Scientific Journal of
Immunology & Immunotherapy

Research Article

The Prevalence of Chronic Kidney Disease and Associated Factors among Type-2 Diabetic Patients Admitted to Dilla University Referral Hospital Medical, Ward, Snnpr, Ethiopia, 2019 -

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Submitted: 22 June 2020; **Approved:** 20 October 2020; **Published:** 28 October 2020

Cite this article: Nibret E, Worku G, Zewdie A. The Prevalence of Chronic Kidney Disease and Associated Factors among Type-2 Diabetic Patients Admitted to Dilla University Referral Hospital Medical, Ward, Snnpr, Ethiopia, 2019. Sci J Immunol Immunother. 2020;4(1): 016-021.

ABSTRACT

Background: Type 2 diabetes mellitus globally affects 18–20 % of adults over the age of 65 years .Diabetic kidney disease is one of the most frequent and dangerous complications of type-2 diabetes mellitus, affecting about one-third of the patients with type-2 diabetes mellitus. However; there was no any related studies address in study area concerning this issue. Therefore, this study is conducted with the aim of determining the prevalence of chronic kidney disease and its associated factors among type 2 diabetic patients admitted to Dilla University Referral Hospital medical ward from 2015-2018.

Methods: Retrospective study design was conducted from 2015-2018, at medical ward health management information system log book and chart of the patients were reviewed for all type 2 diabetes mellitus patients who was admitted to medical ward during last 4 years period. The data was collected by using structured pre-tested checklists. Systematic random sampling technique was used to select 307 type-2 Diabetes Mellitus. The data was analyzed by Statistical package social science version 20 and displayed descriptive statistics through tables. Binary and logistic regression models were used to identify the association between the dependent and independent variable at the odd ratio 95 % confidence interval with *P-value* less than 0.05

Result: In this study the prevalence of chronic kidney disease among type-2 diabetes mellitus patients admitted to medical ward of Dilla University Referral Hospital in the last four years (2015-2018) was 18.24 %.The associated factors for chronic kidney disease were poor glycemic control 50(16.3 %),high blood pressure 36(11.7 %) and family history of kidney disease 21(6.8 %).

Conclusion: There is relatively higher prevalence rate of chronic kidney disease and increasing number of chronic renal failure among type 2 diabetes mellitus patients who had been admitted in the medical ward of study site. Hypertension, poor glycemic control and family history of kidney disease were found to be associated factors of chronic kidney disease. To recommend that the policy makers and health planners should be focused to develop effective strategies for the prevention of occurrying chronic kidney disease due to type 2 diabetes mellitus diseases.

Keywords: Chronic kidney disease; Type 2 diabetic patients

ABBREVIATIONS

AOR: Adjusted Odd Ratio; BP: Blood Pressure; BMI: Body Mass Index; CKD: Chronic Kidney Disease; COR: Crude Odd Ratio; DM: Diabetic Mellitus; EGFR: Estimated Glomerular Filtration Rate; RBS: Random Blood Sugar

BACKGROUND

The prevalence and incidence of Diabetes Mellitus(DM) has increased significantly worldwide, mainly due to a higher prevalence of type 2 DM. Type 2 DM globally affects 18-20 % of adults over the age of 65 years. It is estimated that approximately 285 million people, between 20 and 79 years old, currently have DM, 70 % of whom live in middle- and low-income countries. This increase in type 2 DM occurs disproportionately, affecting mainly developing countries, thus bringing enormous challenges in the public health care for these patients [1].

Diabetic Kidney Disease (DKD) is one of the most frequent and dangerous complications of type 2 DM, affecting about one-third of the patients. In addition to the increasing complexity of outpatient care for patients with DM, DKD results in increased hospitalizations and mortality rates, especially due to cardiovascular complications. DKD also increases the demand for renal replacement therapies, such as dialysis and kidney transplants. The combined economic and social costs of this disease are high and of concern to the world's health systems [2].

