IMPAIRED GLOMERULAR FILTRATION RATE, MACROSCOPIC ALBUMINURIA, AND ASSOCIATED FACTORS AMONG ADULT PATIENTS ADMITTED TO JIMMA UNIVERSITY MEDICAL CENTER, SOUTH-WEST ETHIOPIA

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A RESEARCH REPORT TO BE SUBMITTED TO THE DEPARTMENT OF INTERNAL MEDICINE, INSTITUTE OF HEALTH, JIMMA UNIVERSITY FOR PARTIAL FULFILMENT OF REQUIREMENTS FOR CERTIFICATE OF SPECIALTY IN INTERNAL MEDICINE

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IMPAIRED GLOMERULAR FILTRATION RATE, MACROSCOPIC ALBUMINURIA, AND ASSOCIATED FACTORS AMONG ADULT PATIENTS ADMITTED TO JIMMA UNIVERSITY MEDICAL CENTER, SOUTH-WEST ETHIOPIA

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ABSTRACT

Background– Chronic kidney disease (CKD) is a world-wide public health problem associated with adverse outcomes of kidney failure, cardiovascular disease (CVD), and premature death. It is one of the rising non-communicable diseases in low and middle income countries. Early detection and treatment of CKD using readily available, inexpensive therapies can slow or prevent progression to end-stage renal disease.

Objective–To assess impaired estimated glomerular filtration rate, macroscopic albuminuria, and associated factors among adult patients admitted to Jimma University Medical Center**.**

Method–Institution based cross sectional study was conducted from November 1, 2016-April 30, 2017. Consecutive sampling method was used to select study participants. Bi-variate and multi-variable logistic regression analyses were conducted to generate factors associated with impaired estimated GFR and albuminuria. A P-value of <0.05 was considered statistically significant.

Results–The study involved 422 patients admitted to JUMC who had at least one urine analysis and serum creatinine level during the study period. Fifty two (12.3%) of the study subjects had macroscopic albuminuria, 19.2% and 32.7% had impaired estimated glomerular filtration rate according to Modification of Diet in Renal Disease (MDRD-4) and Cockcroft-Gault **(**CG) equations respectively. Old age (P=.002, AOR=2.376; 95%CI: 1.378-4.095), male sex (P=.013, AOR=2.084; 95%CI: 1.167-3.721), and hypertension (P=.007, AOR=2.233; 95%CI:1.244-4.010) were independently associated with impaired eGFR using one of the two equations while diabetes mellitus (P=.006, AOR=2.785; 95%CI: 1.332-5.825) and BP measurement above optimal (P<.001, AOR=4.757; 95%CI: 1.962-11.533) were associated with macroscopic albuminuria.

Conclusion–Impaired estimated Glomerular Filtration Rate and macroscopic albuminuria were found in significant proportion of study participants which necessitates routine urine analysis and estimation of Glomerular Filtration Rate for patients with CKD risk factors.

Key words- Albuminuria, Chronic Kidney Disease, Creatinine, Glomerular Filtration Rate, Jimma University Medical Center

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ACRONOMYS AND ABBREVATIONS

ACR----------Albumin-creatinine ratio
AIDS----------Acquired Immune Deficiency Syndrome
AKI----------Acute Kidney Injury
BMI----------Body Mass Index
BP----------Blood pressure
CAGE----------Cut down, Annoyed, Guilty, Eye opener
CG----------Cockcroft-Gault equation
CKD----------Chronic kidney disease
CKD-EPI----------Chronic Kidney Disease Epidemiology
CVD----------Cardiovascular disease
CrCl----------Creatinine clearance
DKA----------Diabetic Keto-acidosis
DM----------Diabetic mellitus
eGFR----------estimated glomerular filtration rate
ESRD----------End-stage renal disease
FBS----------Fasting blood sugar
GFR----------Glomerular filtration rate
HIV----------Human Immune Deficiency Virus
JUMC----------Jimma University Medical Center
KDOQI----------Kidney Disease Outcomes Quality Initiative
MDRD----------Modified Diet Renal Disease
NCD----------Non-communicable disease
NSAID----------Non steroidal anti-inflammatory drug
PICT----------Provider initiated counseling and testing
RBS----------Random blood sugar
RFT----------Renal function test
SCr----------Serum creatinine
SSA----------Sub-Saharan Africa
UA----------Urine analysis
UACR----------Urinary albumin-creatinine ratio
US----------Ultrasound
WHO----------World Health Organization

INTRODUCTION

Chronic kidney disease is a world-wide public health problem associated with adverse outcomes of kidney failure, cardiovascular disease and premature death (1-5).The two key kidney measures for definition and staging of CKD; albuminuria and glomerular filtration rate (GFR) are consistently associated with high cardiovascular risk in a broad range of population (3-5). Albuminuria is associated with progression of kidney disease, increased atherosclerosis, and left ventricular abnormalities indirectly contributing to cardiovascular morbidity and mortality (3-5).

Glomerular filtration rate (GFR) is defined as the volume of plasma that can be completely cleared of a particular substance by the kidneys in a unit of time (6). It is accepted as the best overall measure of kidney function and is central to diagnosis, and management of CKD. Estimation of GFR (eGFR) using equations based on serum creatinine with adjustments for age, gender and race are widely used as surrogate measures of GFR (7).

The global increase in the incidence and prevalence of CKD is being driven by the global increase in the prevalence of diabetes mellitus, hypertension, obesity, and aging (8). The preventive strategies of CKD involves identifying those at risk of developing CKD; educating the population on how to prevent renal disease; raising the awareness of the general public, policy makers, and health care workers; modifying the lifestyle of susceptible individuals; detecting early stage of CKD; and hindering the progression of disease (9).

Sub-Saharan Africa in general and Ethiopia in particular, apart from scarcity of studies, poor data quality limits inferences and draws attention to the need for more information and validated measures of kidney function especially in the context of the growing burden of non-communicable diseases (9).

Early detection and treatment of CKD using readily available, inexpensive therapies can slow or prevent progression to end-stage renal disease (ESRD) (1, 2, 10, 11).

LITERATURE-REVIEW

Chronic kidney disease (CKD) which is a reduced glomerular filtration rate, increased urinary albumin excretion, or both, is an increasing public health issue with estimated worldwide prevalence of 8-16% (12). Individuals with chronic kidney disease are at high risk of cardiovascular disease, and roughly half die of cardiovascular disease without developing ESRD (4, 5, 13).

Recent data suggest a large, rising burden of chronic kidney disease (CKD) in the general population and rising expenses associated with it. The most obvious societal effect of CKD is the enormous financial cost and loss of productivity associated with advanced kidney disease; many developed nations spend more than 2–3% of their annual health-care budget to provide treatment for ESRD, while the population with ESRD represents approximately 0.02–0.03% of the total population. The Medicare cost of end-stage renal disease has risen from $12.2 in 2000 to $20.8 billion in 2007 (11, 14). It is also associated with increased cardiovascular mortality and a loss of disability-adjusted life years. The global increase in the incidence and prevalence of CKD is being driven by the global increase in the prevalence of diabetes mellitus, hypertension, obesity, and aging. Obesity remains the number one preventable risk factor for chronic kidney disease because obesity largely mediates diabetes and hypertension, the 2 most common etiologies for end-stage kidney disease. However, obesity itself likely has independent effects on renal hemodynamic and individuals with a low number of nephrons are likely to be the most susceptible to these changes (8, 15).

In sub-Saharan Africa, CKD is a substantial health burden with risk factors that include communicable and non-communicable diseases where overall estimated prevalence is 13.9%. It affects mainly young adults aged 20-50 years in Sub- Saharan Africa which is primarily due to hypertension and glomerular diseases. In addition to noncommunicable diseases, communicable diseases such as infectious glomerulonephritis, schistosomiasis, malaria, and HIV infection are common and can cause CKD in the region (9, 16).

In a study done in Addis Ababa from 2006 through 2009 on 3,709 adults death for which verbal autopsies were completed shows 51% of deaths were attributed to noncommunicable diseases, 42% to communicable diseases, and 6% to injuries. The leading cause of death was cardiovascular disease (CVD) (24%); proportions for hypertension (12%) and stroke (11%) were similar and constituted most of the CVD deaths (17).

