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The proportion of chronic kidney disease and its associated factors among adult diabetic patients at Tibebe Ghion Specialized Hospital, Bahir Dar, Ethiopia

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ABSTRACT

Background: Chronic kidney disease is defined as a progressive loss of kidney function occurring over several months to years. Programs to detect chronic kidney disease, linked to comprehensive primary and secondary Prevention strategies are rare in our country. This study aimed to assess the proportion of chronic kidney disease and its associated factors among adult diabetic patients.

Methods: An institutional-based cross-sectional study design was used. Adult Diabetic Patients (≥18 years of age) coming to the medical outpatient clinic were considered as study participants and they were selected using a systematic random sampling technique. Data were checked for completeness, then entered into Epi Data 3.1, and exported to SPSS Version 24 for analysis. Descriptive statistics such as frequency, crosstab, and median were utilized. chronic kidney disease epidemiology collaboration equations for calculating estimated glomerular filtration rate Simple binary logistic regression was conducted to identify candidate variables for multiple binary logistic regression at a p-value of <0.2. Those variables whose P-value <0.05 in multiple binary logistic regression were considered as significantly associated variables with chronic kidney diseases.

Result: A total of 329 individuals were participating in the study. Of which 199 (60.5%) were males. The median age of participants was 39 (IQR; 28: 56) years. Of the total participants, 125(38%) had no formal education. The proportion of chronic kidney disease was 16.7% (95% CI: 12.8%–21%), The study also found that older age (AOR = 3.02; 95%CI: 1.37, 6.69), pre-existing hypertension (AOR = 4.85; 95%CI: 2.07, 11.3), current systolic blood pressure ≥140mmHg (AOR = 6.33, 95%CI: 3.34, 11.99), and presence of Albuminuria (AOR = 2.98, 95% CI: 1.26, 7.09) were associated with chronic kidney disease.

Conclusions: The proportion of CKD among diabetic patients in Tibebe Ghion Specialized Hospital was relatively high as compared to other studies. Health care professionals should consider strict follow-up for older age patients, patients with co-morbidities like hypertension, and for those patients with Albuminuria.

1. Introduction

Chronic kidney disease (CKD) is defined as a progressive loss of kidney function occurring over several months to years. This is characterized by the gradual replacement of normal kidney structure with fibrotic tissues [1]. CKD is considered when the estimated GFR is < 60ml/mim/1.73m2, whereas the Estimated Glomerular filtration rate (eGFR) is calculated based on height, weight, gender, and serum creatinine level [2].

Different studies have reported that there are many risk factors for CKD and classified them into initiating and perpetuating factors. Initiating factors play a role in starting the cycle of loss of a functional unit of the kidney, such as older age, male sex, and diabetes, and perpetuating factors that drive the disease progression, such as proteinuria, hypertension, and hyperuricemia [3]. Of which diabetes and hypertension are the major risk factors for the development and progression of chronic

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kidney disease [4].

Diabetes mellitus (DM) refers to a group of common metabolic disorders that are characterized by hyperglycemia [5]. Poorly controlled diabetes can cause damage to the vasculature of kidneys that filter waste products from the body. This resulted in kidney damage and also can cause elevated blood pressure. High blood pressure can cause further kidney damage by increasing the pressure in the delicate filtering system of the kidneys. DM is considered the leading cause of end-stage renal disease (ESRD), nontraumatic lower-extremity amputations, and adult blindness [6].

Most complications of CKD can be prevented or delayed by early detection and treatment [1,7,8]. Routine screening for CKD based on estimated GFR (eGFR) derived from serum creatinine measurements is recommended for diabetes care as reduced eGFR is an independent predictor of cardiovascular and renal events and mortality in patients with diabetes. Furthermore, given that CKD is often not detected until it is advanced, targeted screening of diabetic patients based on eGFR is cost-effective and has potential benefits, such as early identification and treatment of affected patients [1].

