Chronic kidney disease and the global NCDs agenda. BMJ Specialist Journals; 2017.

49. Hill NR, Fatoba ST, Oke JL, Hirst JA, O'Callaghan CA, Lasserson DS, et al. Global prevalence of chronic kidney disease–a systematic review and meta-analysis. PloS one. 2016;11(7):e0158765.

50. Stats F. National chronic kidney disease fact sheet, 2017. US Department of Health and Human Services, Centers for Disease Control and Prevention. 2017.

51. Pinho NAd, Silva GVd, Pierin AMG. Prevalence and factors associated with chronic kidney disease among hospitalized patients in a university hospital in the city of São Paulo, SP, Brazil. Brazilian Journal of Nephrology. 2015;37:91-7.

52. Ngu K, Reid D, Tobin A. Trends and outcomes of chronic kidney disease in intensive care: a 5-year study. Internal medicine journal. 2017;47(1):62-7.

53. Lüders F, Fürstenberg T, Engelbertz C, Gebauer K, Meyborg M, Malyar NM, et al. The impact of chronic kidney disease on hospitalized patients with peripheral arterial disease and critical limb ischemia. Angiology. 2017;68(2):145-50.

54. Wilson S, Mone P, Jankauskas SS, Gambardella J, Santulli G. Chronic kidney disease: Definition, updated epidemiology, staging, and mechanisms of increased cardiovascular risk. Journal of clinical hypertension (Greenwich, Conn). 2021;23(4):831.

55. Kaze AD, Ilori T, Jaar BG, Echouffo-Tcheugui JB. Burden of chronic kidney disease on the African continent: a systematic review and meta-analysis. BMC nephrology. 2018;19(1):1-11.

56. Stanifer JW, Jing B, Tolan S, Helmke N, Mukerjee R, Naicker S, et al. The epidemiology of chronic kidney disease in sub-Saharan Africa: a systematic review and meta-analysis. The Lancet Global Health. 2014;2(3):e174-e81.

57. Kaba M, Camara M, Béavogui M, Bah A, Fousény D, Kourouma M, et al. Risk factors for chronic kidney disease among patients admitted to the medical wards in Conakry. Saudi Journal of Kidney Diseases and Transplantation. 2016;27(5).

58. Mwenda V, Githuku J, Gathecha G, Wambugu BM, Roka ZG, Ong'or WO. Prevalence and factors associated with chronic kidney disease among medical inpatients at the Kenyatta National Hospital, Kenya, 2018: a cross-sectional study. The Pan African Medical Journal. 2019;33.

59. Bahrey D, Gebremedhn G, Mariye T, Girmay A, Aberhe W, Hika A, et al. Prevalence and associated factors of chronic kidney disease among adult hypertensive patients in Tigray teaching hospitals: a cross-sectional study. BMC research notes. 2019;12(1):1-5.

60. Alemu H, Hailu W, Adane A. Prevalence of chronic kidney disease and associated factors among patients with diabetes in northwest Ethiopia: a hospital-based cross-sectional study. Current Therapeutic Research. 2020;92:100578.

61. Organization WH. Noncommunicable diseases country profiles 2018. 2018.

62. Buffet L, Ricchetti C. Chronic kidney disease and hypertension: A destructive combination. 2012.

63. Nordheim E, Jenssen TG. Chronic kidney disease in patients with diabetes mellitus. Endocrine Connections. 2021;10(5):R151-R9.

64. Betônico CC, Titan SM, Correa-Giannella MLC, Nery M, Queiroz M. Management of diabetes mellitus in individuals with chronic kidney disease: therapeutic perspectives and glycemic control. Clinics. 2016;71:47-53.

65. Shahbazian H, Rezaii I. Diabetic kidney disease; review of the current knowledge. Journal of renal injury prevention. 2013;2(2):73.

66. Damman K, Valente MA, Voors AA, O'Connor CM, van Veldhuisen DJ, Hillege HL. Renal impairment, worsening renal function, and outcome in patients with heart failure: an updated meta-analysis. European heart journal. 2014;35(7):455-69.

67. Swanepoel CR, Atta MG, D'Agati VD, Estrella MM, Fogo AB, Naicker S, et al. Kidney disease in the setting of HIV infection: conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference. Kidney international. 2018;93(3):545-59.

68. Manaye GA, Abateneh DD, Asmare WN. Chronic Kidney Disease and associated factors among HIV/AIDS Patients on HAART at University of Gondar Referral Hospital, Northwest Ethiopia. 2020.

69. Islam F, Wu J, Jansson J, Wilson D. Relative risk of cardiovascular disease among people living with HIV: a systematic review and meta-analysis. HIV medicine. 2012;13(8):453-68.