Immunodeficiency emerged as one of the strongest determinants of renal impairment. Cross-sectional screening of HIV-Infected Black Patients Using Cockcroft-Gault and Modification of Diet in Renal Disease Study Equations concluded prevalence of low eGFR according to Modification of Diet in Renal Disease Study and CG equations was 3% and 10%, respectively. Proteinuria was observed in 20.5% of patients (18).

Due to the asymptomatic nature of this disease, CKD is not frequently detected until its later progress, resulting in lost opportunities for prevention (19).

A facility based cross sectional study conducted at Butajira hospital, southern Ethiopia among 214 randomly selected diabetic adults show 39 (18.2%) and 51 (23.8%) of the study participants were found to have CKD, as defined by eGFR< 60 ml/min/1.73 m2, according to the MDRD and Cockcroft-Gault equations, respectively (20).

Noncommunicable diseases (NCDs) are the most common causes of premature death and morbidity having a major impact on health-care costs, productivity, and growth. Chronic kidney disease (CKD) which is increasingly common both in developed and developing nations is a key determinant of the poor health outcomes of major NCDs such as hypertension and diabetes mellitus (21).

Screening for chronic kidney disease (CKD) is an effective strategy to allow earlier detection and management to reduce the increasing burden of CKD (1, 2, 22).

A community based, cross-sectional study involving multistage random cluster sampling done in Delhi and its surrounding regions showed prevalence of low eGFR was 13.3% by CG equation and 4.2% by MDRD equation. The survey population had a 2.25% prevalence of proteinuria. In a multivariate logistic regression analysis; age above 60 years, female gender, low educational status, increased waist circumference, hypertension and diabetes were associated with low eGFR and proteinuria. In this study only 3.3% of subjects with renal impairment were aware of their disease (23).

Hypertension is the major modifiable risk factor for CKD progression and is associated with development of left ventricular hypertrophy and proteinuria, both predictors of CV mortality (24, 25).

The prevalence of hypertension is also increasing in Ethiopia. A meta-analysis of 9 studies revealed that the pooled prevalence of hypertension among the Ethiopian population was 19.6 % (95 % CI: 13.7 %, 25.5 %) (26).

The MDRD study indicated that patients with higher levels of proteinuria had faster declines in GFR and that the beneficial effect of lowering BP on the progression of CKD was associated with the severity of baseline proteinuria (27).

Diabetes mellitus is recognized as one of the emerging public health problems in developing countries. A cross-sectional population based survey conducted among adults aged ≥35 years in urban and rural settings of northwest Ethiopia showed the prevalence of 5.1% [95% CI: 3.8, 6.4] and 2.1% [95% CI: 1.2, 2.9] respectively (28).

There is now evidence that smokers with type 1 or type 2 diabetes are at higher risk of developing micro-albuminuria, of progressing to develop gross proteinuria (i.e. overt diabetic nephropathy) and, above all, of accelerated progression of diabetic nephropathy towards ESRD than non-smokers with diabetes. The adverse effects of smoking on the progression of CKD have also been shown in non-diabetic renal disease (29, 30).

A prospective cohort study which included 4343 persons aged ≥65 from the Cardiovascular Health Study suggests that moderate alcohol consumption has neither adverse nor beneficial effects on kidney function (31).

Non-steroidal anti-inflammation drugs (NSAIDs) are implicated in rapid deterioration of renal function (32). Adams at el cohort study showed high prevalence of current NSAID use among groups at-risk for significant drug-related adverse events or who have major chronic conditions that are relative contraindications to NSAID use. The prevalence of NSAID use among people with hypertension was 16%, with kidney disease 15.9%, and a history of CVD 20.0%. The potential to make a substantial impact on chronic disease burden via improved use of NSAIDs is considerable (33, 34).

The presence of baseline proteinuria and reduced baseline eGFR are powerful independent predictors for AKI (35).

In other collaborative meta-analysis of general population cohorts, ACR was associated with risk of mortality linearly on the log-log scale without threshold effects. Similar findings were recorded for cardiovascular mortality and in studies with dipstick measurements (3, 36).

Although serum creatinine based equations are commonly used, they have limitations. In one narrative review of literatures, Laterza et al reported Cystatin C is clearly an attractive endogenous marker to assess renal function because all studies confirm a strong correlation to SCr and to the clearance of exogenous substances in both healthy volunteers and in patients with impaired renal function (7, 37).

In study done in tertiary hospital in Lagos, Nigeria in 2011 found dipstick proteinuria in 8.3% of HIV sero-negative and 42.5% of HIV positive subjects (38).

The prevalence of impaired eGFR using CG-equation is higher than that of impaired eGFR by MDRD-4 equations. On the other hand, MDRD-4 and CKD-EPI equations perform closely. The study from South-Africa which found that highest agreement between GFR estimators was between MDRD and CKD-EPI equations (9, 23, 39, 40, 41).

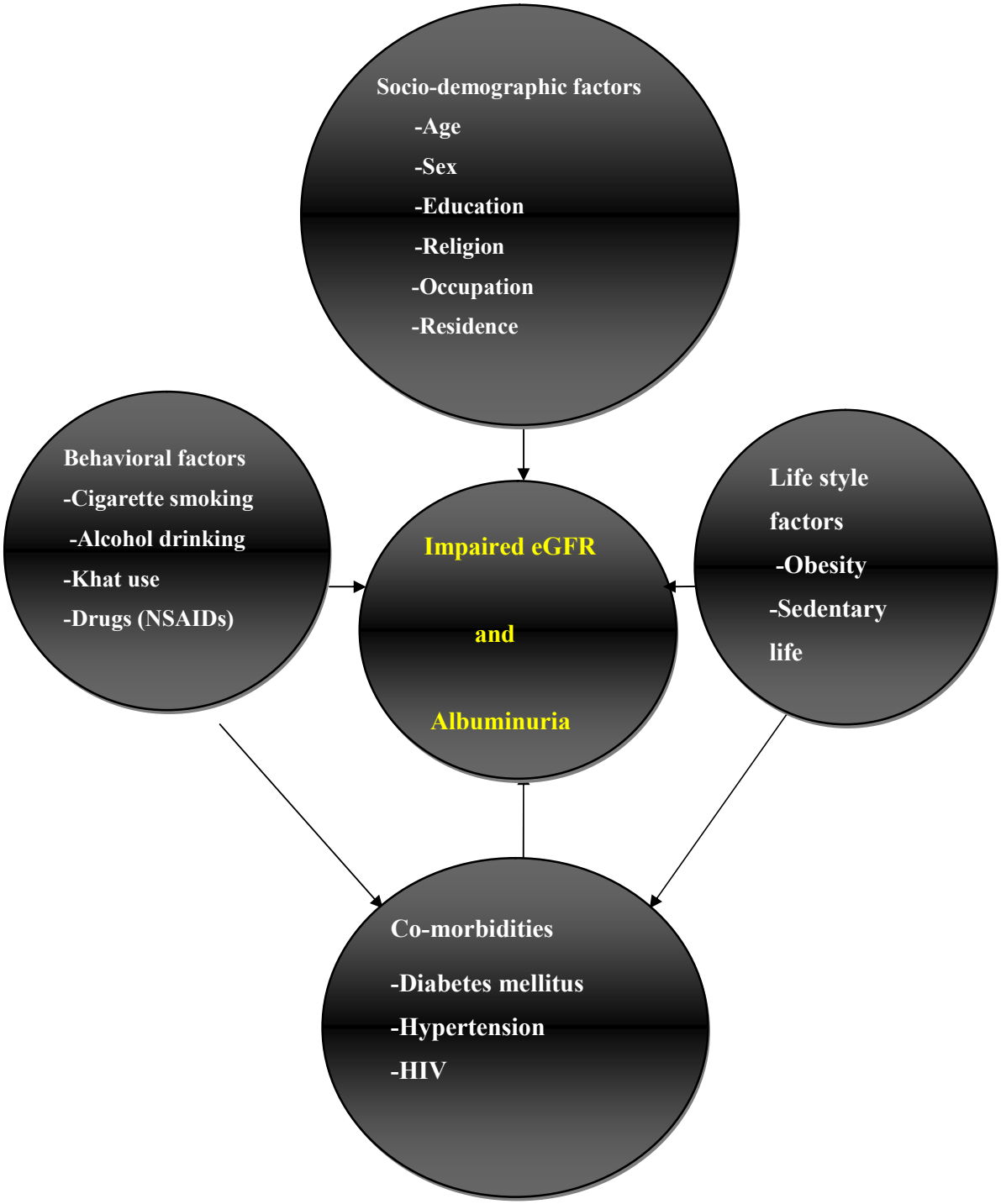

Figure 1-Conceptual frame work of factors associated with impaired estimated GFR and albuminuria (Source; developed after literature review)

OBJECTIVES

1. General objective

- To assess prevalence of impaired estimated glomerular filtration rate, albuminuria, and associated factors among adult patients admitted to JUMC, 2016/2017.