Chronic Kidney Disease (CKD) is an emerging global public health problem. The disease is a component of a new epidemic of chronic conditions that replaced malnutrition and infection as leading causes of mortality during the 20th century. Age-standardized death rates due to CKD have increased during the last 23 years. CKD has shifted from the 36th cause of death in 1990 to the 19th cause in 2013 [3].

A change in the global approach to CKD from the treatment of End Stage Renal Disease (ESRD) to intensive primary and secondary prevention is therefore considered an absolute public health priority [4]. Africa is the second largest continent in the world, with a population of over 1 billion; 961.5 million people live in sub-Saharan Africa and 195 million in Northern Africa [5]. Africa now faces the dual challenge of infectious illnesses and chronic diseases. Africa's chronic disease burden is secondary to various factors, including increased life expectancy, changing lifestyle practices, poverty, urbanization and globalization [6].

The risk of all cause and cardiovascular mortality, kidney failure, cardiovascular disease and hospitalizations is higher among diabetic patients with CKD, as defined through estimated GFR (eGFR) < 60 ml/min/1.73 m2, than among those with normal renal function [7-9. Additionally, affected patients have an increased risk of complications, such as hypertension, anemia, malnutrition, bone and mineral disorders, retinopathy and neuropathy, and thus suffer extra morbidity and mortality [10,11].

In countries like Ethiopia, most patients will not have access to therapy for kidney failure. With limited resources, the focus must be on detection and prevention of kidney disease. However, as part of this effort it is important to lay the foundation for effective care programs to treat advance stages of kidney disease, including treating kidney failure with dialysis [12,13].

Although estimating the prevalence of CKD combined with identification and treatment of risk factors is central to disease management and prevention planning, there are virtually no published studies on the prevalence and risk factors of CKD among diabetic

patients in Ethiopia. Thus, the aim of this study was to estimate the prevalence and associated risk factors of CKD among diabetic adults attending their course treatment at hospital of Southern Ethiopia.

METHODS

Study setup

A descriptive institution based-retrospective study was conducted at DURH which is located in Dilla Town. The town is found in Gedeo Zone SNNPR, Southern Ethiopia and located 360 kms southern of Addis Ababa, which is the capital city of Ethiopia. DURH has five wards, namely Medical (39 beds), surgical (29 beds), obey/gyn (25 beds), Pediatrics (38 beds) and psychiatry (12 beds) and all DM patients who were admitted to DURH medical ward in the last 4 years was included in the study. The study period was from January to– June 2019 on type 2 DM patients who had developed chronic kidney disease; and were admitted in medical ward from 2015-2018.

Sample size and sampling procedure

The sample size was determined by using single population proportion formula of the p-value 23.8 % which was done previously at facility based cross sectional study conducted in Butajira hospital, southern Ethiopia with 5 % marginal error(d) and 95 % of Confident Interval (CI) of certainty(alpha = 0.05) [14]. Finally added 10 % by considering incomplete data recorded on patients chart and registration books showed that 279+27.9 = 306.9~307.

Systematic random sampling technique has undertaken. There were 10,408 patients admitted to medical ward of DURH in the last four years (2015-2018). Among those, 334 were type 2 DM patients admitted to medical ward. So; the k value was obtained by dividing 334/307 = ~1.09 Therefore; all admitted type 2 DM patients were selected from the recorded and the chart was reviewed in detail.

Data collection and analysis

Data was collected manually by using well prepared check list format derived by National Kidney Foundation-2013. It was collected from the registration books of laboratory findings after investigation of patients' blood sample are recorded. Likewise; the HMIS registration books in medical ward and patients chart was reviewed in detail. All socio demographic data and the possible associated factors were recorded into the checklist carefully.

Data were entered using SSPS version 20 statistical software for further analysis. Descriptive statistics were carried out to identify the study population using socio demographic and others variables and the prevalence of chronic kidney disease was estimated for the overall sample at 95 % confidence intervals using logistic regression analysis. CKD was considered on type -2 DM patients who had baseline serum creatinine value, and eGFR was calculated with current Creatinine value. Both bivariate and multivariate analysis was used to identify associated factors and Crude& adjusted odds ratios with their 95 % CI were calculated to determine the strength and presence of association at the P- value less than 0.05 that was considered to declare the level of significance.