70. Falke RM, Levey AS. Hereditary Kidney Disease: All Family Members Are Affected. Journal of the American Society of Nephrology. 2018;29(10):2451-2.

71. Drawz PE, Sedor JR, Hostetter TH. Family history and kidney disease. American Journal of Kidney Diseases. 2012;59(1):9-10.

72. Zhang J, Thio CH, Gansevoort RT, Snieder H. Familial aggregation of CKD and heritability of kidney biomarkers in the general population: The Lifelines Cohort Study. American Journal of Kidney Diseases. 2021;77(6):869-78.

73. McClure M, Jorna T, Wilkinson L, Taylor J. Elderly patients with chronic kidney disease: do they really need referral to the nephrology clinic? Clinical kidney journal. 2017;10(5):698-702.

74. Mallappallil M, Friedman EA, Delano BG, McFarlane SI, Salifu MO. Chronic kidney disease in the elderly: evaluation and management. Clinical Practice (London, England). 2014;11(5):525.

75. Vart P, Powe NR, McCulloch CE, Saran R, Gillespie BW, Saydah S, et al. National trends in the prevalence of chronic kidney disease among racial/ethnic and socioeconomic status groups, 1988-2016. JAMA network open. 2020;3(7):e207932-e.

76. Kovesdy CP, Furth SL, Zoccali C. Obesity and kidney disease: hidden consequences of the epidemic. Brazilian Journal of Nephrology. 2017;39:1-10.

77. García-Carro C, Vergara A, Bermejo S, Azancot MA, Sellarés J, Soler MJ. A nephrologist perspective on obesity: from kidney injury to clinical management. Frontiers in Medicine. 2021;8:418.

78. Matsumoto A, Nagasawa Y, Yamamoto R, Shinzawa M, Hasuike Y, Kuragano T, et al. The association of alcohol and smoking with CKD in a Japanese nationwide cross-sectional survey. Hypertension Research. 2017;40(8):771-8.
79. Joo YS, Koh H, Nam KH, Lee S, Kim J, Lee C, et al., editors. Alcohol consumption and progression of chronic kidney disease: results from the Korean cohort study for outcome in patients with chronic kidney disease. Mayo Clinic Proceedings; 2020: Elsevier.
80. Lai Y-J, Chen Y-Y, Lin Y-K, Chen C-C, Yen Y-F, Deng C-Y. Alcohol consumption and risk of chronic kidney disease: a nationwide observational cohort study. Nutrients. 2019;11(9):2121.
81. Kim H-N, Kim S-H, Song S-W. Is alcohol drinking associated with renal impairment in the general population of South Korea? Kidney and Blood Pressure Research. 2014;39(1):40-9.
82. Jain G, Jaimes EA. Nicotine signaling and progression of chronic kidney disease in smokers. Biochemical pharmacology. 2013;86(8):1215-23.
83. Wu C-C, Wang H-E, Liu Y-C, Zheng C-M, Chu P, Lu K-C, et al. Sleeping, Smoking, and Kidney Diseases: Evidence From the NHANES 2017–2018. Frontiers in Medicine. 2021:1671.
84. Yacoub R, Habib H, Lahdo A, Al Ali R, Varjabedian L, Atalla G, et al. Association between smoking and chronic kidney disease: a case control study. BMC public health. 2010;10(1):1-6.
85. Saunders MR, Kim SD, Patel N, Meltzer DO, Chin MH. Hospitalized patients frequently unaware of their chronic kidney disease. Journal of hospital medicine. 2015;10(9):619-22.
86. Gillani AH, Amirul Islam FM, Hayat K, Atif N, Yang C, Chang J, et al. Knowledge, attitudes and practices regarding diabetes in the general population: A cross-sectional study from Pakistan. International journal of environmental research and public health. 2018;15(9):1906.
87. Sa'adeh HH, Darwazeh RN, Khalil AA, Sa'ed HZ. Knowledge, attitudes and practices of hypertensive patients towards prevention and early detection of chronic kidney disease: a cross sectional study from Palestine. Clinical hypertension. 2018;24(1):1-13.
88. Oluyombo R, Ayodele O, Akinwusi P, Okunola O, Gbadegesin B, Soje M, et al. Awareness, knowledge and perception of chronic kidney disease in a rural community of South-West Nigeria. Nigerian journal of clinical practice. 2016;19(2):161-9.

89. Afzal N. Knowledge, Attitudes and Practices (KAP) of Type 2 Diabetes and Chronic Kidney Disease Management among Patients Visiting General Physicians in Islamabad: A Cross-Sectional Study. Journal of Health Care Communications. 2021;6(4):0-.