2. Specific objectives

- To determine prevalence of impaired estimated glomerular filtration rate using both MDRD and CG for adult patients admitted to JUMC.
- To assess the magnitude of albuminuria as a marker for CKD and cardiovascular system disease.
- To find out factors associated with impaired estimated GFR and albuminuria.
- To assess the concordance among different GFR estimating equations.

MATERIALS AND METHODS

1. Study Area and period

The study was conducted at Jimma University Medical Center (JUMC) from November 1, 2016- April 30, 2017. JUMC is one of the oldest public hospitals in the Ethiopia which is located 352 km southwest of Addis Ababa. Currently, it is the only teaching and referral hospital in the southwestern part of the country, providing services for approximately 15,000 inpatient, 160,000 outpatient attendants, 11,000 emergency cases and 4500 deliveries in a year coming to the hospital from the catchment population of about 15 million people. It delivers services at inpatients and outpatients by trained nurses, interns, residents, specialists and subspecialists on daily bases.

2. Study design

Institution based cross sectional study was conducted.

3. Population

3.1 Source population

All adult patients admitted to Jimma University Medical Center.

3.2 Study population

Adult patients admitted with at least one result of RFT and Urine analysis during study period were recruited.

4. Inclusion and exclusion criteria

4.1 Inclusion criteria

All adult patients admitted to JUMC during study period were included in the study.

4.2 Exclusion criteria

Patients with possibility of functional proteinuria, and patients with established pre-eclampsia were excluded from study.

5. Sample size and sampling procedure

5.1 Sample size

The sample was calculated using a formula for estimation of single population proportion taking prevalence of impaired eGFR and albuminuria to be P=50%, margin of error 5%, and using 95% confidence level.

$N = \frac{(Z_{\alpha/2})^2 P(1-P)}{d^2}$ => (1.96)² x 0.5(1-0.5) / (.05)² = 384patients

P = 50% (Prevalence of impaired eGFR and albuminuria which is unknown)

Zα/2 = standard normal variable at 95% confidence level (1.96).

d= precision (tolerable margin of error)

considering the expected patient loss from the study as 10%, the final sample size was calculated to be 384 + 384x10%=422.

5.2 Sampling Method

Consecutive sampling method was used for patients admitted JUMC during the study period.

6. Variables

6.1 Dependent variables

- Impaired eGFR
- Albuminuria

6.2 Independent variables

- Age
- Sex
- Education
- Religion
- Occupation
- Residence
- Hypertension
- Diabetes mellitus
- Obesity
- Sedentary life
- HIV/AIDS
- Cigarette smoking
- Alcohol drinking
- Drug(NSAIDs) use

7. Data collection tool and procedure

Questionnaire subdivided into four parts; identification and socio-demographic characteristics, medical history, physical examination and laboratory findings, was developed in English with modification from Screening and Early Evaluation of Kidney Disease (SEEK) study. Data was collected by trained nurses and medical interns with supervision by Internal medicine resident.

Sources of data were patients and patient records.

8. Data Quality Assurance

During preparatory stage, the questionnaires was carefully designed and pre-tested on 5% (20) of study population to minimize errors.

Data collectors and supervisors were trained for two days prior to data collection period.

Using structured questionnaires, the collected data was checked for consistency, completeness and odd answers immediately at the end of the interview.

During data analysis and report writing, appropriate statistical technique for appropriate data was used.

9. Data processing and analysis

Collected data was checked for completeness by principal investigator.

Serum creatinine based glomerular filtration rate was estimated for all study participants by CG, MDRD-4 and CKD-EPI equations using QxMD calculator with correction for black race.

Urine analysis of all study subjects were revised; after excluding possible causes of functional albuminuria, dipstick proteinuria of >=+1 was taken as macroscopic albuminuria.

Finally, the data was entered in to the computer using EpiData software and after verification; it was exported to SPSS 20 version for descriptive analysis and inferential statistics.

Descriptive statistics: percentages, means, medians, standard deviations and ranges were used to describe findings.

A bi-variate analysis was done to sort variables candidate for multiple logistic regression having value less than or equals to 0.25. Multivariable logistic regression analyses were conducted using Backward LR to generate factors associated with the dependent variable.

P-value < .05 and 95% confidence interval (CI) and AOR was used in judging the statistical significance of the associations.

10. Ethical Consideration

Ethical clearance was obtained first from Institutional Review Board (IRB) of the Jimma University Institute of Health.

Then, appropriate letter from the hospital director was taken to the concerned body prior to data collection. Purpose & significance of the study was explained and written informed consent was obtained from each study participants or their attendants. Patients' confidentiality, equity of services and interests of patients was ensured during the study period by informing the data collectors on ethical issues. This study didn't involve any potentially harmful intervention to the patient.

11. Operational definition

Acute kidney injury-defined as an increase in SCr by >=0.3 mg/dl within 48 hours; and/or an increase in SCr to >=1.5 times baseline, which is known or presumed to have occurred within the prior 7 days; and/or urine volume <0.5 ml/kg/h for 6 hours.

Adult-individuals who are between 18-60 years

Alcohol use problem-those who drink alcohol and responded 'yes' at least for one of the CAGE assessment question.

Chronic kidney disease-is defined as abnormal serum creatinine, eGFR and/or proteinuria which present for > 3 months or eGFR <60ml/min in patients with ultrasonographic finding of shrunken kidney and/or normocytic normochromic anemia.

Current smoker- is defined as a person who have used at least 100 cigarettes during their lifetime and who at the time they participated in the study, reported smoking every day or someday.

Diabetes mellitus-defined as previously diagnosed patients on medication irrespective of their current blood sugar and/or FBS>=126mg/dl.

Elderly- individuals who are 60+ year old

Elevated serum creatinine-serum creatinine level >1.01 mg/dl for female and >1.25 mg/dl for male using NHANES-III cut off point for blacks.

End stage renal disease/chronic kidney failure-eGFR<15ml/min using steady state serum creatinine.

Functional proteinuria-dipstick proteinuria in the presence of fever, UTI, heart failure and/or pregnancy.

Hypertension- BP>=140/90 mmHg or previously diagnosed patients on antihypertensive medications irrespective of their admission BP.

Impaired estimated glomerular filtration rate (eGFR)-defined as eGFR less than 60ml/min using one of the two creatinine based equations (CG & MDRD-4).

Macroscopic albuminuria-dipstick proteinuria >=1+ excluding functional proteinuria.

Moderate physical exercise-regular exercise for <150min/week or working rigorously for < 75min/week.

Obesity-defined as having BMI >=25 Kg/m2

12. Dissemination plan

After research completion and finalizing, the report of the study findings is going to be disseminated to all relevant stakeholders through presentation and publication on peer reviewed journal.

Copies of the research will be submitted to Jimma University post graduate school, department of Internal Medicine, and other stake holders for possible intervention based on the findings.

RESULT

1. Socio-demographic characteristics of study participants

A total of 422 patients were included in the study. Two hundred fifteen (50.9%) were male patients. The mean age of the study participants was 45.37 ± 18.49 of which 29.4% were 60 years and older. One hundred ninety one (45.3%) couldn`t read and write while 33 (7.8%) had completed college and above. Two hundred fifty four patients (60.2%) were rural residents and 162 (38.4%) were farmers (Table 1).