RESULT

Characteristics of respondents

The characteristics of respondents showed that a total of 307 of them fulfill the required variables and involved in this study. From the total study groups, nearly three-fourth 218(71 %) of the type-2 DM patients were age 41-50 years old and half of them 155(50.5 %) were females. The mean age of the respondent was 47.38 years (S.D 7.6) with maximum and minimum of 64 years and 32 years respectively. Around a half (48.9 %) attended higher education level (Table 1).

Table 1: Distribution of CKD in relation to socio-demographic and other characteristics of type -2 DM patients admitted in Dilla referral hospital medical ward in the last four years (2015-2018), May, 2019. (n= 307).

Characteristics	Categories	Chronic Kidney Disease (CKD)		Total n(%)
		Yes n(%)	NO n(%)	
Age in years	30	0	45(14.7)	45(14.7)
	41	43(14)	175(57)	218(71)
	51	7(2.9)	22(7.2)	29(9.4)
	61	7(2.9)	8(2.6)	15(4.9)
Sex	Male	19(6.2)	133(43.3)	152(49.5)
	Female	37(12)	118(38.4)	155(50.50
Wheat in Kg	50-60	14(4.6)	114(37.1)	128(41.7)
	61-70	36(11.7)	129(42)	165(53.7)
	> 70	7(2.3)	7(2.3)	14(4.6)
Level of education	Can't read& write	0	21(6.8)	21(6.8)
	Can only read& write	50(16.3)	79(25.7)	129(42)
	Diploma& BSc	7(2.3)	143(46.6)	150(48.9)
	MSc& above	0	7(2.3)	7(2.3)
Regular Exercise	Yes	0	180(58.6)	180(58.6)
	NO	57(18.6)	70(22.8)	127(41.4)
Diet	Only sugar free	0	173(56.4)	173(56.4)
	Most of the time sugar free	50(16.3)	56(18.2)	106(34.5)
	Sometimes sugar free	7(2.3)	21(6.8)	28(9.1)
Income	<1500	14(4.6)	49(16)	63(20.5)
	1500 - 3000	43(14)	152(49.5)	195(63.5)
	3001 - 4500	0	42(13.7)	42(13.7)
	> 4500	0	7(2.3)	7(2.3)
Life style	Sedentary	36(11.7)	35(11.4)	71(23.1)
	Smoking	7(2.3)	7(2.3)	14(4.6)
	Short sleep duration	14(4.6)	14(4.6)	28(9.1)
	Daily physical exercise	0	194(63.2)	194(63.2)
Admission RBS value	<180 mg/dl	57(18.6)	64(20.8)	121(39.4)
	180 - 600mg/dl	0	94(30.6)	94(30.6)
	High range	0	92(30)	92(30)
Drug discontinuance	Yes	57(18.6)	78(25.4)	135(44)
	No	0	172(56)	172(56)
Duration of DM in years	<5	0	144(46.9)	144(46.9)
	05-Oct	28(9.1)	92(30)	120(39)
	Nov-15	22(7.1)	14(4.6)	36(11.7)
	> 15	7(2.3)	0	7(2.3)
BMI	Under wgt	0	7(2.3)	7(2.3)
	Healthy wgt	0	215(70)	215(70)
	Over wgt	43(14)	28(9.1)	71(23.1)
	Obesity	14(4.6)	0	14(4.6)