90. Mondal R, Ritu RB, Rahman MS, Sarker RC, Banik PC. Knowledge attitude and practices towards chronic kidney disease among type-2 diabetic patients in Bangladesh. International Journal of Education and Health. 2021;5(1):17-26.

91. WHO. WHO STEPS surveillance manual: the WHO STEPwise approach to chronic disease risk factor surveillance. World Health Organization; 2005. Report No.: 9241593830.

92. Annear N, Banerjee D, Joseph J, Harries T, Rahman S, Eastwood J. Prevalence of chronic kidney disease stages 3–5 among acute medical admissions: another opportunity for screening. QJM: An International Journal of Medicine. 2008;101(2):91-7.

93. De Francisco A, Fernandez E, Cruz J, Casas M, Gómez-Gerique J, León A, et al. Under-recognized renal insufficiency in hospitalized patients: implications for care. European Journal of Internal Medicine. 2010;21(4):327-32.

94. Olanrewaju TO, Aderibigbe A, Popoola AA, Braimoh KT, Buhari MO, Adedoyin OT, et al. Prevalence of chronic kidney disease and risk factors in North-Central Nigeria: a population-based survey. BMC nephrology. 2020;21(1):1-10.

95. Hamadou B, Boombhi J, Kamdem F, Fitame A, Amougou SN, Mfeukeu LK, et al. Prevalence and correlates of chronic kidney disease in a group of patients with hypertension in the Savanah zone of Cameroon: a cross-sectional study in Sub-Saharan Africa. Cardiovascular diagnosis and therapy. 2017;7(6):581.

96. Hunegnaw A, Mekonnen HS, Techane MA, Agegnehu CD. Prevalence and associated factors of chronic kidney disease among adult hypertensive patients at Northwest Amhara Referral Hospitals, Northwest Ethiopia, 2020. International Journal of Hypertension. 2021;2021.

97. Mondal R, Ritu RB, Rahman MS, Sarker RC, Banik PC. Knowledge attitude and practices towards chronic kidney disease among type-2 diabetic patients in Bangladesh Atitude e práticas em relação à doença renal crônica entre pacientes diabéticos tipo-2 em Bangladesh.

98. Yusoff DM, Yusof J, Kueh YC. Knowledge, attitude and practices of the risk for chronic kidney disease among patients in a tertiary teaching hospital. The Malaysian Journal of Nursing (MJN). 2016;8(2):3-11.

ANNEXES

ANNEX I

Information sheet for participants

Information sheet (English version)

Title of the research project: Magnitude of chronic kidney disease and associated factors among medical ward admitted patients at Wolkite University specialized hospital, 2022.

Study design: Institutional based cross-sectional study.

Name of Principal investigator: BISRAT FIKADU

ADVISORS: 1. MR. FANTA OBSA (BSc, MSc in CLS)

2. MR. WAQTOLA CHENEKE **(Assoc Prof of CLS, PhD Fellow)**

3. MR. SINTAYEHU ASAYE (BSc, MSc in CLS)

Name of the Organization: Jimma University, Institute of Health Sciences, School of Medical Laboratory Sciences.

Name of the sponsor Organization: Wolkite University

Introduction: This information sheet what provided or read to you describes about the research. When the data collector reads the information sheet, we will expect attentive listening and you can ask questions at any time.

Aim of the study

The aim of the study is to determine the magnitude of chronic kidney disease and associated factors among medical ward admitted patients at Wolkite University specialized hospital.

Procedure

If you agree to take part in the study, one of the investigators or a health worker will give you verbal and/or written information about the study and you will be given the consent form to sign, the physician or health professional will ask you some questions about your general health and

perform a complete medical examination and assess whether you qualify to participate in the study. If you are fit for the study 5 ml of blood samples will also be collected for laboratory examination of creatinine and urea.

Risk and discomfort

Participating in this project will not cause more discomfort than is required you could go through for routine examination. But there could be minor pain and change in color of your skin following the blood drawing and which would disappear in short duration. If you have any discomfort, you can contact any of the investigators in this project. The amount of blood taken from each volunteer throughout the study period is 5ml which will not affect your health. There is no major risk participating in this research, as the whole procedure is carried out by physician and/or health professionals following the standard good clinical practice.

Benefits and incentives

The result of the laboratory finding will be communicated to your physician for use in the management of the disease. You will have the chance to know your general health status from the medical examinations. And if the medical examination reveals any abnormalities that need immediate treatment, your doctor will be notified about the result. You will not be provided with any direct incentives for your participation in the research. But the cost for general medical examination will be covered by the project.

Confidentiality

All information about the patients will be kept confidential. Log books used in the laboratory will have no names but codes. The information sheet that links the coded number to patient name will be locked inside a box and it will not be revealed to anyone except your physician and the principal investigator.