Table 1- Socio-demographic characteristics of study participants, Jimma University Medical Center, Ethiopia, 2017

Socio-demographic characteristics	Category	Frequency	Percentage
Age	<40 year	175	41.5
	40-59 year	122	28.9
	>=60 year	125	29.6
Sex	Male	215	50.9
	Female	207	49.1
Marital status	Married	343	81.3
	Single	54	12.8
	Widowed	16	3.8
	Divorced	9	2.1
Religion	Muslim	293	69.4
	Christian	129	30.6
Occupation	Farmer	162	38.4
	Housewife	105	24.9
	Merchant	63	14.9
	Student	40	9.5
	Employee	27	6.4
	Daily laborer	12	2.8
	Other	13	3.1
Educational status	Illiterate	191	45.3
	Grade 1-8	167	39.6
	Grade 9-12	31	7.3
	College/University	33	7.8
Residence	Rural	254	60.2
	Urban	168	39.8

2. Clinical and lifestyle characteristics of study participants

Majority (89.8%) of the study participants were medical patients. Of this 71.3% had non-communicable disease as one of their major diagnosis including 12.8% patients who were diagnosed with AKI and/or CKD during their hospital stay. The rest of patients (10.2%) were surgical patients including 10 (2.4%) who were post-operation state; however, all laboratory data was determined before surgery.

One hundred seventy three (41%) of study participants had BP measurement above optimal at admission of which 114 (27%) were previously diagnosed to have hypertension. Forty nine (11.6%) were not checked for hypertension previously of which 4(8.2%) were diagnosed to have hypertension during admission.

Fifty four (12%) were known diabetic patients. One hundred forty nine (35.3%) study participants had used Khat of which 67(15.9%) were using it at the time of this study. Sixty eight (16.1%) patients had used NSAIDs (Diclofenac or Ibuprofen) within two weeks of admission of which 26.5% were old age. A third (33.4%) of study participants engage in regular physical exercise or their work involve significant physical activities. Twenty five (5.9%) of patients were obese. Twenty six (6.2%) of study subjects were HIV patients (Table 2 and Figure 2).

Table 2- Life style and clinical characteristics of study participants, Jimma University Medical Center, Ethiopia, 2017

Life style and clinical characteristics	Category	Frequency	Percentage
Cigarette smoking	Never	400	94.8
	Past	17	4.0
	Current	5	1.2
Alcohol drinking	Never	378	89.6
	Occasionally	25	5.9
	<3times/week	13	3.1
	3-6times/week	4	0.9
	Daily	2	0.5
Alcohol use problem	No	413	97.9
	Yes	9	2.1
Khat use	Never	273	64.7
	Past	82	19.4
	Current	67	15.9
NSAIDs use with two weeks	No	354	83.9
	Yes	68	16.1
History of DM	No	368	87.2
	Yes	54	12.8
History of hypertension	No	259	61.4
	Not checked for previously	49	11.6
	Yes	114	27.0
Physical exercise	No	204	48.3
	<150min/week	77	18.2
	>=150min/week	141	33.4
BP	<120/80	249	59.0
	120-139/80-89	57	13.5
	>=140/90	116	27.5
BMI	<25	397	94.1
	>=25	25	5.9
HIV status	Nonreactive	396	93.8
	Reactive	26	6.2

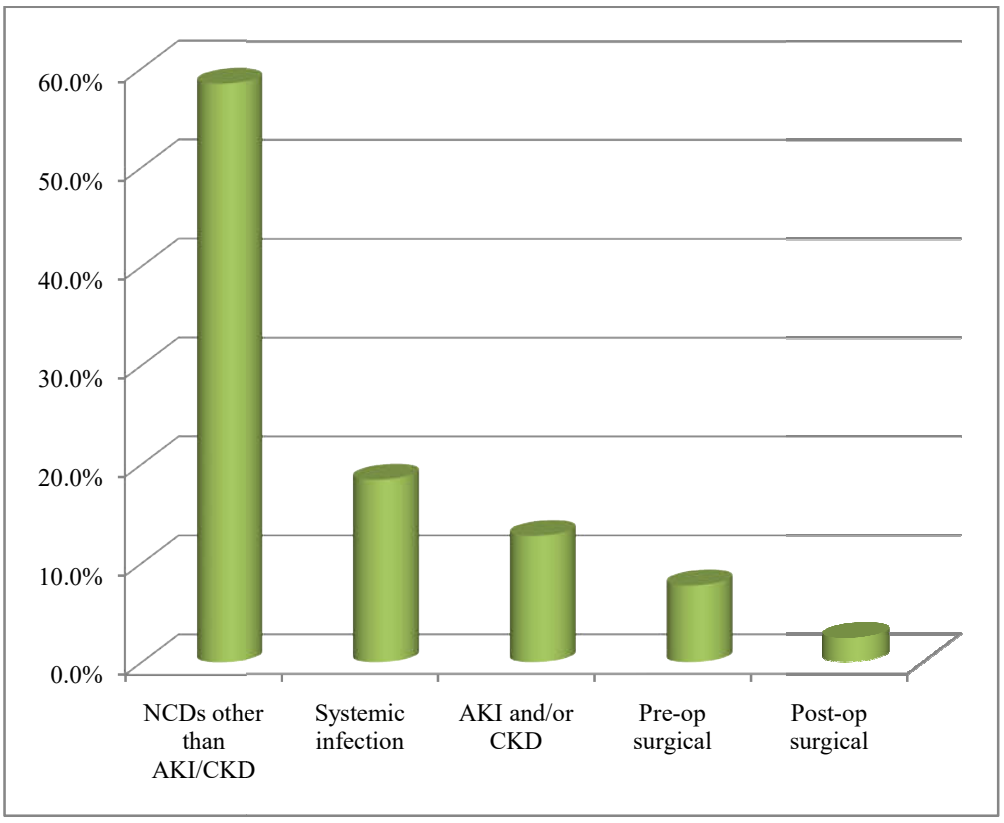

Figure 2-Admission diagnosis of study participants, Jimma University Medical Center, Ethiopia, 2017

3. Pattern of impaired eGFR and albuminuria

One hundred seventeen (27.7%) of the study subjects had elevated serum creatinine level, 138(32.7%), and 81(19.2%) had impaired estimated GFR by CG, and MDRD-4 equations respectively.

Of the total 422 patients included in the study, 52 patients (12.3%) had macroscopic albuminuria of all grades, of which 19 (4.5%) had +1, 18 (4.3%) had +2, 13(3.1%) had +3 and 2(0.5%) patients had +4 dipstick proteinuria.

Moreover, 21.7% and 32.1% of the study participants with impaired eGFR using CG and MDRD-4 equation respectively had macroscopic albuminuria (Table 3).

Table 3-Pattern of macroscopic albuminuria according to level of eGFR, Jimma University Medical Center, Ethiopia, 2017

	eGFR by CG equation		eGFR by MDRD-4 equation	
	<60ml/min (n=138)	>=60ml/min (n=284)	<60ml/min/1.73m2 (n=81)	>=60ml/min/1.73m2 (n=341)
Albuminuria (>=+1)	30(21.7%)	22 (7.7%)	26(7.6%)	26(32.1%)

4. Factors associated with impaired eGFR and albuminuria

On bi-variate analysis; age (P<.001, COR= 3.564; 95%CI: 2.146-5.920), sex (P=.001, COR=2.079; 95%CI: 1.370-3.156), residence (P=.002, COR=2.01;95%CI:1.30 - 3.108), educational status (P<.001, COR=.465; 95% CI: .308-.703), occupation (P=.005,COR=.548:95%CI:.362-.830), Khat use (P=.015,COR=1.685;95% CI: 1.108,2.564), hypertension (P<.001,COR=2.314;95%CI:1.525-3.510), and physical exercise (P=.04,COR=1.610;95%CI:1.021-2.538) were associated with impaired eGFR using CG equations. However, after multivariable logistic regression using Backward LR, old age (P=.002, AOR=2.376, 95%CI 1.378-4.095), male gender (P=.037, AOR=1.609, 95% CI 1.029-2.515), rural residence (P=.008, AOR=1.882, 95%CI 1.181-3.000), and hypertension (P=.015, AOR=1.974, 95%CI: 1.142-3.411) were independently associated with impaired eGFR computed using CG equation.