Globally, diseases of the kidney and urinary tract together are the 12th cause of death and the 17th cause of disability. CKD affects around 10–13% of the general population. It has been estimated that more than 500 million individuals globally are suffered from CKD, regardless of the cause. In sub-Saharan Africa, it is a considerable health burden. CKD is at least 3–4 times more frequent in Africa than in the developed world [9,10]. Chronic renal failure was the first cause of hospital deaths in men and the fifth in women in 2011 [11]. Millions of people around the world have kidney diseases and these patients will eventually need renal replacement therapy. Hemodialysis, peritoneal dialysis, and kidney transplantation save lives but with great costs, which are becoming a major issue in western countries because they account for a significant proportion of healthcare expenditure [12].

Having a proper follow-up of DM patients allows for early detection of chronic kidney disease and management to prevent mortality and morbidity related to CKD so that it increases the life expectancy and productivity as a community. This study also reduces costs for the patients, for health care Sectors, governments, and Nongovernmental organizations related to late diagnosis and complications of CKD; also, it informs health care professionals for considering screening for CKD. Therefore, this study aimed to assess the proportion of chronic kidney disease and its associated factors among adult diabetic patients in Tibebe Ghion Specialized Hospital.

2. Methods and materials

2.1. Study setting and period

Bahir Dar is situated on the southern shore of Lake Tana, the source of the Blue Nile (locally called Abay). Bahir Dar city (one of the ten most beautiful cities in Africa and one of the twelve UNESCO Learning Cities Awardee of 2015). The city is located approximately 578 km (360 miles) north-northwest of Addis Ababa and has an elevation of 1840 meters (6036 feet) above sea level. Tibebe Ghion specialized hospital is located about 10 km south of the city center and about 7 km from the new bus station ('Addisu Meneharia') on the way to Adet District and about 23 km from the Blue Nile Falls (locally called 'TisEsat' (Smoke of Fire).

TGSH is a tertiary hospital that has 6 major wards and 2 intensive care units also the facility has about 452beds, and the catchment area of the hospital is more than 5 million populations. The hospital receives patients who are referred from across the Amhara region and gives outpatient and inpatient services in all major departments. The study was conducted from October 2020 to October 2021.

2.2. Study design

An institutional-based cross-sectional study design was conducted among Diabetic patients at Tibebe Ghion Specialized Hospital.

2.3. Source population

The source populations were all adult diabetic patients at Tibebe Ghion Specialized Hospital.

2.4. Study population

All adult diabetic patients appear in the Medial referral clinic (MRC) at Tibebe Ghion specialized hospital during the data collection period.

2.5. Inclusion and exclusion criteria

2.5.1. Inclusion criteria

✓ Adult (age ≥18 years) diabetes mellitus patients on regular follow-up and those who signed informed written consent was included in the study.

2.5.2. Exclusion criteria

✓ Short follow-up period (<3 months), incomplete patient charts, pregnant women, and critically ill patients were excluded from the study.

2.6. Study variables

2.6.1. Dependent variables

- Chronic kidney disease

2.6.2. Independent variable

- Age, sex, educational status, residence, income, type of DM, duration of DM, family history of chronic kidney disease, smoking status, alcohol consumption habit, body mass index, preexisting hypertension, waist circumference, urine albumin level, previous history of kidney disease.

2.7. Sample size determination

The sample size determination was made using the single population proportion formula with the following assumptions: a proportion of 21.8% (9), a 95% confidence interval, a 5% margin of error, and 10% for non-response rate.

So, estimated sample (n) = $\underline{(Z\alpha_{/2})}^2$ $\underline{\text{x P (1-P)}}$ = n = 329

d^2

2.8. Sampling technique and procedures

Diabetic Adult Patients (≥18 years of age) Visiting MRC were considered as study participants and they were selected by using a systematic random sampling technique. The k value is 3 and we were selecting the sample every 3rd from the total population. The first participant was selected by using lottery methods.

2.9. Operational definitions

Chronic kidney disease (CKD): Estimated GFR of <60ml/mim/1.73 m^2.