Right to refused or withdraw

You have full right to withdraw from participating in this study at any time before and after consent without explaining the reason. Your decision will not affect your right to get health service you are supposed to get otherwise.

Information sheet (Amharic version)

የጥናቱርዕስ፡-

ተኝቶታካሚዎችላይየኩላሊትምርመራበማድረግየህመሙንክስተትማወቅእናከህመሙጋርተያያዥነትያ ላቸዉንነገሮችጥናትማድረግነው፡፡

ተመራማሪ፡-አቶብስራትፍቃዱ

ወጪውንየሚሸፍነውተቋም፡-ወልቂጤዩኒቨርሲቲ

መግቢያ፡-የማብራሪያና ስምምነት ቅጽ አሁን እርስዎ እንዲሳተፉ የምንጠይቀዎትን የምርምር ጥናት የሚያብራራነው፡፡ በዚህ ጥናት ለመሰሳተፍ ከመወሰንዎ በፊት ይህንን ቅጽ መረጃ ሰብሳቢዎቹ በሚያነቡበት ጊዜ በጥሞና በማድመጥ ጥያቄ ካለዎት ይጠይቁ፡፡ በዚህ ጥናት መሳተፍ ከጀመሩ በኃላ በማንኛውም ጊዜ ጥያቄካለዎት መጠየቅ ይችላሉ ፡፡

የጥናቱዓላማ፡-ይህ ጥናት የኩላሊት ምርመራ በማድረግ የኩላሊት ህመምን እና ከህመሙ ጋር ተያያዥነት ያላቸዉን ነገሮች ማሳወቅ ነው፡፡ በተጨማሪም በሀገራቱ ሊደረጉ ለሚችሉ ሌሎች ተከታታይ ጥናቶች እንደ መነሻ ጥናት በመሆን ይጠቅማል፡፡

የአሰራርሂደት፡-በዚህ ጥናት ውስጥ ለመሣተፍ ከተስማሙ ስምምነቱን መረዳትና መስማማትዎትን ለማረጋገጥ መረጃ ሰብሳቢው በሚሰጥዎት ቅፅ ላይ በፊርማ መግለፅ ይገባዎታል፡፡ ከዚህ በኃላ መረጃ ሰብሳቢው መጠይቁን ይጠይቀዎታል ፡ ስምዎን መናገር አያስፈልገዎትም፡፡ ለራስዎ ህክምና ክትትል ለላቦራቶሪ ከሚሰጡት የደም ናሙና ተጨማሪ ስለሚያስፈልግ ትብብር ያደርጋሉ

ሊከሰቱየሚችሉስጋቶች፡-በዚህ ጥናት ላይ በመሳተፍዎ የከፉ የጤና ችግሮችን ያመጣል ብለን አናምንም፡፡ነገር ግን በመርፌው ምክንያት በተወጉበት ቦታ ላይ ትንሽ የቆዳ መቅላትና ህመም ለትንሽ ጊዜሊ ያጋጥምይችላል፡፡ሆኖም ግን ከትንሽ ጊዜ በኃላ የሚጠፋ ነው፡፡

ፋይዳ፡-በዚህ ጥናት ላይ በመሳተፍዎ አጠቃላይ የኩላሊትዎ ሁኔታ እንዲያውቁ ይረድዎታል፡፡ ጥናቱ የሚያሳየውን ውጤት አይተን ችግር ካለ ለሃኪምዎ በአግባቡ እከንዲታከሙ ይደረጋል፡፡ በዚህ ጥናት በመሳተፍዎ ምንም ዓይነት ማበረታቻ ወይም ክፍያ የለም ፡፡ ነገር ግን ለላቦራቶሪ ምርመራ የሚወጣው ወጪ የሚሸፍነው በጥናት አድራጊው ድርጅት ነው፡፡

ሚስጥርስለመጠበቅ፡-ለዚህ ጥናት የሚሰበሰበው መረጃ የእርስዎ ለመሆኑ ስምዎ አይገለፅም ፡፡ መረጃው በዋናው ተመራማሪ ፋይል ተደርጎ በሚስጥራዊ ቁልፍ በኮምፒውተር የሚቀመጥ በመሆኑ ሌላ ሰው ሊያገኘው አይችልም፡፡ ደግሞ በዚህ ጥናት ላለመሳተፍ ከፈለጉ ያለመሳተፍ ሙሉ መብት አለዎት፡፡ ከመጠይቁ ውስጥ ጥቂት ጥያቄዎችን ወይም ሙሉ በሙሉ ያለመመለስ መብት አለዎት፡፡በጥናቱ ባለመሳተፍዎ ወይም መልስ ባለመስጠትዎ በሆስፒታሉ ከሚሰጠው መደበኛ አገልግሎት ላይ ምንም ዓይነት ዕንቅፋት አይኖርም፡፡

Annex II: Informed consent (English version)

Name of the study participant _____

Code number_____

I have clearly been informed about the research project that aims to determine the magnitude and associated factor of chronic kidney disease among admitted patients. The objectives of the research project have clearly been explained to me and I have been told that the results obtained from me will help me as well as the community for better management of the disease. I had been also informed about the confidentiality of this research project. Moreover, I have also been well informed of my right to keep hold of information, decline to cooperate and make myself withdraw from the study. 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.