Age (P=.036,COR=1.869;95%CI: 1.040-3.358), sex (P=.004,COR=2.091;95%CI: 1.262-3.465), residence (P=.001,COR=2.532;95%CI: 1.451-4.419), occupation (P=.022,COR=.564;95%CI: .346-.919) and hypertension (P<.001,COR=3.562;95%CI: 2.079-6.103) were associated with impaired eGFR computed by MDRD-4 equation on bi-variate analysis. After multivariable logistic regression; male gender (P=.013, AOR=2.084, 95%CI: 1.167-3.721), rural residence (P=.001, AOR=2.954; 95%CI: 1.556-5.609), moderate exercise (P=.023, AOR=2.290; 95%CI: 1.120-4.685), and hypertension (P=.003, AOR=2.597; 95%CI: 1.378-4.893) were associated independently with impaired eGFR using MDRD-4 equation.

On bi-variate analysis; obesity (P=.019, COR=3.042; 95%CI: 1.204-7.683), history of known hypertension (P<.001, COR=3.206; 95%CI: 1.754-5.863), and diabetes mellitus (P=.002, COR=3.039; 95%CI: 1.517-6.091) were associated with macroscopic albuminuria.

After multi-variate logistic regression analysis, we found that diabetes mellitus (P=.006, AOR=2.785, 95%CI 1.332-5.825) and hypertension (P<.001, AOR=6.303, 95%CI 3.059-12.987) were strongly associated with macroscopic albuminuria (Table 4-9).

Table 4-Cross-tabulation and bi-variate logistic regression analysis of factors associated with impaired eGFR using CG-equation, Jimma University Medical Center, Ethiopia, 2017

Variables		Impaired eGFR by CG		Bi-variate analysis	
		<60ml/min n=138	>=60ml/min n=284	COR (95%CI)	*P*-value
Age	>=60 year	60(43.5%)	65(22.9%)	3.564(2.146,5.920)	.000
	40-59year	42(30.4%)	80(28.2%)	2.027(1.201,3.421)	.008
	<40year	36(26.1%)	139(48.9%)	1	
Sex	Male	87(63.0%)	128(45.1%)	2.079(1.370,3.156)	.001
	Female	51(37.0%)	156(54.9%)	1	
Residence	Rural	98(71.0%)	156(54.9%)	2.01(1.3, 3.108)	.002
	Urban	40(29.0%)	128(45.1%)	1	
Formal education	Yes	58(42%)	173(60.9%)	.465(.308,.703)	.000
	No	80(58%)	111(39.1%)	1	
Religion	Muslim	103(74.6%)	190(66.9%)	1.456(.923,2.298)	.107
	Christian	35(25.4%)	94(33.1%)	1	
Occupation	Non-farmer	72(52.2%)	189(66.5%)	.548(.362, .830)	.005
	Farmer	66(47.8%)	95(33.5%)	1	
Cigarette smoking	Yes	11(8.0%)	11(3.9%)	2.150(.908,5.089)	.082
	No	127(92.0%)	273(96.1%)	1	
Alcohol drinking	Yes	17(12.3%)	27(9.5%)	1.337(.702, 2.547)	.376
	No	121(87.7%)	257(90.5%)	1	
Khat use	Yes	60(43.5%)	89(31.3%)	1.685(1.108,2.564)	.015
	No	78(56.5%)	195(68.7%)	1	
BMI	>=25	7(5.1%)	18(6.3%)	.790(.322,1.938)	.606
	<25	131(94.9%)	266(93.7%)	1	
Physical exercise	>=150min/week	55(39.9%)	86(30.3%)	1.610(1.021,2.538)	.040
	<150min/week	25(18.1%)	52(18.3%)	1.210(.687, 2.131)	.509
	No	58(42.0%)	146(51.4%)	1	
History of known HTN	Yes	72(52.2%)	91(32.0%)	2.314(1.525,3.510)	.000
	No	66(47.8%)	193(68.0%)	1	
History of DM	Yes	15(10.9%)	39(13.7%)	.766(.407,1.444)	.410
	No	123(89.1%)	245(86.3%)	1	
NSAIDs use within two weeks	Yes	21(15.2%)	47(16.5%)	.905(.517,1.585)	.727
	No	117(84.8%)	237(83.5%)	1	
BP(mmHg)	>=140/90	54(39.1%)	62(21.8%)	2.805(1.758,4.476)	.000
	120-139/80-89	25(18.1%)	32(11.3%)	2.516(1.382,4.581)	.003
	<120/80	59(42.8%)	190(66.9%)	1	
PICT	Reactive	9(6.5%)	17(6.0%)	1.096(.475,2.525)	.830
	Non-reactive	129(93.5%)	267(94.0%)	1	

Table 5-Multi-variable logistic regression analysis of factors associated with impaired eGFR using CG equation, Jimma University Medical Center, Ethiopia, 2017

Variables		Bi-variate analysis		Multi-variable analysis	
		COR (95%CI)	*P*-value	AOR (95%CI)	*P*-value
Age	>=60 year	3.564(2.146,5.920)	.000	2.376(1.378,4.095)	.002
	40-59year	2.027(1.201,3.421)	.008		
	<40year	1			
Sex	Male	2.079(1.370,3.156)	.001	1.609(1.029,2.515)	.037
	Female	1			
Residence	Rural	2.01(1.3, 3.108)	.002	1.882(1.181,3.000)	.008
	Urban	1			
Formal education	Yes	.465(.308,.703)	.000		
	No	1			
Religion	Muslim	1.456(.923,2.298)	.107		
	Christian	1			
Occupation	Non-farmer	.548(.362, .830)	.005		
	Farmer	1			
Cigarette smoking	Yes	2.150(.908,5.089)	.082		
	No	1			
Khat use	Yes	1.685(1.108,2.564)	.015		
	No	1			
Physical exercise	>=150min/week	1.610(1.021,2.538)	.040		
	<150min/week	1.210(.687, 2.131)	.509		
	No	1			
History of known HTN	Yes	2.314(1.525,3.510)	.000		
	No	1			
BP(mmHg)	>=140/90	2.805(1.758,4.476)	.000	1.974(1.142,3.411)	.015
	120-139/80-89	2.516(1.382,4.581)	.003	2.112(1.114,4.025)	.022
	<120/80	1			

Table 6-Cross-tabulation and bi-variate logistic regression analysis of factors associated with impaired eGFR by MDRD-4 equation, Jimma University Medical Center, Ethiopia, 2017

Variables		Impaired eGFR by MDRD		Bi-variate analysis	
		(<60ml/min) n=81	(>=60ml/min) n=341	COR (95% CI)	*P*-value
Age	>=60 year	25(30.9%)	100(29.3%)	1.433(.783, 2.623)	.244
	40-59 year	30(37.0%)	92(27.0%)	1.869(1.040,3.358)	.036
	< 40year	26(32.1%)	149(43.7%)	1	
Sex	Male	53(65.4%)	162(47.5%)	2.091(1.262,3.465)	.004
	Female	28(34.6%)	179(52.5%)	1	
Residence	Rural	62(76.5%)	192(56.3%)	2.532(1.451,4.419)	.001
	Urban	19(23.5%)	149(43.7%)	1	
Formal education	Yes	38(46.9%)	193(56.6%)	.678(.417,1.102)	.117
	No	43(53.1%)	148(43.4%)	1	
Religion	Muslim	60(74.1%)	233(68.3%)	1.324(.767,2.288)	.314
	Christian	21(25.9%)	108(31.7%)	1	
Occupation	Other	41(50.6%)	220(64.5%)	.564(.346,.919)	.022
	Farmer	40(49.4%)	121(35.5%)	1	
Cigarette smoking	Yes	7(.6%)	15(4.4%)	2.056(.810,5.221)	.130
	No	74(91.4%)	326(95.6%)	1	
Alcohol drinking	Yes	11(13.6%)	33(9.7%)	1.467(.707,3.044)	.304
	No	70(86.4%)	308(90.3%)	1	
Khat use	Yes	32(39.5%)	117(34.3%)	1.250(.760,2.058)	.380
	No	49(60.5%)	224(65.7%)	1	
BMI	>=25	6(7.4%)	19(5.6%)	1.356(.523, 3.511)	.531
	<25	75(92.6%)	322(94.4%)	1	
Physical exercise	>=150min	31(38.3%)	110(32.3%)	1.515 (.875, 2.622)	.138
	<150min/week	18(22.2%)	59(17.3%)	1.640(.857, 3.137)	.135
	No	32(39.5%)	172(50.4%)	1	
History of known HTN	Yes	43(53.1%)	113(33.1%)	3.254(1.971,5.374)	.000
	No	38(47.9%)	228(66.9%)	1	
History of DM	Yes	10(12.3%)	44(12.9%)	.951(.456,1.980)	.893
	No	71(87.7%)	297(87.1%)	1	
NSAIDs use within two weeks	Yes	8(9.9%)	60(17.6%)	.513(.235,1.121)	.094
	No	73(90.1%)	281(82.4%)	1	
BP(mmHg)	>=140/90	39(48.1%)	77(22.6%)	3.562(2.079,6.103)	.000
	120-139/80-89	11(13.6%)	46(13.5%)	1.682(.788, 3.588)	.179
	<120/80	31(38.3%)	218(63.9%)	1	
PICT	Reactive	6(7.4%)	20(5.9%)	1.284(.498, 3.308)	.605
	Non-reactive	75(92.6%)	321(94.1%)	1	

