

Prevalence of Chronic Kidney Disease in Patients with Type 2 Diabetes Mellitus attending A Secondary Care Hospital in North Central Nigeria

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ABSTRACT

Worldwide, Chronic Kidney Disease (CKD) is a public health problem that is associated with adverse outcomes of kidney failure, diseases of the cardiovascular system and untimely death. The purpose of this study was to determine the prevalence of chronic kidney disease in type 2 diabetes mellitus (DM) patients and to determine kidney staging on the basis of estimated glomerular filtration rate (eGFR) values. One hundred and twenty (120) patients were recruited for the study (mean age 54.7 ± 14.701). This study was a prospective cross sectional study among out-patients with Diabetes mellitus in north central Nigeria. A validated questionnaire was used to capture socio-demographics. Informed consent was obtained from each patient and blood samples were collected in an EDTA vacutainer, after which the blood samples were sent to PATHCARE diagnostic center, to determine the serum creatinine and eGFR levels. Most of the subjects were female (75.0%) while only 25.0% were males. More than one half (67.5%) of the subjects have Stage I, 21.7% have Stage 2, 7.5% were on Stage 3, 1.7% on Stage 4 and 1.7% of the subjects have Stage 5 kidney disease. The prevalence of CKD among the type 2 Diabetes Mellitus patients studied was 10.8%. There is a need for studies with larger sample size. Routine eGFR assessment after 3 months in subjects with eGFR less than 60 mL/min/1.7 m² should be emphasised.

Keywords: Chronic Kidney disease (CKD), Diabetes mellitus, estimated glomerular filtration rate (eGFR).

INTRODUCTION

Chronic kidney disease (CKD) is an important contributor to morbidity and mortality from non-communicable diseases, and this disease should be actively addressed to meet the United Nation's Sustainable Development Goal target. This was to reduce premature mortality from non-communicable diseases by a third by 2030¹. Worldwide, CKD is a public health problem that is associated with adverse outcomes of kidney failure, diseases of the cardiovascular system and untimely death². The causes of CKD that are most frequent are diabetic nephropathy, hypertension, glomerulonephritis, pyelonephritis, polycystic kidney disease,

obstructive nephropathy and interstitial nephritis. Also, CKD can be the final outcome of untreated acute kidney injury (AKI) that is caused by medicines, infections, toxic substances and heavy metals including cadmium, lead, mercury and chromium³. CKD diagnosis is commonly made when the symptoms become worsened, or after chance findings from screening tests (urinary dipstick or blood tests). The best indicator to determine overall kidney function is estimated Glomerular Filtration Rate (eGFR), which is determined either via exogenous markers (egiohexol) or calculated using equations⁴. The primary cause of CKD varies by setting, with hypertension and diabetes

being the most common causes⁵. Overall, the prevalence of CKD is high (9.1% of the global population) with CKD and its effect on cardiovascular disease resulting in 2.6 million deaths and 35.8 million disability-adjusted life-years (DALYs), with most DALYs attributable to CKD occurring in middle and low-middle Socio-demographic Index (SDI) quintiles. Importantly, CKD has continued to rise in rank among leading causes of death over the 27-year period studied, because of ageing and an increasing burden of risk factors for CKD (including diabetes and hypertension) that, together, contributed to more than half the deaths from CKD in 2017⁶. CKD is associated with an increased risk for cardiovascular disease mortality and is a risk multiplier in patients with hypertension and diabetes⁷⁻⁹. The prevalence of CKD is also increasing at a more rapid rate in developing countries. These differences between the developed and the developing countries are due to the fact that the burden of CKD is moving away from communicable diseases and toward chronic NCDs in the developed countries of the world. However, in developing countries, there is a double burden of communicable diseases and NCDs. The prevalence of some diseases such as obesity, hypertension, and diabetes mellitus has increased in the developing countries of the world such as Nigeria due to many factors¹⁰⁻¹². CKD has a huge financial burden on families of subjects with the medical condition in Nigeria¹³⁻¹⁴. Based on the aforementioned and paucity of data on the prevalence of CKD in Kwara State. Hence, there is need to conduct a study on the prevalence of CKD among patients with type 2 diabetes mellitus in Ilorin, Kwara State, Nigeria.

METHOD

Study design

This study is a prospective cross sectional study among out-patients with Diabetes mellitus.

Study site description

The study was conducted at General OutPatients Department (GOPD) clinic, General Hospital, Ilorin, Kwara State. General Hospital is located along college of education road, opposite Queen Elizabeth School, Ilorin. Ilorin is the state capital of Kwara in North-Central, Nigeria. The newly remodeled general hospital is a 500-bedded hospital that was commissioned on the 10th of June, 2014. Its mandate is to provide primary, secondary and tertiary healthcare services.