High BP	Yes	36(11.7)	29(9.4)	65(21.2)
	No	21(6.8)	221(72)	242(78.8)
ACEI/ARB drug use for HTN control	Yes	57(18.6)	110(35.8)	167(54.4)
	No	0	140(45.6)	140(45.6)
Any comorbid condition	Yes	43(14)	78(25.4)	121(39.4)
	No	14(4.6)	172(56)	186(60.6)
Recent serum CR value	Yes	57(18.6)	236(76.9)	293(95.4)
	No	0	14(4.6)	14(4.6)
Baseline serum CR value	Yes	57(18.6)	208(68.4)	265(86.3)
	No	0	42(13.7)	42(13.7)
eGFR in ml/min/1.73m2	≥90	0	250(81.4)	250(81.4)
	60 - 89	14(4.6)	0	14(4.6)
	45 - 59	15(4.9)	0	15(4.9)
	30 - 44	7(2.3)	0	7(2.3)
	15 - 29	14(4.6)	0	14(4.6)
	<15	7(2.3)	0	7(2.3)
Stage of CKD	Stage - II	14(4.6)	0	14(4.6)
	Stage - IIIA	15(4.9)	0	15(4.9)
	Stage - IIIB	7(2.3)	0	7(2.3)
	Stage - IV	14(4.6)	0	14(4.6)
	Stage - V	7(2.3)	0	7(2.3)
Family history of kidney disease	Yes	21(6.8)	8(2.6)	29(9.4)
	No	36(11.7)	242(78.8)	278(90.6)
Kidney US finding	Yes	50(16.3)	0	50(16.3)
	No	7(2.3)	250(81.4)	257(83.7)
Poor glycemic control	Yes	50(16.3)	108(35.2)	158(51.5)
Total serum cholesterol level	No	7(2.3)	142(46.3)	149(48.5)
	Yes	21(6.8)	236(76.9)	257(83.7)
	No	36(11.7)	14(4.6)	50(16.3)

ASSOCIATED FACTORS RELATED TO CKD

In multiple logistic regression analysis hypertension was significant associated variable and type 2- DM patients who had no hypertensive was almost 94 % less likely to develop CKD (AOR = 0.061, 95 % CI: 0.03-0.15) compared to hypertensive patients. Patients who had good glycemic control had almost 71 % less likely to develop CKD (AOR =0.29(95 % CI = 0.11-0.78), compared to those who had poor glycemic control. Type 2-DM patients who have no family history of kidney disease 97 % less likely to develop CKD (AOR =0.029, 95 % CI = 0.01-0.09) as compared from those who have family history of kidney disease (Table 2).

DISCUSSION

As it was indicated by different studies, CKD is one of the major health problems in the world, especially in low resource settings. The

Table 2: Bivariate and multivariate analysis of associated factors of CKD in type 2-dm patients admitted in medical ward of Dilla University referral hospital for the previous four years (2015-2018) may, 2019 (n=307).

Characteristics	Categories	CKD		OR(95%CI)	
		Yes	NO	COR	AOR
Poor glycemic control	Yes	50(16.3)	108(35.2)	0.11(0.05-0.25)**	0.29(0.11-0.81)*
	No	7(2.3)	142(46.3)	1	1
High blood pressure	Yes	36(11.7)	29(9.4)	0.08(0.04-0.12)***	0.06(0.02-0.23)***
	No	21(6.8)	221(71.99)	1	1
Family history of kidney disease	Yes	21(6.8%)	8(2.6%)	14.9(6.31-35.34***	0.03(0.01-0.09)***
	No	36(12%)	242(78.83)	1	1
Comorbid conditions	Yes	42(13.68)	79(25.73)	0.15(0.08-0.30)***	0.99(0.28-3.58)
	No	14(4.56)	172(56.02)	1	1

Prevalence and mortality rate increases through time in among type 2 DM patients in medical wards of Hospitals [15].

The present study showed that among 307 of type 2 DM patients who were admitted in medical ward of DURH in the previous four years (from 2015-2018), 18.24 % had CKD. This is similar to the finding from a study done in Butajira Hospital, in south Ethiopia where it was found that 18.2 % with eGFR calculated by MDRD and, it was 23.8 % with cocraff- Gaulttechnique. It is more common in age groups of >60 years (64.3 %) than <60 years old (17.7 %) (p <0.001) .In the current study it is more prevalent in age groups 41-50 years old (71 %) among that, 14 % of type 2 DM patients has CKD and 2.9 % of which were age groups greater than 60 years old. In the study of Butajirahospital, those type-2 DM patients whose age groups greater than 60 years old, and had diagnosis CKD were 64.3 %. This much difference in age groups might be due to the study design, not recording the exact age of the patients [14].