Signature_____ Date_____

Informed consent (Amharic version)

የተሳታፊዎች ስምምነት ማረጋገጫ ቅጽ

የተሳታፊዉ ስም ----------

የሚስጥር ቁጥር ----------

እኔ ስሜ ከላይ የተገለጸዉ ግለሰብ የተፈለኩት በዚህ ጥናት እንድሳተፍ ሲሆን የጥናቱ አላማና ጥቅም ተገልፆልኛል፡፡ ስለዚህ ለዚህ ጥናት መረጃና የስምምነት ቃሌን የምሰጠዉ በአጠቃላይ የጥናቱን አላማና ጥቅም በመረዳትና በፍጹም ፈቃደኝነት ነው፡፡ በመጠይቁ ላይ የምሰጠዉ የእኔ መረጃ እንደማይባክን እንደሚያዝም ተነግሮኛል፡፡ በተጨማሪም ጥናቱ ዉስጥ ላለመሳተፍ ከፈለኩኝ መብቴ የተጠበቀ እንደሆነና በማንኛዉም ጊዜ ከጥናቱ በራሴ ዉሳኔ መዉጣት ቁምር መብቴ መሆኑንና ከጥናቱ በመዉጣቴ ምንም አይነት ችግር እንደማይደርስብኝ በሚገባ ተገልጸልኛል፡፡ ስለሆነም ሁኔታዉን በሚገባ በማጤን በፈቃደኝነት በምርምሩ ላይ ለመሳተፍ ፈቃደኝነቴን ሰጥቻለሁ፡፡ ማንኛዉንም ያልገባኝን ነገር የመጠየቅ እድል ተሰጥቶኝ በሚገባኝ ቋንቋ መልስ አግኝቻለሁ፡፡ በተጨማሪም የሁሉም የላብራቶሪ ምርመራ ዉጤቶች በጊዜዉ ለህኪሜ እንደሚሰጥልኝ እና ዉጤቱን

ማወቅ ከፈለኩ ማግኘት እንደምችል ተነግሮኛል፡፡ በአጠቃላይ እኔ ከላይ በመተማመኛ ቅፅ የተጠቀሱትን ሁሉ በሚገባና በተረጋጋ መንፈስ አንብቤአለሁ፡፡ ስለዚህ በዚህ ጥናት ለመሳተፍ ፈቃደኛ መሆኔን በፊርማዬ አረጋግጣለሁ፡፡

ፊርማ_____ ቀን_____

ANNEX III

Questionnaire

This questionnaire records both socio-demographic and clinical characteristics. For each question please give the answer carefully. Your name is not included in the questionnaire and they are completely anonymous and confidential. Your answers will be kept only by the investigators and will not be distributed to anyone else. Make ticks to the appropriate response.

Questionnaire no: _____

Name of investigators _____

Name of interviewer: _____

Date: _____

Section 1: Socio-demographic characteristics

S/N	Questions	Choices	Remark
01	Sex	1. Male 2. Female	
02	Age in years		
03	Place of residence	1. Urban 2. Rural	
04	Marital status	1. Unmarried 2. Married 3. Divorced 4. Widowed	
05	Educational level	1.No formal education 2.Primary school 3. Secondary school 4. College/University	

06	Religion	1. Orthodox 2. Muslim 3. Protestant 4. catholic 5. Others, specify---------	
07	Occupational Status	1. Unemployed 2. Government/ 3. private employed 4. Farmer 5. housewife 6. daily labour 7. Others, specify---------	

Section 2: Questions for associated factor for chronic disease

08	Do you have family members who have Chronic Kidney Disease?	1. Yes 2. No	
09	Do you have history of known Hypertension?	1. Yes 2. No	
10	Do you have history of known DM?	1. Yes 2. No	
11	Do you have history of heart problem?	1. Yes 2. No	
12	Do you have any history of chronic diseases	1. Yes	

	other than the above?	2. No 3. I don't know	
13	If yes, for Q. No 11 please mention it		
14	Do you smoke cigarette currently?	1. Yes, for how long? _____ 2. No	
15	Have you been a smoker previously?	1. Yes, for how long? _____ 2. No	
16	If yes to Q. No 17, for how long did you smoke?		
17	Do you consume alcohol?	1. Yes 2. No	
18	If yes, how much drink per week and its type		