Diabetic Mellitus (DM): is a serious, chronic disease that occurs either when the pancreas does not produce enough insulin (a hormone that regulates blood sugar, or glucose), or when the body cannot effectively use the insulin it produces.

Estimated Glomerular filtration rate (eGFR): Is calculated based on height, weight, gender, and serum creatinine level for assessment of kidney function.

Fasting blood sugar (FBG): Serum glucose level measured after at least 8 h of fasting.

Medical Referral Clinic (MRC): A place where patients are visiting for follow-up after diagnosis.

Pre-existing hypertension: Patients who have known hypertension historically.

2.10. Data collection tools and procedures

The data collection tool was developed after reviewing different kinds of literature; the tool had two parts: the first part was socio-demographic and the second part was clinical and laboratory characteristics. The patient's chart was also reviewed for information like medications, blood pressure, urine albumin, and serum glucose level. The last three months' FBS (fasting blood sugar) average was used to assess control.

Socio-demographic, clinical, and anthropometric data were collected by nurses after the participants agreed to sign written consent. Height was measured using Stadiometer, and weight was recorded using a balance. Body mass index (BMI) was calculated as weight divided by height squared (kg/m2). Underweight, normal weight, overweight and obese was classified as BMI <18.5, 18.5–24.9, 25–29.9, and ≥30, respectively. Blood pressure was measured by nurses using an analog sphygmomanometer and stethoscope. Measurements were taken from the upper arm while placing the hand at the heart level after the patients had been sitting for more than 5 min. Systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg or current uses of blood pressure-lowering medication were used to define hypertension Considering their current fasting blood glucose (FBG) level, participants were classified with good glycemic control (FBG <150 mg/dl) and poor glycemic control (FBG ≥150 mg/dl) (9).

Laboratory technologists have collected blood and urine samples and performed biochemical tests. Five milliliters of fasting venous blood sample were collected with the standard venipuncture technique to separate serum. Human bridge centrifuge 584 analyzers were used for biochemical analysis. Serum glucose, creatinine, and urea level were measured by using the enzymatic glucose oxidase, kinetic alkaline picrate, and enzymatic glutamate-dehydrogenase (GLDH) methods, respectively. Ten milliliters of freshly voided urine were collected from a clean and dry container. Then, urine albumin was determined and the Presence of albumin in the urine (from +1 to +4) was defined as albuminuria.

The glomerular filtration rate (GFR) was estimated by using chronic kidney disease Epidemiology Collaboration (CKD-EPI) equation as follows $GFR = 141 \times \min(SCr/\kappa, 1)^{a} \times \max(SCr/\kappa, 1)^{-1.209} \times 0.993^{Age}$, Multiply by 0.742 for women And by 1.21 for African ancestry (28). CKD is defined by using eGFR. Patients having CKD are classified into five stages according to the kidney disease: Improving Global Outcomes (KDIGO) classification system as follows:

Stage 1 normal - eGFR of ≥90 ml/min/1.73 m2,
Stage 2 mildly reduced eGFR of 60–89, ml/min/1.73 m2,
Stage 3 moderately reduced eGFR of 30–59 ml/min/1.73 m2,
Stage 4 severely reduced eGFR of 15–29 ml/min/1.73 m2 and
Stage 5 ESRD (kidney failure): eGFR of <15 ml/min/1.73 m2.
Stage 3 was further classified into 3A (eGFR of 45–59.9 ml/min/1.73 m2) and 3B (eGFR of 30–44.9 ml/min/1.73 m2) (29).

2.11. Data quality assurance and data analysis

The data was collected by trained health professionals (trained nurses who work in medical referral clinics & trained medical laboratory Technicians and medical residents). One day of training was given to the data collector on how to collect the data. A pre-test was carried out on 5% of the actual sample size who fulfilled the criteria. Based on the finding of the pre-test, the questionnaires were revised. Data collection was supervised by internal medicine residents. Every day the principal investigator was checking the collected data and any incomplete documents were cleaned and checked for quality before data entry.