Table 7-Multi-variable logistic regression analysis of factors associated with impaired eGFR by MDRD-4 equation, Jimma University Medical center, Ethiopia, 2017

Variables		Bi-variate analysis		Multi-variate analysis	
		COR (95% CI)	*P*-value	AOR (95% CI)	*P*-value
Age	>=60 year	1.433(.783, 2.623)	.244		
	40-59 year	1.869(1.040,3.358)	.036		
	< 40year	1			
Sex	Male	2.091(1.262,3.465)	.004	2.084(1.167,3.721)	.013
	Female	1		1	
Residence	Rural	2.532(1.451,4.419)	.001	2.954(1.556,5.609)	.001
	Urban	1			
Formal education	Yes	.678(.417,1.102)	.117		
	No	1			
Occupation	Other	.564(.346,.919)	.022		
	Farmer	1			
Cigarette smoking	Yes	2.056(.810,5.221)	.130		
	No	1			
Physical exercise	>=150min	1.515 (.875, 2.622)	.138		
	<150min/week	1.640(.857, 3.137)	.135	2.290(1.120,4.685)	.023
	No	1			
History of known HTN	Yes	3.254(1.971,5.374)	.000	2.233(1.244,4.010)	.007
	No	1			
NSAIDs use within two weeks	Yes	.513(.235,1.121)	.094		
	No	1			
BP(mmHg)	>=140/90	3.562(2.079,6.103)	.000	2.597(1.378,4.893)	.003
	120-139/80-89	1.682(.788, 3.588)	.179		
	<120/80	1			

Table 8- Cross-tabulation and bi-variate logistic regression analysis of factors associated with macroscopic albuminuria, JUMC, Ethiopia, 2017 G.C.

Variables		Macroscopic albuminuria		Bi-variate analysis	
		(>=+1) n=52	(<+1) n=370	COR (95% CI)	*P*-value
Age	>=60 year	14(26.9%)	111(30.0%)	.977(.473, 2.019)	.951
	40-59 year	18(34.6%)	104(28.1%)	1.341(.677, 2.657)	.400
	< 40year	20(38.5%)	155(41.9%)	1	
Sex	Male	32(61.5%)	183(49.5%)	1.635(.902, 2.963)	.105
	Female	20(38.5%)	187(50.5%)	1	
Residence	Rural	29(55.8%)	225(60.8%)	.813(.452,1.460)	.487
	Urban	23(44.2%)	145(39.2%)	1	
Formal education	Yes	31(59.6%)	200(54.1%)	1.255(.695,2.265)	.451
	No	21(40.4%)	170(45.9%)	1	
Religion	Muslim	38(73.1%)	25568.9%)	1.224(.638,2.347)	.543
	Christian	14(26.9%)	115(31.1%)	1	
Occupation	Other	31(59.6%)	230(62.2%)	1.113(.615, 2.013)	.723
	Farmer	21(40.4%)	140(37.8%)	1	
Cigarette smoking	Yes	3(5.8%)	19(5.1%)	1.131 (.323, 3.963)	.847
	No	49(94.2%)	351(94.9%)	1	
Alcohol drinking	Yes	9(17.3%)	35(9.5%)	2.003(.902,4.451)	.088
	No	43(82.7%)	335(90.5%)	1	
Khat use	Yes	21(40.4%)	128(34.6%)	1.281(.707,2.320)	.414
	No	31(59.6%)	242(65.4%)	1	
BMI	>=25	7(13.5%)	18(4.9%)	3.042(1.204,7.683)	.019
	<25	45(86.5%)	352(95.1%)	1	
Physical exercise	>=150min/wk	17(32.7%)	124(33.5%)	.982 (.509, 1.894)	.956
	<150min/week	10(19.2%)	67(18.1%)	1.069 (.487, 2.343)	.868
	No	25(48.1%)	179(48.4%)	1	
History of known HTN	Yes	33(63.5%)	130(35.1%)	3.206(1.754, 5.863)	.000
	No	19(36.5%)	240(64.9%)	1	
History of DM	Yes	14(26.9%)	40(10.8%)	3.039(1.517,6.091)	.002
	No	38(73.1%)	330(89.2%)	1	
NSAIDs use within two weeks	Yes	8(15.4%)	60(16.2%)	.939 (.421, 2.096)	.879
	No	44(84.6%)	310(83.8%)	1	
BP (mmHg)	>=140/90	29(55.7%)	87(23.5%)	6.583(3.21,13.474)	.000
	120-139/80-89	11(21.2%)	46(12.4%)	4.723(1.965,11.352)	.001
	<120/80	12(23.1%)	237(64.1%)	1	
PICT	Reactive	4(7.7%)	22(5.9%)	1.318 (.436, 3.989)	.625
	Non-reactive	48(92.3%)	348(94.1%)	1	

Table 9- Multi-variable logistic analysis of factors associated with macroscopic albuminuria, Jimma University Medical Center, Ethiopia, 2017

Variables		Bi-variate analysis		Multi-variable analysis	
		COR (95% CI)	*P*-value	AOR (95%CI)	*P*-value
Sex	Male	1.635(.902, 2.963)	.105		
	Female	1			
Alcohol drinking	Yes	2.003(.902,4.451)	.088		
	No	1			
BMI	>=25	3.042(1.204,7.683)	.019		
	<25	1			
History of known HTN	Yes	3.206(1.754, 5.863)	.000		
	No	1			
History of DM	Yes	3.039(1.517,6.091)	.002	2.785(1.332,5.825)	.006
	No	1			
BP (mmHg)	>=140/90	6.583(3.21,13.474)	.000	6.303(3.059,12.987)	.000
	120-139/80-89	4.723(1.965,11.352)	.001	4.757(1.962,11.533)	.001
	<120/80	1			

5. Performance of serum creatinine based equations

The mean SCr, eGFR by CG, MDRD-4 and CKD-EPI of study subjects were 1.83, 78.47, 109.4 and 97.34 respectively.

Using CG equation, 8.3% of study participants had eGFR<15ml/min, 4.3% had eGFR of 15-29.9ml/min and 20.1% had eGFR of 30-59.9ml/ml.

On the other hand, 8.3% had eGFR<15ml/min/1.73m2, 3.1% had eGFR of 15-29.9 ml/min/1.73m2 and 7.8% had eGFR 30-59.9 ml/min/1.73m2 using MDRD-4 equation.

Using CKD-EPI, 8.5% of the study participants had eGFR < 15ml/min/1.73m2, 2.8% had eGFR 15-29.9ml/min/1.73m2, 8.1% had 30-59.9ml/min/1.73m2, 18.5% had eGFR 60-89.9ml/min/1.73m2, and 62.1% had eGFR>=90ml/min/1.73m2 (Figure 3-4).

