World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(REVIEW ARTICLE)

Predictors of renal failure among type 2 diabetic patients in Nigeria: A scoping review

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World Journal of Advanced Research and Reviews, 2026, 29(01), 1682-1691

Publication history: Received on 14 December 2025; revised on 24 January 2026; accepted on 26 January 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.29.1.0174

Abstract

Background: Although diabetes care has advanced and awareness is increasing, research on the factors leading to renal failure in Nigerian patients with type 2 diabetes remains scarce and inconsistent.

Aim: This scoping review aimed to identify and map out existing literature on renal failure predictors among T2DM patients in Nigeria.

Method: Studies published from 2016 to 2025 were identified using electronic databases including Google Scholar, PubMed, Sci-Hub, and Web of Science. Articles employed in this review were cross-sectional, prospective, retrospective, cohort, and hospital-based studies that focused on predictors, prevalence, or risk factors of kidney failure in Nigerian T2DM patients. A standardized PRISMA-guided form was employed to extract data and summarize in a descriptive and thematic approach.

Result: Seventeen studies that met the inclusion criteria were included in the analysis. The identified predictors were described and categorized into groups, including biochemical and emerging biomarkers, clinical factors, socio-demographic information, and aspects of lifestyle. Poor glycemic control (HbA1c), hypertension, prolonged duration of diabetes, dyslipidemia, and obesity were frequently identified predictors of renal impairment. Renal function evaluation across all studies relied on creatinine-based techniques, with limited use of novel biomarkers including NGAL and hs-CRP.

Conclusion: The most dominant predictors of renal failure are hypertension, BMI, duration of diabetes, obesity, poor glycemic control, dyslipidemia, albuminuria, abnormal lipids, antioxidant, advanced age, male gender, smoking, and history of diabetes. Emerging biomarkers, including neutrophil gelatinase-associated lipocalin (NGAL) and high-sensitivity C-reactive protein (hs-CRP), can contribute to early detection.

Keywords: Renal failure; Type 2 Diabetes mellitus, Glycemic control; NGAL; CRP

1. Introduction

Globally, diabetes mellitus stands as the most prevalent non-communicable disease and a significant factor in disease burden and premature mortality [1, 2]. Type 2 diabetes mellitus (T2DM), a chronic metabolic disorder marked by

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insulin resistance, where the body fails to utilize the available insulin effectively, has become a major public health challenge disproportionately affecting low- and middle-income countries [3, 4]. According to the International Diabetes Federation's 2022 estimate, 537 million adults across the globe had diabetes. By 2030, this figure is projected to grow to 643 million, and by 2045, it is expected to reach 783 million. Additionally, according to the Non-Communicable Disease Risk Factor Collaboration (NCD-RisC) in 2022, 828 million people were living with diabetes globally, with over 95% having T2DM [5]. Sub-Saharan Africa is projected to have the most rapid growth in diabetes cases, with Nigeria ranked among the top ten countries most affected globally. This underscores the importance of early management and prevention [6].

Renal complications are the most common and potentially life-altering consequences of T2DM [7]. Diabetes kidney disease (DKD), also known as Diabetes nephropathy (DN), is a micro- circulatory disorder, specifically contributing to morbidity and mortality among diabetes patients and a leading cause of end-stage renal disease (ESRD) [8–10]. Worldwide, 30-40% of T2DM patients develop chronic kidney disease, and renal failure often advances without noticeable symptoms [8, 9, 11]. A previous study in Nigeria reported that 50 out of 273 individuals with type 2 diabetes mellitus—about 18.3%—showed signs of nephropathy. The research found that having diabetes for a longer time, higher HbA1c levels, and lower eGFR were consistently linked to a higher risk. A recent systematic review highlighted the impact of hypertension, obesity, advancing age, prolonged duration of diabetes, and genetic background on diabetic nephropathy, as it increases the risk of DN, underscoring the significance of timely intervention and regular monitoring [12,13].