Data were checked for completeness and entered into Epi data 3.1, and exported to SPSS Version 24 for analysis. Descriptive statistics such as frequency, crosstab, and median were utilized. Simple binary logistic regression was conducted to identify candidate variables for multiple binary logistic regression at a p-value of <0.2. Those variables whose P-value <0.05 in multiple binary logistic regression were considered as significantly associated variables with chronic kidney diseases.

Both crude and adjusted odds ratios with their 95% confidence intervals (CI) were computed to measure the strengths of associations between variables. A p-value of <0.05 was considered statistically significant. The Hosmer-Lemeshow test for logistic regression was checked to examine the goodness of fit of the model, and data were fitted for the model ($x^2 = 3.07$, p-value = 0.93). Multicollinearity was assessed using variance inflation factors (VIF), and all variables had VIF< 10 which means no Multicollinearity, but when assessed using correlation matrix, some of the variables has strong correlation coefficients such as BMI with waist circumference and age, types of DM with the duration of DM, and antihypertensive medications with the presence of preexisting hypertension, then BMI, types of DM and taking antihypertensive medication was removed from further analysis.

3. Results

3.1. Socio-demographic and clinical characteristics of participants

A total of 329 individuals were participating in the study. Of which 199 (60.5%) were males. The median age of participants was 39 (IQR; 28: 56) years. Of the total participants, 125(38%) had no formal education and only 9 (2.7%) of the participants had master's degrees and above. Regarding the residency of the participants, 177(53.8%) were from urban areas. Among the study participants, 92(28%) were having a monthly income of greater than 4000ETB (80$) Table 1.

3.2. Clinical, behavioral, and laboratory characteristics of the study participants

Among the study participants, 171(52%) and 158(48%) were having

Table 1
Socio-demographic characteristics of the study participants, October 2021, Ethiopia, n = 329.

Variables	Category	Number (n) = 329	Percentage
Age (year)	<60	266	80.9
	≥60	63	19.1
Gender	Male	199	60.5
	Female	130	39.5
Educational status	No education	125	38
	Primary	67	20.4
	Secondary	33	10
	Diploma	49	14.9
	Degree	46	14
	Masters and above	9	2.7
Residency	Rural	152	46.2
	Urban	177	53.8
Income (ETB)	<1001	71	21.6
	1001–2000	66	20.1
	2001–3000	48	14.6
	3001–4000	52	15.8
	>4000	92	28

ETB* = Ethiopian birr.

type 1 diabetes and type 1 diabetes, respectively. Out of all the study participants, 248(75.4%) and 197(59.9%) had low-risk waist circumference and normal BMI, respectively. The majority 227(69%) of the respondents were with a duration of diabetes <10 years. A small proportion of participants had a history of alcohol consumption 80(24.3%) and smoking 21(6.4%). Sixty-five (19.8%) and 30 (9.1%) patients were overweight and obese, respectively. Among all study participants, 237 (72%) were not taking antihypertension medications. Among participants, 60(18.2%) and 57(17%) of them had SBP and DBP of ≥140 mmHg and ≥90mmHg, respectively. The majority 204(62%) of participants with diabetes have an average fasting blood sugar level >150 mg/dL, which is an indicator of poor glycemic control. Of the participants, 74(22.5%) of them had positive urine albumin levels Table 2.

3.3. The proportion of CKD among diabetic patients according to CKD-EPI equations

The overall proportion of CKD (defined by eGFR <60 mL/min/1.73 m^2) was found to be 16.7% (95% CI: 12.8%–21%) The prevalence of CKD stage 3a was 32(9.7%), stage 3b was 9(2.7%), stage 4 was 6 (1.8%), and stage 5 was 8(2.4%) Table 3.