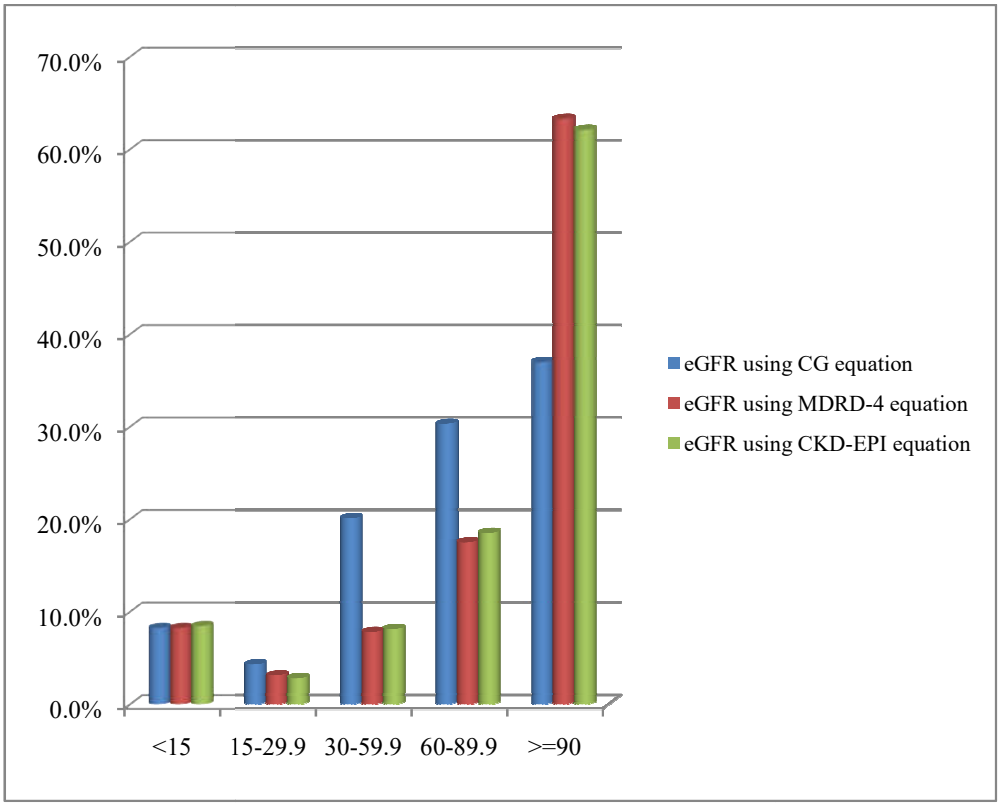

Figure 3- Estimated GFR using serum creatinine based equations, Jimma University Medical Center, Ethiopia, 2017

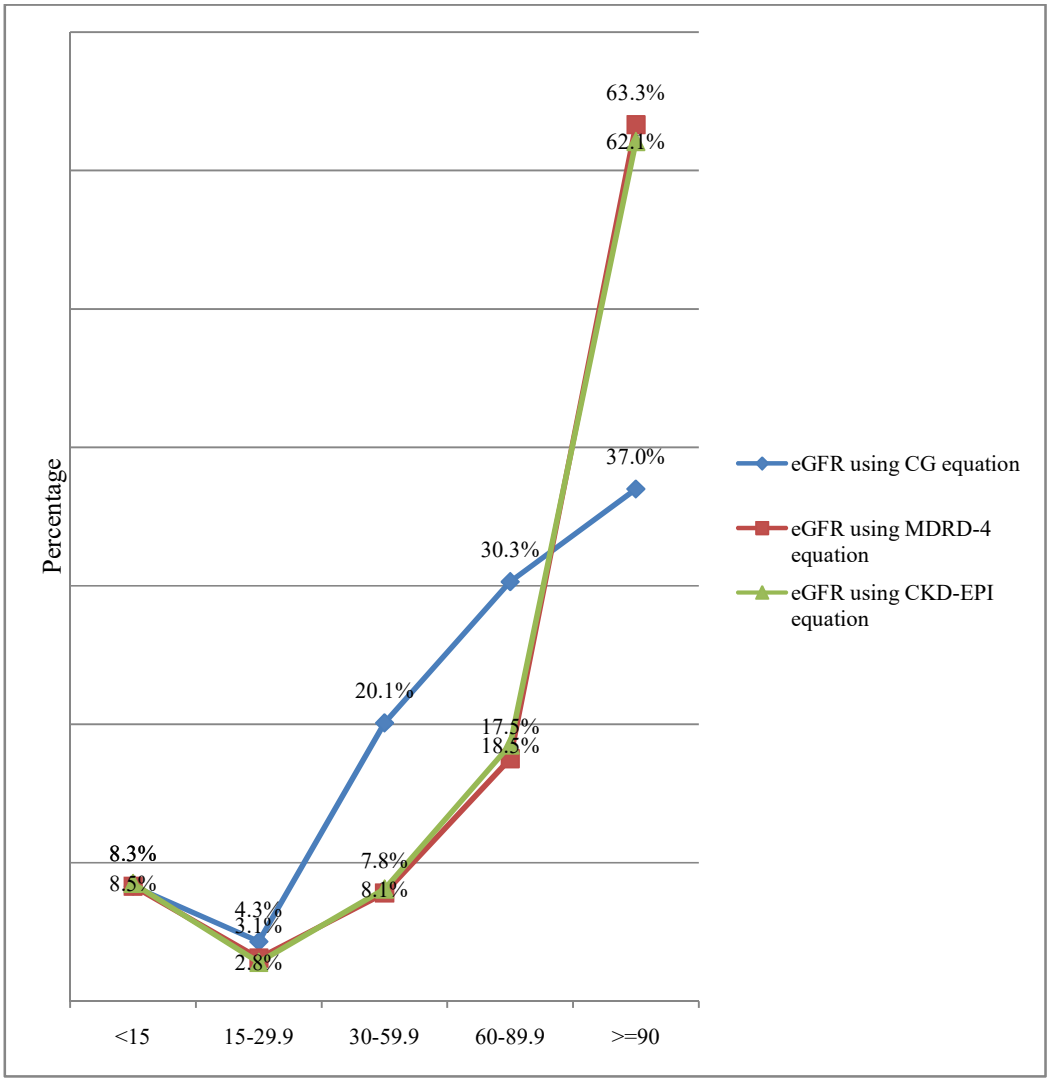

Figure 4- Comparison of the three serum creatinine based equations, Jimma University Medical Center, Ethiopia, 2017

DISCUSSION

More than twenty seven percent (27.7%) of patients had elevated serum creatinine level above the cut-off point for blacks.

Prevalence of eGFR <60ml/min was 19.2%, 19.4% and 32.7% by MDRD-4, CKD-EPI and CG equations respectively while 12.3% of the study participants had dipstick proteinuria. This is comparable with the results of study conducted among diabetic patients attending hospital at Southern part of Ethiopia that found eGFR < 60 ml/min/1.73 m2 of 18.2% and 23.8% according to the MDRD and Cockcroft-Gault (CG) equations. The other systematic and meta-analysis, estimates prevalence of CKD in SSA ranged from 2% in Cote d'Ivoire to 30% in Zimbabwe with overall prevalence of 13.9%. However, in this review hospital based studies were excluded that possibly contributed to lower CKD prevalence (9, 20).

Community based cross-sectional study conducted from 2005-2007 in Delhi and surrounding showed that prevalence of all grades of dipstick proteinuria was 2.25%, low eGFR was 13.3% by CG equation and 4.2% by MDRD equation (23).

Prevalence of dipstick albuminuria found by our study (12.3%) roughly goes in line with the study done in tertiary hospital in Lagos, Nigeria in 2011 which found dipstick proteinuria in 8.3% of HIV sero-negative and 42.5% of HIV positive subjects (38).

Old age (P=.002, AOR=2.376), and hypertension (P=.015, AOR=1.974) were independently associated with two fold increased risk of having impaired eGFR by CG equation. Besides, rural residence (P=.001, AOR=2.954) and male gender (P=.013, AOR=2.084) independently increased risk of having eGFR < 60ml/min computed by both CG and MDRD-4 equations by 2-3 folds.

Moderate physical exercise (P=.023, AOR=2.29) was associated with 2 fold increased risk of having impaired eGFR computed by MDRD-4 equation. This finding is inconsistent with studies from North India and Screening and Early Evaluation of Kidney Disease (SEEK) study (23, 40).