This scoping review seeks to research existing studies on renal failure predictors among diabetic patients with type 2 diabetes in Nigeria. By detecting and classifying these predictors, the review seeks to give an exhaustive discussion of the current state of the knowledge and gaps needed to be addressed by further research and how early intervention can be used to reduce the increasing incidence of diabetic nephropathy in the country.

2. Methodology

2.1. Study design

This scoping review was conducted to examine, map, and summarize the existing literature review on the predictors of renal failure among T2DM patients in Nigeria. The methodological approach adopted in this review was based on Arksey and O'Malley's framework, further developed through the recommendations of Levac et al., guided by the JBI Manual for Evidence Synthesis, and reported according to PRISMA-ScR standards [14].

2.2. Search strategy

A multifaceted and iterated search approach was applied via multiple electronic databases, such as Google Scholar, PubMed, Scopus, Web of Science, Sci-Hub, and the Cochrane Library, to discover significant research published between 2016 and 2025. The search strategy merge medical subject headings (MeSH) and plain-text terms, including 'renal failure,' 'type 2- diabetes mellitus (T2DM), predictors, renal failure, risk factors,' 'end-stage renal disease,' 'chronic kidney disease,' and abbreviations were employed accordingly to clarify results. To examine additional eligible publications, reference lists of included studies were screened manually.

2.3. Eligibility Criteria

Publications employed in this review were defined using the CoCoPop framework (condition, context, and population). The medical condition of interest was renal failure, including chronic kidney disease (CKD) and complications of type 2 diabetes mellitus. This review explored studies from Nigeria's clinical, community, and research environs, centered on adults with diagnosed T2DM. Studies that reported predictors, or risk factors, of renal failure among individuals with T2DM in Nigeria, published between 2017 and 2025, using observational designs including cross-sectional, case-control, or cohort studies with full-text articles available in English were included in this review. Studies without abstracts and full texts, conference extracts, or editorials, or involving T1DM or non-diabetic renal dysfunction, were excluded.

2.4. Data extraction and charting

The selected studies were added to Mendeley, and any duplicates removed. Two reviewers independently extracted the data, and any discrepancies settled through discussion. Key study characteristics such as author(s), year, location, design, and population information were collected to assess both the methodology and context of each study.

Established predictors or risk factors for renal failure were classified into clinical, biochemical, and new biomarkers, as well as demographic and lifestyle factors relevant to kidney failure.