3.4. Factors associated with CKD among diabetic patients according to CKD-EPI equations

All variables were assessed for simple binary logistics analysis and variables which have a p-value <0.2 in the simple binary logistics analysis were eligible for multiple binary logistic regression analysis. However, variables such as sex, residency, educational status, family history of CKD, and FBS had a p-value >0.20 and exclude from further analysis. Four variables (age ≥60 years, preexisting of HTN, SBP ≥140 mmHg, and having positive Urine albumin) have a statistically significant association with CKD by CKD-EPI equations in multiple binary logistic regression analysis.

Patients whose age ≥60 years were three times more likely to develop CKD than patients who are found <60 years [AOR = 3.02; 95% CI, 1.37, 6.69]. The odds of CKD among hypertensive patients were 4.85 times higher as compared to patients without hypertension [AOR = 4.85; 95% CI,2.07,11.3]. The odds of CKD among diabetic patients with high systolic blood pressure were 2.3 times higher as compared to a patient with normal systolic blood pressure [AOR = 2.29; CI, 0.97, 5.19]. The odds of CKD among diabetic patients with albuminuria were three times higher than in patients without Albuminuria [AOR = 2.98; 95%, CI, 1.26, 7.09] (Table 4).

Table 2
Clinical, behavioral, and laboratory characteristics of the study participants, n = 329.

Variables	Category	Frequency	Percentage
Types of diabetes	Type 1	171	52
	Type 2	158	48
Waist circumference	Low risk	248	75.4
	High risk	81	24.6
Duration of diabetes	<10years	227	69
	≥10 years	102	31
Family Hx of CKD	Present	38	11.6
	Absent	291	88.4
Smoking status	Smoker	21	6.4
	Non-smoker	308	93.6
Alcohol consumption habit	Yes	80	24.3
	No	249	75.7
History of HTN	Present	110	33.4
	Ascent	219	66.6
Body mass index (Kg/ m^2)	Underweight (<18.5)	37	11.2
	Normal (18.5–24.9)	197	59.9
	Overweight (25–29.9)	65	19.8
	Obese (≥30)	30	9.1
Anti-hypertension medication	Present	92	28
	Absent	237	72
Systolic blood pressure	≥140 mmHg	60	18.2
	<140 mmHg	269	81.8
Diastolic blood pressure	≥90 mmHg	57	17.3
	<90 mmHg	272	82.7
Fasting blood sugar	≥150 mg/dl	204	62
	<150 mg/dl	125	38
Urine albumin	Positive	74	22.5
	Negative	255	77.5
Previously diagnosed CKD	Present	29	8.8
	Absent	300	91.2

Table 3
The Proportion of different stages of chronic kidney disease (CKD) according to chronic kidney disease-epidemiology (CKD-EPI) equations (N = 329).

Stages of CKD	Descriptions	Egfr	Frequency	Percent
Stage 3a	Mild to moderately decreased	45–59.9	32	9.7
Stage 3b	Moderate to severely decreased	30–44.9	9	2.7
Stage 4	Severely decreased	15–29.9	6	1.8
Stage 5	End stage renal disease	≤15	8	2.4
Total			55	16.7

4. Discussions

This study was conducted to assess the proportion and factors associated with CKD among adult diabetics at TGSH using an estimated glomerular filtration rate (eGFR). The proportion of CKD in this study was found to be 16.7% (95% CI: 12.8%, 21%) This finding was in line with the study conducted at the University of Gondar which was 14.3% (30), the observed similarity might be due to similarity in population characteristics and in both case prevalence of CKD was determined by using CKD EPI equations, but the prevalence of CKD in our study was lower than that of Jimma's (26%) [1], the difference might be because of, case-mix which means in case of Jimma studies they incorporate both diabetic and hypertensive patients as study participants. Studies reported that diabetes and hypertension are the major risk factors for the development and progression of chronic kidney disease [4].