Section 3: Anthropometric and Blood Pressure Measurements

19	Height(m)		
20	Weight(Kg)		
21	BMI(Kg/m^2)		
22	Systolic Blood Pressure(mmHg)		
23	Diastolic Blood Pressure(mmHg)		

Section 4: Questions for Knowledge section of chronic kidney disease

24	Have you ever heard about CKD?	1.yes 2.no	

25	If yes For Q. No 26 from where you have heard about CKD?	1. family member 2. Health professional 3. other	
26	Did you know causes or risk factors for CKD?	1.Yes 2.No	
27	Do you know high blood pressure can cause kidney disease?	1.Yes 2.No	
28	Do you know high blood sugar (diabetes) can cause kidney disease?	1.Yes 2.No	
29	Do you know cardiovascular disease can cause kidney disease?	1.Yes 2.No	
30	Do you know advantage of early detection of CKD	1.Yes 2.No	
31	Did you know any sign and symptoms of CKD?	1.Yes 2.No	
32	If yes for Q, No 33, please mention		

Section 5: Questions for Practices section of chronic kidney disease

33	Do you have a habit of cigarette smoking?	1.Yes 2.No	
34	Do you have a habit of drinking alcohol?	1.Yes 2.No	
35	Do you have a habit of regular blood pressure checkup?	1.Yes 2.No	
36	Do you have a habit of taking medication without physician recommendation?	1.Yes 2.No	
37	Do you regularly visit to health institutions for	1.Yes	

	diagnosis of CKD?	2.No	
38	Do you have a habit of healthy diet?	1.Yes 2.No	
39	Do you have a habit of regular exercise, such as walking and jogging?	1.Yes 2.No	
40	If yes for Q. No 40, for how many days and minutes per week		

Section 6: laboratory result

Creatinine _____

Urea _____

Proteinuria_____

ይህ መጠይቅ ማህበራዊ አና ጤና ነክ ጉዳዮችን የያዘ ነው::እባኮት እያንዳንዱ ጥያቄ በጥንቃቄ ይመ.ለ.

ካርድ ቁጥር_____

የሚስጥር ቁጥር_____

ክፍል1.ማህበረሰባዊእናግላዊጥያቄዎች

ተ.ቁ	መጠይቅ	ምርጫዎች	ይለፍ
01	**ጸታ**	1. **ወንድ** 2. **ሴት**	
02	**እድሜህ/ሽ/ዎት ስንት ነው**?		
03	**የት'ነው'የሚኖሩት**?	1. **ከተማ** 2. **ገጠር**	
04	**የጋብቻሁኔታዎንይግለፁልኝ**	1. **ያላገባ/ች** 2. **ያገባ/ች** 3. **የተፋቱ/የተለያዩ** 4. **የሞተባት/በት**	
05	**የትምህርትደረጃዎንይንገሩኝ**	1. **ያልተማረ/ች** 2. **አንደኛደረጃ** 3. **ሁለተኛደረጃ** 4. **ኮሌጅ/ዩኒቨርሲቲ**	

06	የትኛውንሀይማኖትተከታይነዎት?	1. ሙስሊም 2. ኦርቶዶክስ 3. ፕሮቴስታንት 4. ካቶሊክ 5. ሌላ	
07	የመተዳደሪያስራዎትምንድነው?	1. ስራአጥ/ቤተሰብጥገኛ 2. የመንግስት 3. የግሌ/ድርጅትሰራተኛ 4. አርሶአደር 5. የቤት እመቤት 6. የቀን ሰራተኛ 7. ሌላ	