Other study done in India, the prevalence of CKD was 64.7 % of which 46 % were females. The mean age was 53.4 (± 11.9) years, with a mean body mass index of 27.3 (± 4.8) kg/m2., but in the current study 155(50.5 %) were females. The mean age and BMI were 47.38 years (±0.46) and 23.09 kg/m2(±0.19) respectively [16,17]. This difference might be due to the study design, race or life style.

According to the study that done in the Three Hospitals (Black Lion Specialized Hospital, St. Paul's Hospital Millennium Medical College and Zewditu Memorial Hospital), the overall prevalence of CKD was 54.9 %. Most of CKD patients were stage-V 163 (38.6 %) and the least were stage –II 49 (11.6 %). In the current study most of CKD patients were stage –III 22 (7.2 %) and the least were stage –V 7(2.3 %) [18,19]. This difference might be due to use of different formula to calculate the eGFR, use of different mobile applications to calculate the eGFR ,study design and not recording the exact age of patients.

According to the study done in Gaborone, Botswana, the prevalence of CKD was 63.5 % .Most of CKD patients were stage –I and the prevalence decreases serially from stage-II, III, IV to stage-V 53.3 %, 29.9 %, 13.9 %2.3 % and 0.77 % respectively. In the Gaborone's study, not achieving the target BMI, target glycemic control and use of ACEI/ARB are significantly associated with CKD. The prevalence of target BMI, target glycemic control, hypertension and ACEI/ARB use were19.3 %,38.2 %, 20.9 % and 52.5 % respectively. In the current study the prevalence is 3.5 times less than that of the Gaborone's

study and most of the CKD were stage –IIIA (4.9 %) ,but stage-II and stage IV had the same magnitude which was 4.6 % [20].

In the current study, the prevalence of CKD was almost half of the study in the University of Washington (37.6 %). In Washington CKD accounted 58.7 % in patients aged >60 years, 25.7 % in patients aged <60 years. In this study, older age, poor glycemic control, and having hypertension were significantly associated with CKD presence but not increasing severity of CKD. In the current study, the prevalence was 2.9 % in patients aged >60 years, but 16.9 % in patients aged <60 years. In the current study, Older age, having high admission RBS value were not significantly associated with CKD, but having hypertension, family history of kidney disease and poor glycemic control were significantly associated with CKD. But whereas a protective factor for CKD with AOR of 0.06(0.03-0.15),0.03(0.01-0.09) and 0.29(0.11-0.78) respectively [21]. This difference can be due to the study design, race, life style, use of different technique to calculate eGFR, use of different software to calculate eGFR or not recording the exact age of patients in Dilla hospital.

CONCLUSION

The present study indicated that there is relatively high prevalence rate of CKD and increasing number of chronic renal failure among type 2 DM patients who had been admitted in the medical ward and the most common chronic complication of type 2-DM was CKD. Hypertension, poor glycemic control and family history of kidney disease were found to be predictors of CKD. Strengthening the prevention strategies of chronic diseases and their complications and once CKD is diagnosed, physicians should fulfill all investigating modalities and document it to the chart of the patients clearly, and upon discharge closely follow the patient in short appointments in medical referral clinic.

AUTHORS' CONTRIBUTION

EN was the principal investigator and wrote the paper included data collection, analysis and interpretation. GW made substantial contributions to the analysis and interpretation of the data, drafting and revising the manuscript. AZ was also contributed to data analysis and interpretation as well as revising the manuscript. They also reviewed the first and second drafts. All authors read and approved the final manuscript.

ACKNOWLEDGEMENT

We thank the Dilla Referral Teaching Hospital for providing use with the dataset to conduct this study. We are also thankful to University of Dilla for the approval of ethical clearance and technical support.

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