Study population:

Subjects were patients with diabetes mellitus attending GOPD.

Inclusion Criteria

1. Type 2 DM patients.
2. Male and female patients above 18 years of age.
3. Patients with diabetes mellitus and hypertension comorbidities or patients with not more than 3 comorbidities.

Exclusion Criteria

1. Type 1 DM patients
2. <18 years old patients
3. Emergency patients
4. Patients with more than 3 comorbidities
5. Pregnant women

Sampling Technique

Convenient sampling method was used to enroll eligible patients who consented to participate in the study.

Sample size determination

The minimum sample size of T2DM patients attending GOPD, General Hospital, Ilorin, was determined by using the statistical formula of Fisher as described by Araoye, 2003¹⁵. Thus, the sample size for this study was 120 subjects.

Data Collection

Patient recruitment was done at GOPD clinic in collaboration with the doctors. All those who met the inclusion criteria were selected. Informed consent was obtained and patients were counselled appropriately. A validated questionnaire was administered

to obtain all relevant information on socio-demographics. With the help of a phlebotomist, blood samples were collected in an EDTA vacutainer, after which blood samples were sent to PATHCARE diagnostic center, where creatinine levels were calculated and eGFR values determined.

Data analysis

Descriptive analysis was used for continuous variables such as age. The mean, median, standard deviation and range were tabulated. For categorical measurements such as gender; the frequencies were computed. Data was analyzed using the SPSS version 21. P-value < 0.05 was considered as statistically significant.

Ethical consideration

Ethical approval was obtained from the Ministry of Health and General Hospital, Ilorin. Any significant change(s) that was made to the study, was communicated to the

ethical committee as appropriate. Written and oral consents of the patients were sought before enrolment.

RESULTS

Socio- Demographic Information of Subjects

The mean age of the subjects was 54.7 ± 14.701 with the minimum age of 22 years while the maximum age was 100 years. There were more female subjects 75% while only 25% of the subjects were males. Majority of the subjects (50.8%) are Muslims, while the remaining 49.2%, are Christians. The data obtained reveals that 61.7% of the subjects were Yorubas, 25% Igbos and only 13.3% were Hausas. Based on Educational Status, 37.5% of the subjects have secondary educational status while 28.3% have primary education, 29.2% have the tertiary level and the remaining 6% do not have formal educational.. Also, 70% are married, 23.3% are single while 6.7% of the subjects are widowed (Table 1).

Table 1: Socio-Demographic Information of the Subjects

		N=120	Frequency (F)	Percentage (%)
Age mean		54.70±14.701		
Gender	Male	30		25
	Female		90	75
Religion	Islam		61	50.8
	Christianity		59	49.2
Tribe	Yoruba		74	61.7
	Igbo		30	25.0
	Hausa		16	13.3
Educational status	Primary		34	28.3
	Secondary		45	37.5
	Tertiary		35	29.2
	Nil		6	5.0
Marital status	Married	84		70.0
	Single		28	23.3
	Widowed		8	6.7

Table 2 illustrates the kidney staging of the subjects using eGFR values. It can be deduced that 67.5% of the subjects have Stage I, 21.7% have Stage 2, 7.5% have

Stage 3, 1.7% have Stage 4 and the remaining 1.7% of the subjects have Stage 5 kidney disease. The eGFR was calculated using the Modification of Diet in Renal

Disease (MDRD) formula.

Table 2: Classification of CKD among type 2 Diabetes Mellitus Patients using eGFR

CKD staging Based on eGFR level (mL/min/1.7m ²)	Observed N	Expected N	Residual	X ²	p-value
Stage I: >90	81	24.0	57.0	185.250	0.000
Stage II: 60-89	26	24.0	2.0		
Stage III = 30-59	9	24.0	-15.0		
Stage IV = 15-29	2	24.0	-22.0		
Stage V = <15	2	24.0	-22.0		
Total	120				

Using the MDRD formula

Of 120 patients studied, only 13 had cases of CKD with a prevalence of 10.8% as shown in Table 3 below.