In this study, patients who are found ≥60 years of age were three times more likely to develop CKD than patients who are <60 years. This result is consistent with the study conducted in Gondar, (9), and Jamaica [13]. Studies reported that eGFR diminishes with age, and at age ≥60 years; 25% of the diabetics had eGFR <60 mL/min/1.73 m^2. Similarly, another study reported that individuals aged ≥65 years had a higher chance of developing renal insufficiency and proteinuria compared to their counterparts [14]. Studies also reported that Older age is a risk factor for the development of CKD, most likely reflecting both lower mean levels of eGFR and higher rates of renal function loss in older compared with younger patients because of an age-associated decline in kidney function (33). therefore, screening diabetics patients in the elder age group is an important strategy for the detection of CKD and to improve the outcomes [15].

This study also revealed that the presence of pre-existing hypertension (BP ≥ 140/90mmHg) and systolic blood pressure were independent predictors of CKD among diabetic patients; this result was supported by the study conducted in Gondar [16], Jimma [1], and Spain [17], In which uncontrolled blood pressure was associated with a high risk of CKD. Studies reported hypertension is one of the leading causes of CKD due to the deleterious effects that increased BP has on kidney vasculature. Long-term, uncontrolled, high BP leads to high intraglomerular pressure, impairing the glomerular filtration rate that results in CKD [18].

Studies suggested that there are the beneficial effects of controlling blood pressure and using antihypertensive agents on kidney function in diabetics have been described repeatedly in current guidelines [19].

Our study also found that the odds of CKD among diabetic patients with albuminuria were three times higher than in patients without

Table 4
Factors Associated with chronic kidney disease (CKD) (N = 329).

Variables	Category	CKD		COR [95%CI]	AOR [95%CI]
		Yes (%) n = 55(16.7)	NO (%) n = 274(83.3)		
Age	<60	29(10.9)	237(89.1)	1.00	
	≥60	26(41.3)	37(58.7)	5.74 [3.05,10.81]	3.03[1.37, 6.69] **
Income	<1001	8(11.3)	63(88.7)	1.00	
	3001–4000	10(19.2)	42(80.8)	2.47[1.03,5.95]	1.13[0.31,4.17]
Waist circumference	Low risk	31(12.5)	217(87.5)	1.00	
	High risk	24(29.6)	57(70.4)	2.95[1.61,5.41]	0.48[0.19,1.21]
Duration of DM	<10 years	25(11.0)	202(89.0)	1.00	
	≥10 years	30(29.4)	72(70.6)	3.37[1.86,6.10]	1.74[0.76,3.95]
Smoking history	Smoker	7(33.3)	14(66.7)	2.71[1.04,7.06]	0.73[0.19,2.72]
	Non-smoker	48(15.6)	260(84.4)	1.00	
Alcohol consumption habit	Yes	24(30.0)	56(70.0)	3.01[1.64,5.54]	1.45[0.63,3.36]
	No	31(12.4)	218(87.6)	1.00	
Preexisting HTN	Present	44(40.0)	66(60.0)	10.16[5.28,19.56]	4.85[2.07,11.3] ***
	Absent	11(5.0)	208(95.0)	1.00	
SBP	≥140 mmHg	26(43.3)	34(56.7)	6.33[3.34,11.99]	2.29[0.97, 5.19] *
	<140 mmHg	29(10.8)	240(89.2)	1.00	
DBP	≥90 mmHg	25(43.9)	32(56.1)	6.30[3.30,12.03]	1.01[0.27,3.83]
	<90 mmHg	30(11.0)	242(89.0)	1.00	
Urine albumin	Positive	33(44.6)	41(55.4)	8.52[4.52, 16.06]	2.98[1.26,7.09]*
	Negative	22(8.6)	233(91.4)	1.00	
Previously diagnosed CKD	Present	10(34.5)	19(65.5)	2.98[1.30,6.83]	1.38[0.47,4.02]
	Absent	45(15.0)	255(85.0)	1.00	

* = P value < 0.05, ** = P value < 0.01, * ** = P value < 0.001.
COR= Crude Odds Ratio, AOR = Adjusted Odds Ratio.