Individuals who had diabetes mellitus (P=.006, AOR=2.785) were three times more likely to have macroscopic albuminuria. On the other hand, BP measurement above optimal (P=.001, AOR=4.757) had increased risk of macroscopic albuminuria by more than four fold.

However, cigarette smoking (P=.082), alcohol (P=.088), NSAIDs (P=.094) and HIV/AIDS (P=.605) were not associated with any of the study outcomes.

In this study, the prevalence of impaired eGFR using CG-equation is higher than that of impaired eGFR by MDRD-4 and CKD-EPI equations. On the other hand, MDRD-4 and CKD-EPI equations performed closely. This is roughly in line with the study from South-Africa which found that highest agreement between GFR estimators was between MDRD and CKD-EPI equations (9, 23, 39, 41).

More than 70% of the study participants had NCDs as one of their admission diagnosis. Forty one percent (41%) of patients had BP above optimal (BP>=120/80 mmHg) of which more than 27% were hypertensive while at least 12% of the study participants had diabetes mellitus. On the other hand, we found that more than 19% of the study participants had eGFR <60ml/min by all three equations while more than 12% had dipstick proteinuria. These are the reflection of double burden of NCDs on developing nations like Ethiopia where there are limited facilities to care for chronic diseases like ESRD. These all necessitates timely detection and treatment of NCDs in general and CKD in particular and their risk factors. The health workers should be vigilant in utilizing available resources to detect risk factors of NCDs including CKD and foster healthy life style of their clients through health education. Policy makers and all other stake holders should set clear directions at national, regional and institution levels to combat the complications and costs of NCDs.

CONCLUSION

Impaired estimated Glomerular Filtration Rate and Macroscopic albuminuria of all grades was found in significant proportion of study participants which necessitates routine urine analysis and estimation of Glomerular Filtration Rate for patients with CKD risk factors.

On the other hand MDRD-4 and CKD-EPI equations perform comparable in estimating GFR through the range of eGFR while CG equation correlate better with other equations when eGFR below 30ml/min.

RECOMMENDATIONS

- ✓ Estimation of GFR and urine analysis should be routine for patients with traditional risk factors for CKD and urologic diseases.
- ✓ We recommend Ethiopian Federal Ministry of Health and other stake holders to give due emphasis to combat the alarmingly rising non-communicable diseases and its burdens.
- ✓ We also recommend researchers to pursue further studies in the field using the results of this study as input.

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QUESTIONNAIRE

Data collection tool for assessment of impaired glomerular filtration rate, albuminuria and associated factors among adults patients admitted to JUMC, southwest Ethiopia

Principal investigator: TAMIRU ADUGNA(MD)

Instruction for data collectors:

Dear data collector, this study is aimed to assess patterns of impaired GFR and albuminuria among patients admitted to JUMC adult wards for various conditions.

Candidates-all adult patients who have **at least one urine analysis and renal function test** except patients with fever, pregnancy, preeclampsia/eclampsia, and/or urinary tract infection.

Use '**X**' to mark correct the responses.

Please make sure that the data is complete.

If you have any question, you can contact Dr.Tamiru Adugna by one of the following ways at any time.

- Mob. No -0946380781/0922710378
- Email address: adutamiru@gmail.com

Hospital number _____; Initials_____; Ward; _____

Part-I–Identification and Socio demographic characteristics of the study participants

1.Age___years

2.Sex 1. Male ☐ 2. Female ☐

3.Marital status: 1. Single ☐ 2. Married ☐ 3. Divorced ☐ 4. Widowed ☐

4. Religion 1. Christian ☐ 2.Muslim ☐ 3. Wakefata ☐ 4.Other (specify)_____

5.Occupation:

1. Salaried employee ☐ 2. Merchant ☐ 3. Farmer ☐ 4. Laborer ☐

5. Student ☐ 6. Housewife ☐ 7. Other (specify) _____

6.Educational status: 1. Illiterate ☐ 2. Grade 1-8 ☐ 3. Grade 9-12 ☐

4.College/university ☐ 5. PG / Masters or Professional ☐

6. Other (specify) _____

7.Family size_____

8.Residence: 1. Urban ☐ 2. Rural ☐

Part-II– Medical history

9. Do you have family history of renal disease? 1. Yes ☐ 0. No ☐

Did you ever experience the following GUS symptoms?					
S/N	Symptoms	Yes	Duration(days)	# of episodes	No
10	Reddish urine color change(hematuria)	☐			☐
11	Decreased urine volume	☐			☐
12	Body swelling (periorbital and feet)	☐			☐
13	Flank pain *	☐			☐
14	Frequency*	☐			☐
15	Urgency*	☐			☐

**mention # of episodes for the last three symptoms (13-15)*

16. Did you ever smoke cigarette? 0 – Never ☐ 1 – Past ☐ 2 – Current* ☐

No of pack year(s) ☐

Do you drink alcohol? 0 – Never ☐ 1 – Past ☐ 2 – Current

a. If answer for Q# 17 is 2, how often do you drink? **1**- Socially **2** - <3days/wk **3**- (3-6) days/wk **4**- Daily

b.

CAGE assessment	Yes	No
Plan to Cut-down	☐	☐
Being Annoyed with critics	☐	☐
Feeling Guilty	☐	☐
Use as Eye opener	☐	☐

17. Do you use the following substances?

Chat 0 – Never ☐ 1 – Past ☐ 2 – Current ☐ duration ☐ yrs

Cocaine 0 – Never ☐ 1 – Past ☐ 2 – Current ☐ duration ☐ yrs

18. Do you involve in physical exercise? 1. Yes ☐ 0. No ☐

If 'yes',how often ☐ times/week, how many ☐ minutes/each exercise?

If 'no', does your work involve significant physical activity? (manual labor)

1. Yes ☐ 0. No ☐

Do you have any of the following chronic illness?

	Yes	Duration(yr)	Medication(s)	No
19. Hypertension **ψ**	☐			☐
20. Diabetes mellitus	☐			☐
21. Heart disease	☐			☐
22. Peripheral arterial disease	☐			☐
23. Stroke	☐			☐
24. Renal stone(known)	☐			☐

*****_Current smokers are defined as persons who reported smoking at least 100 cigarettes during their lifetime and who, at the time they participated in a survey about this topic, reported smoking every day or someday_

Ψ _please put 'Nc' (=**Not checked for hypertension previously**) in the box of hypertension raw instead of 'No' for respondents who were **not** checked for hypertension previously._

25. Do you have history of the following medication use?

NSAIDs (Diclofenac, Ibuprofen) 1.Yes ☐ last used ☐ days back 0. No

Part-III Physical examination on admission

26. V/S-BP [on admission_________,Day2___________,Day3 ________],

PR_______, T°_______, Wt (with☐shoes) Kg , Ht (wi☐ıt shoes)

cm , ☐ BM☐ Kg/m², MUAC cm

27. Abdominal circumference ☐ cm

Part-IV Laboratory findings

If any of the tests has been done more than once, please document all. If they were done more than three times, document the first test and the last two results.

28. U/A

Microscope (RBC_____, WBC_____, RBC casts_____), Dipstick (albumin____)

Microscope (RBC_____, WBC_____, RBC casts_____), Dipstick (albumin____)

Microscope (RBC_____, WBC_____, RBC casts_____), Dipstick (albumin____)

29. RFT

Serum creatinine (mg/dl) Cr_1 =☐ Cr_1 =☐ Cr_1 =☐

Serum BUN (mg/dl) BUN_1 = ☐ BUN_1 =☐ BUN_1 =☐

30. Serum glucose(mg/dl) **FBS** =☐ RBS1=☐ RBS2= ☐

31. Hemoglobin (mg/dl) Hgb1=☐ Hgb2= ☐ Hgb3=☐

32. PICT (put R/NR) ☐ *R=reactive, NR=Non-reactive.

33. Working diagnosis of the patient____

____

34. Treatment given(specify medications & surgical intervention if any)____

____

*Collected by*________________________ *Sign*________ *Date*____________

Checked by ________________________*Sign*________*Date*____________

Thank you very much for completeness!!