ክፍል 2. ስርከሰደደየኩላሊትሕመምጋርየሚያያዙነገሮች

08	ስርየሰደደየኩላሊትሕመምያለበትየቤተሰብአባልአለ?	1. አዎ 2. የለም 3. አላውቅም	
09	በጤናባለሙያየታወቀከፍተኛየደምግፊትአለብዎት?	1. አለብኝ 2. የለብኝም	
10	በጤናባለሙያየታወቀየስኳርበሽታአለብዎት?	1. አዎ 2. የለብኝም	
11	በጤናባለሙያየታወቀየልብሕመምአለብዎት?	1. አዎ 2. የለብኝም 3. አላዉቅም	
12	ከላይ ከተጠቀሱት ውጪ ሌሎች ስር የሰደዱ በሽታዎች አለብዎት?	1. አለብኝ 2. የለብኝም 3. አላዉቅም	
13	አለብኝካለእባክዎንይግለጹት		
14	አሁንሲጋራያጨሳሉ?	1. አዎ,ለምንያህልጊዜ_____ 2. አላጨስም	
15	ከዚህበፊትያጨሱነበር?	1. አዎ 2. አላጨሰም ነበር	
16	ለጥያቄ 17 መልስዎ አዎ ከሆነ፣ ለስንት ጊዜ አጨሱ?		
17	መጠጥይጠጣሉ?	1. አዎ 2. አልጠጣም	
18	ለጥያቄ 20 መልስዎ አዎ ከሆነ በሳምንት ስንትእንደሚጠጡ እና የመጠጡ አይነት ቢነግሩን		

ክፍል 3.የሰዉነትእናየደምግፊትልኬት

19	ቁመት(ሜ.)		
20	ክብደት(ኪ.ግ)		
21	(ኪ.ግ/ሜ^2)		
22	ሲሰቶሊክየደምግፊት(mmHg)		
23	ዳያስቶሊክየደምግፊት(mmHg)		

ክፍል 4.እውቀትን የሚያስሱ ጥያቄዎች

24	ስለ ስር የሰደደ የኩላሊት ሕመም ሰምተው ያውቃሉ?	1. አዎ 2. አላውቅም	
25	ለጥያቄ 26 መልስዎ አዎ ከሆነ፣ የት ነው የሰሙት?	1. ከቤተሰብ 2. ከባለሙያ 3. ከሌላ	
26	ስለ ስር የሰደደ የኩላሊት ሕመም መንስኤ ምክንያች ያውቃሉ?	1. አዎ 2. አላውቅም	
27	ከፍተኛ የደምግፊት ስር ለሰደደ የኩላሊት ሕመም እንደሚያጋልጥ ያውቃሉ?	1. አዎ 2. አላውቅም	
28	የስኳር በሽታ ስር ለሰደደ የኩላሊት ሕመም እንደሚያጋልጥ ያውቃሉ?	3. አዎ 4. አላውቅም	
29	የልብ ሕመም ስርለሰደደ የኩላሊት ሕመምእንደሚያጋልጥ ያውቃሉ?	1. አዎ 2. አላውቅም	
30	ስር የሰደደ የኩላሊት ሕመም በጊዜ የመታከም ጥቅም ያውቃሉ	1. አዎ 2. አላውቅም	
31	ማንኛውም አይነት ስር የሰደደ የኩላሊት ሕመም ምልክት ያውቃሉ?	3. አዎ 4. አላውቅም	
32	ለጥያቄ 33 መልስዎ አዎ ከሆነ፣ ምን ምን ምልክት እንደሆነ ይጥቀሱ		

ክፍል 5:ተግባርንየሚያስሱጥያቄዎች

33	ሲጋራ የማጨስ ልምድ አሎት?	1.አዎ 2.የለኝም	
34	አልኮል የመጠጣት ልምድ አሎት?	1.አዎ 2.የለኝም	
35	የደም ግፊተዎን በመደበኛነት የመለካት ልምድ አሎት?	1.አዎ 2.የለኝም	
36	ያለባለሙያትዛዝማንኛውምመድሀኒትየመውሰድ ልምድ አሎት?	1.አዎ 2.የለኝም	
37	ለኩላሊት ምርመራ በመደበኛነት ወደ ጤናተቁዋም የመሄድ ልምድ አሎት?	1.አዎ 2.የለኝም	
38	ጤነኛ የሆነ አመጋገቤ ይመገባሉ?	1.አዎ 2.አልመገብም	
39	መደበኛየሆነየሰውነትእንቅስቃሴየማድረግልምድአሎት?	1.አዎ 2.የለኝም	
40	ለጥያቄ 40 መልስዎ አዎ ከሆነ በሳምንት ስንቴ እና ለስንት ደቂቃ		

ክፍል 6: የላብራቶሪ ዉጤት

Creatinine _____

Urea _____

Proteinuria_____

Annex IV.

Working principle and procedure for determination of Serum Creatinine, urea, and eGFR

I. Serum Creatinine

Creatinine is generated endogenously in muscles from creatine and creatine phosphate (molecules providing the muscle with energy) as a result of muscle metabolic processes. It is a small molecule, so it passes through the glomerular sieve completely at a constant rate related to muscle mass. Plasma creatinine is inversely related to GFR, increased plasma creatinine values always indicate decreased excretion i.e. impaired kidney function. The creatinine clearance enables a quite good estimation of the glomerular filtration rate which allows better detection of kidney disease and monitoring of renal function. Creatinine assays are conducted for diagnostic purposes, for therapeutic monitoring of acute and chronic renal diseases, and for monitoring kidney dialysis.