Table 3: Prevalence of CKD among Type 2 Diabetes Mellitus Patients Studied

Number of patients studied	Number of patients with CKD (Stage III -V)	Percentage of Patients with CKD
120	13	10.8

Prevalence of CKD found = 10.8%

DISCUSSION

The ratio of male to female with CKD in this study was 1:3. In a review of population-based studies on the prevalence of CKD it was observed that several studies had higher prevalence of CKD in females¹⁶. In a community-based study on kidney disease in Uganda a higher prevalence of CKD in the female was also observed¹⁷. The fact that men have more muscle mass than women, and the differences in hormone metabolism and glomerular structure are assumed to play a role in the differences in prevalence of CKD observed between male and female gender¹⁸. Chronic Kidney Disease (CKD) is defined as a chronic condition characterized by decreased kidney function that is shown by a glomerular filtration rate (GFR) that is less than 60 mL/min per 1.73m²⁴. The prevalence of CKD in patients with T2DM was 10.8%. In contrast to 25.2% in a study in 16 Health Centers of Health Sector in

Alcañiz¹⁹. Also higher in a suburban community in Thailand, the estimated prevalence of CKD stages 3–5 (eGFR < 60 mL/min/1.73 m²) in T2DM patients was 24.4%²⁰. While in Macedonia, 7.5% Subjects was with CKD²¹. Globally, the overall prevalence of CKD among T2DM patients varied at 6.0–39.3%. These discrepancies across different settings may be attributed to the variations in diagnostic methods used²⁰. In a study in Nigeria four of the seven studies that used MDRD formula to calculate eGFR, the prevalence observed were 12.3%, 14.2%, 2.5%, and 13.4%²². T2DM patients with CKD were more likely to have diabetes-related complications including ischaemic heart disease, cerebrovascular disease, diabetic retinopathy, and albuminuria than those without CKD. Taken together, these figures are in line with previous nationwide reports in a study in Thailand²³. Our study delivers previously unrecognized data on the

prevalence of CKD among T2DM in an urban community like kwara state

Due to rapid urbanization and the dramatic increase in the elderly population, our findings support the well-recognized fact that routine surveillance is mandatory to prevent the development of End Stage Renal Disease (ESRD) and decrease the healthcare burden²⁰. This study may also contribute to the fact that improving diabetes care management and screening patients with type 2 DM for CKD will prevent the cascade of events leading to nephropathy by implementing adequate glycemic and blood pressure controls, especially in the early stages of CKD²⁴. The relatively low prevalence of CKD seen amongst T2DM patients attending general hospital can be said to be due to the fact that the sample size was very small, it was not multi-center and the duration of time of study was short.

CONCLUSION

REFERENCE

1. Himmelfarb, J., &Ikizler, T. A. (2010). Hemodialysis. *New England Journal of Medicine*, 363(19), 1833-1845.
2. Levey, A. S., Atkins, R., Coresh, J., Cohen, E. P., Collins, A. J., Eckardt, K. U., &Eknoyan, G. (2007). Chronic kidney disease as a global public health problem: approaches and initiatives—a position statement from Kidney Disease Improving Global Outcomes. *Kidney international*, 72(3), 247-259
3. Zirogiannis, P., Pieridis, A., & Diamantopoulos, A. (2005). Clinical nephrology, volume D.
4. Webster, A. C., Nagler, E. V., Morton, R. L., & Masson, P. (2017). Chronic kidney disease. *The lancet*, 389(10075), 1238-1252.
5. Couser, W. G., Remuzzi, G., Mendis, S., &Tonelli, M. (2011). The contribution of chronic kidney disease to the global burden of major noncommunicable diseases. *Kidney international*, 80(12), 1258-1270.
6. Bikbov, B., Purcell, C. A., Levey, A. S., Smith, M., Abdoli, A., Abebe, M., &Owolabi, M. O. (2020). Global, regional, and national burden of chronic kidney disease, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*, 395(10225), 709-733.
7. Couser, W. G., Remuzzi, G., Mendis, S., &Tonelli, M. (2011). The contribution of chronic kidney disease to the global burden of major noncommunicable diseases. *Kidney international*, 80(12), 1258-1270.

The findings of the study had revealed that the prevalence of CKD in T2DM patients is 10.8% which is within the range of global prevalence.

RECOMMENDATION

Further studies are needed to assess the utility of integrating the clinical predictive factors of CKD among T2DM patients as a part of routine diabetes care and call for strategic goals and actions upon their recognition to reduce the CKD incidence or slow CKD progression²⁰.

STUDY LIMITATION

A major drawback in these studies is that the estimated GFR of the subjects who were observed to have CKD was only assessed once. Ideally, the assessments should have been repeated 3 months later to find out if the values of the estimated GFR were still below 60 mL/min/1.73 m² in the subjects with CKD².