Albuminuria. This result is supported by two studies conducted in the USA which revealed that Albuminuria had a high prevalence of CKD [20, 21]. Albuminuria is an independent risk factor and an early indicator of kidney disease and its persistence is known to be associated with the progression of kidney disease [22]. In addition to this large amounts of albumin in the urine indicate a late stage of diabetic renal disease and indicate, next to the loss of Glomerular filtration rate and the degree of kidney damage. That means the degree of increased albumin loss also heralds an increased chance of losing kidney function [23].

5. Limitations of the study

In this study, we use eGFR <60 mL/min/1.73 m^2 using CKD EPI equation to define CKD and the proportion of CKD in the study group could be underestimated because we did not use Imaging modalities for structural abnormalities of the kidney for the diagnosis of CKD among diabetes. This does not permit us to be more definitive about the diagnosis of diabetes-related kidney disease.

6. Conclusions

This study demonstrated that the proportion of CKD in a sample of 329 diabetic patients in TGSH was relatively high as compared to previous studies. The study also found that there is statistically a significant association between CKD and older age, pre-existing HTN, systolic blood pressure ≥140mmHg, and presence of albuminuria.

7. Recommendation

The patients should have strict follow-up once they are diagnosed with DM which helps them for early detection of CKD and the health care professionals should consider routine CKD screening for all diabetic patients for early detection and delayed progression of CKD, they should consider strict follow-up for older age patients, patients with comorbidities like hypertension, and patients with Albuminuria, and patients with higher systolic blood pressure at presentation needs optimization of blood pressure for prevention of CKD and to decrease its progression. In addition, health facilities and other governmental and non-governmental organizations should maximize the availability and utilization of medical equipment and supplies for the screening of DM and its complications. In addition, they should allocate resources to manage DM and support ongoing effects to reduce the progression of CKD.

Ethics consideration

Ethical clearance was obtained from Bahir Dar University Ethics Review Committee with a reference number of 0037/2021 and the study was also conducted following the Declaration of Helsinki. The name of the participants was not used in collecting the data from the medical files. Confidentiality was maintained by keeping the data collection forms locked in a secure cabinet and the electronic data file was kept securely in a password-protected computer. Data obtained in the course of the study was only handled by the research team.

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CRediT authorship contribution statement

Daniel Tesfe: Formal analysis, contributed to, designing the, study, manuscript preparation, and finalization. contributed to data analysis, and data interpretation. All authors read and approved the final manuscript. **Mesert Adugna:** Formal analysis, Supervision, contributed to, designing the, study, manuscript preparation, and finalization. contributed to data analysis, and data interpretation. participated in the supervision of the study. All authors read and approved the final, manuscript. All, authors read and approved the final, manuscript.and. **Zelalem Mehari Nigussie:** Formal analysis, Supervision, contributed to, designing the, study, manuscript preparation, and finalization. contributed to data analysis, and data interpretation. participated in the supervision of the study. All authors read and approved the final manuscript. **Alem Endeshaw Woldeyohanins:** Formal analysis, contributed to data analysis, and data interpretation. All authors read and approved the final, manuscript.and. **Zemene Demelash Kifle:** Formal analysis, contributed to data analysis, and data interpretation. All authors read and approved the final manuscript.

Availability of data and materials

Most of the data is included in the manuscript. Additional can be found from the corresponding author based on reasonable request.

Declaration of competing interest

The authors declare that they have no competing interests.

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Abbreviations:

AOR	Adjusted odds ratio
BDU	Bahir Dar University
BMI	Body Mass Index
CKD	Chronic Kidney Disease
DALY	Disability Adjusted Life Year
DM	Diabetic Mellitus
ESKD	End Stage Renal Disease
eGFR	Estimated Glomerular Filtration Rate
QOL:	Quality of life
SPSS	Statistical Package for Social Sciences
T2DM	Type 2 Diabetic Mellitus
TGSH	Tibebe Ghion Specialized Hospital

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