Principle

The Jaffe and enzymatic methods are the most frequently used methods for measuring serum creatinine. Roche diagnostic cobas C311 use enzymatic method for determination of creatinine. 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. The liberated hydrogen peroxide reacts with 4-aminophenazone to form a quinoneimine chromogen catalyzed by peroxidase which have a maximum absorbance of 546 nm. The color intensity of the quinoneimine chromogen formed is directly proportional to the creatinine concentration in the reaction mixture.

Creatinine $\xrightarrow{\text{creatininase}}$ creatine

Creatine $+H_2O \xrightarrow{\text{creatinase}}$ sarcosine + urea

Sarcosine $+ H_2O + O_2 \xrightarrow{\text{sarcosine oxidase}}$ glycine + formaldehyde $+ H_2O_2$

$H_2O_2 +$ 4-aminophenazone $\xrightarrow{\text{peroxidase}}$ quinoneimine $+ 4H_2O$

II. UREA

Urea is the major excretory product of protein metabolism which is formed in the liver from ammonia which is produced by amino acid deamination. It is an important marker for evaluation of renal function because it is excreted mostly by the kidneys. An increase in urea level in blood can be caused by renal failure, urinary tract obstruction, dehydration, shock, burns, and gastrointestinal bleeding. Moreover, reduced urea level may be seen in hepatic failure.

Principle

Urea is assayed by enzymatic kinetic method. It is hydrolyzed in the presence of water and urease to produce ammonia and carbon dioxide. The ammonia from this reaction combines with 2-oxaloglutarate and NADH in the presence of glutamate-dehydrogenase (GLDH) to yield glutamate and NAD^+. There has been optimized so that the GLDH is the rate limiting enzyme. The decrease in absorbance due to the decrease of NADH concentration in unit time is proportional to the urea concentration.

$$\text{Urea} + 2H_2O \xrightarrow{\text{urease}} 2NH_4^+ + CO_3^{2-}$$

$$\text{2-oxoglutarate} + 2NH4^+ + 2\text{NADH} \xrightarrow{\text{GLDH}} \text{L-glutamate} + H_2O + 2NAD^+$$

III. Roche Diagnostic cobas C311

The Roche Diagnostic cobas C311 analyzer is fully automated, software-controlled clinical chemistry analyzer consists of Analytical unit and Control unit. It uses Serum, Plasma, Urine, CSF, and Whole Blood (HbA1c only) for in vitro determinations of a large variety of tests. It measures 300 tests per hour. The reagents are recognized by the barcode device during insertion. They are placed in the refrigerator of the instrument which increases their stability on the instrument as from the day of their opening up to 3 months. The cobas C311 analyzer uses photometric assays and ion selective electrode principle.

Endpoint assays and Rate assays are the two fundamental types of photometric assays on this instrument: Measurements are taken by the photometer at specific measure points. If measurements are taken after the reactions are completed, the intensity of the colored (or turbidity) product is an indicator of the sample component's concentration. These are called endpoint assays. For rate assays, the rate of the reaction is proportional to the concentration or

activity of the sample component being analyzed. Measurements are taken as the reaction proceeds

IV. Determination of eGFR by MDRD equation

eGFR= GFR (mL/min/1.73 m2) = 186 x $(Scr^{)-1.154}$ x $(Age)^{-0.203}$ x (0.742 if female) x (1.212 if African American) ; where Scr is serum creatinine in mg/dL, Age is in years, and GFR is Glomerular Filtration Rate in mL/min,

Annex V: Declaration Form

I, the undersigned, hereby declare that this research paper is my original work and has not been presented for an award of a degree in Jimma University or any other university.

Name of the student: Bisrat Fikadu (MSc candidate)

Signature: _____ Date of submission: _____/_____/_____

Approval of the advisors

This thesis is approved by the advisors and examiners:

1. Name of 1st advisor: Mr. FANTA OBSA (BSc, MSc in CLS)

Signature: _____ Date: _____/_____/_____

2. Name of 2nd advisor: Mr. WAQTOLA CHENEKE (Assoc Prof of CLS, PhD Fellow)

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3. Name of 3rd advisor: Mr. SINTAYEHU ASAYE (BSc, MSc in CLS)

Signature: _____ Date: _____/_____/_____

4. Name of internal examiner Mr. SHIFERAW BEKELE (MSc, Assis Prof of CLS, PhD Fellow)

Signature: _____ Date: _____/_____/_____

5. Name of external examiner Mr. Zerihun Ataro (MSc, Assis Prof of CLS)

Signature: _____ Date: _____/_____/_____