8. Matsushita, K., Coresh, J., Sang, Y., Chalmers, J., Fox, C., Guallar, E., & CKD Prognosis Consortium. (2015). Estimated glomerular filtration rate and albuminuria for prediction of cardiovascular outcomes: a collaborative meta-analysis of individual participant data. *The lancet Diabetes & endocrinology*, 3(7), 514-525.
9. Chronic Kidney Disease Prognosis Consortium. (2010). Association of estimated glomerular filtration rate and albuminuria with all-cause and cardiovascular mortality in general population cohorts: a collaborative meta-analysis. *The Lancet*, 375(9731), 2073-2081.
10. Barsoum, R. S. (2006). Chronic kidney disease in the developing world. *New England Journal of Medicine*, 354(10), 997-999.
11. Okpechi, I. G., Chukwuonye, I. I., Tiffin, N., Madukwe, O. O., Onyeonoro, U. U., Umeizudike, T. I., & Ogah, O. S. (2013). Blood pressure gradients and cardiovascular risk factors in urban and rural populations in Abia State South Eastern Nigeria using the WHO STEPwise approach. *PloS one*, 8(9), e73403.
12. Chukwuonye, I. I., Chuku, A., John, C., Ohagwu, K. A., Imoh, M. E., Isa, S. E., & Oviasu, E. (2013). Prevalence of overweight and obesity in adult Nigerians—a systematic review. *Diabetes, metabolic syndrome and obesity: Targets and Therapy*, 6, 43.
13. Chukwuonye, I. I., & Oviasu, E. (2012). The plight of chronic kidney disease patients in Nigeria. *J Dental Med Sci*, 2(2), 52-55.
14. Ulasi, I. I., & Ijoma, C. K. (2010). The enormity of chronic kidney disease in Nigeria: the situation in a teaching hospital in South-East Nigeria. *Journal of tropical medicine*, 2010.
15. Araoye M.O. Research methodology with statistics for health and social sciences. Nathades Publishers, Ilorin, Nigeria. 2003; 17(1);115-120
16. Zhang, Q. L., & Rothenbacher, D. (2008). Prevalence of chronic kidney disease in population-based studies: systematic review. *BMC public health*, 8(1), 1-13.
17. Kalyesubula, R., Nankabirwa, J. I., Ssinabulya, I., Siddharthan, T., Kayima, J., Nakibuuka, J., & Hricik, D. (2017). Kidney disease in Uganda: a community based study. *BMC nephrology*, 18(1), 1-9.
18. Hecking, M., Bieber, B. A., Ethier, J., Kautzky-Willer, A., Sunder-Plassmann, G., Säemann, M. D., & Port, F. K. (2014). Sex-specific differences in hemodialysis prevalence and practices and the male-to-female mortality rate: the Dialysis Outcomes and Practice Patterns Study (DOPPS). *PLoS Med*, 11(10), e1001750.
19. Lou Arnal, L. M., Campos Gutiérrez, B., Cuberes Izquierdo, M., Gracia García, O., Turón Alcaine, J. M., Bielsa García, S., Gimeno Orna, J. A., Boned Juliani, B., Sanjuán Hernández-French, A., & Grupo de Investigación ERC Aragón (2010). Prevalencia de enfermedad renal crónica en pacientes con diabetes mellitus tipo 2 atendidos en atención primaria [Prevalence of chronic kidney

disease in patients with type 2 diabetes mellitus treated in primary care]. *Nefrologia :publicacionoficial de la Sociedad Espanola Nefrologia*, 30(5), 552–556.

20. Jitraknatee, J., Ruengorn, C., &Nochaiwong, S. (2020). Prevalence and risk factors of chronic kidney disease among type 2 diabetes patients: a cross-sectional study in primary care practice. *Scientific reports*, 10(1), 1-10.

21. Stojceva-Taneva, O., Otovic, N. E., &Taneva, B. (2016). Prevalence of Diabetes Mellitus in Patients with Chronic Kidney Disease. *Open access Macedonian journal of medical sciences*, 4(1), 79–82.

22. Chukwuonye, I. I., Ogah, O. S., Anyabolu, E. N., Ohagwu, K. A.,

Nwabuko, O. C., Onwuchekwa, U., Chukwuonye, M. E., Obi, E. C., &Oviasu, E. (2018). Prevalence of chronic kidney disease in Nigeria: systematic review of population-based studies. *International journal of nephrology and renovascular disease*, 11, 165–172.

23. Reutrakul, S., &Deerochanawong, C. (2016). Diabetes in Thailand: status and policy. *Current diabetes reports*, 16(3), 28.

24. Koro, C. E., Lee, B. H., &Bowlin, S. J. (2009). Antidiabetic medication use and prevalence of chronic kidney disease among patients with type 2 diabetes mellitus in the United States. *Clinical therapeutics*, 31(11), 2608-2617.