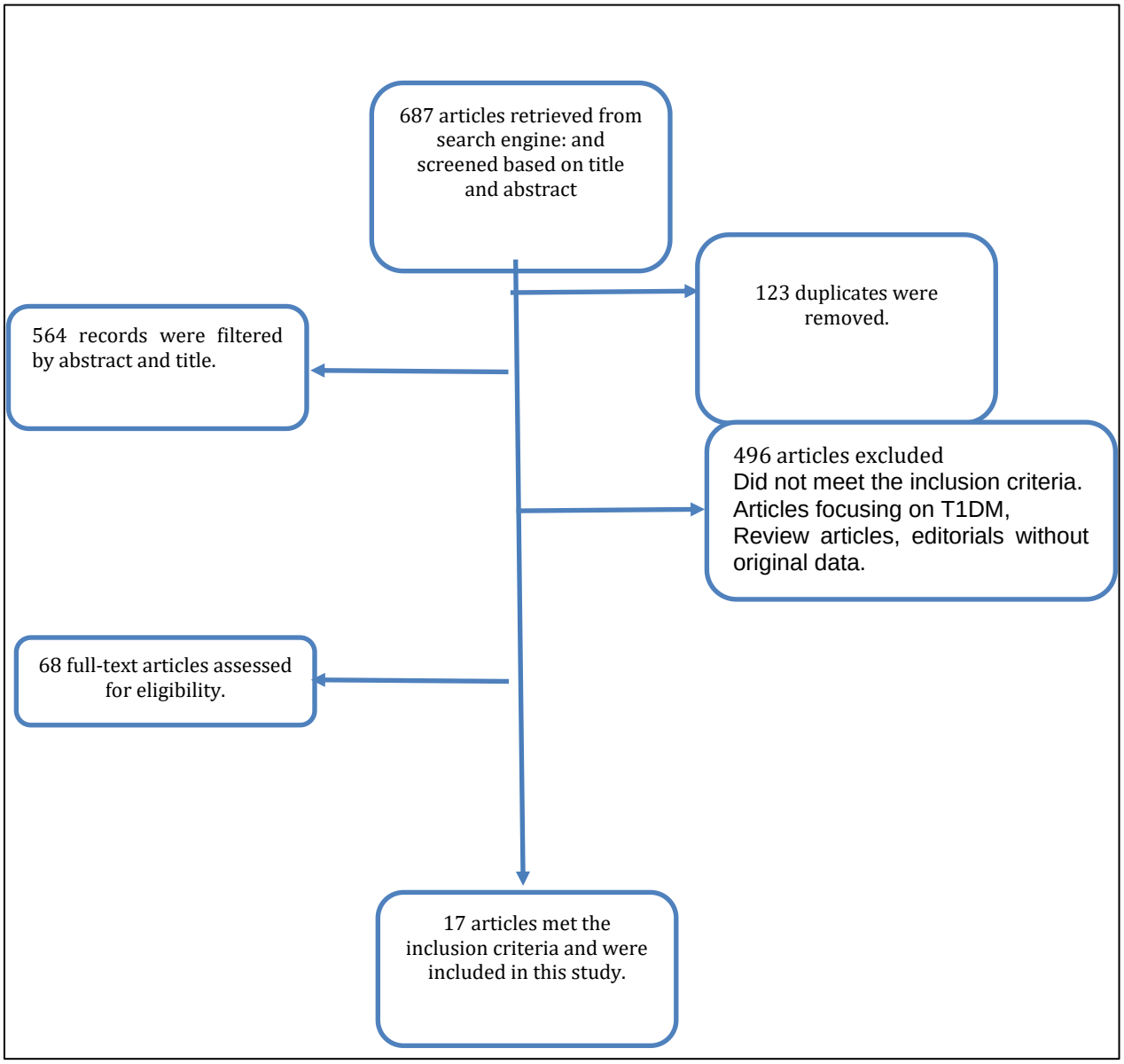

Figure 1 PRISMA flow chart of study selection process

3. Results

Electronic and manual searches were made to identify a total of 687 records. Following the exclusion of 123 duplicates, 564 records were filtered by title and abstract. Out of these, 68 complete articles were examined for eligibility, and 17 met the criteria for inclusion (see Fig 1). Between 2017 and 2025, the research took place across multiple regions in Nigeria, such as Lagos, Port-Harcourt, Ogun, Jigawa, Kano, Rivers, Abia, Ondo, Warri, Bauchi, Imo, and Benue. Sample sizes ranged from 120 to 3111, with most studies being cross-sectional or retrospective and hospital based.

Table 1 highlights the included studies: author/year, study design, population characteristics, and important findings on predictors of renal failure in type 2 diabetes mellitus. Figure 2 presents a pie chart illustrating the frequency analysis of study designs. Table 2 provides a summary of the predictor categories. Table 3 illustrates the regional distribution of these predictors associated with renal failure among patients with type 2 diabetes mellitus.

Table 1 Data extraction summary of the included studies

Authors' name and title	Year	Region	Research design	Sample size (n)	Predictive factors	Conclusion
Ahmad M.B et al. Antioxidants status and the risk of diabetic nephropathy among patients with Type 2 diabetes disease: a one -year follow -up study [15]	2019	Jigawa	Prospective	230	Low SOD, GPx and CAT: high MDA;poor glyceamic control	Low antioxidant defense and high oxidative stress predict nephropathy in T2DM
Ala O.A et al Gender differences of triglyceride glycemic index as a marker of cardiometabolic and renal dysfunctions in type-2- diabetes mellitus [16]	2025	Osogbo	Cross-sectional	192	High triglyceride; glyceamic index	High TGI among T2DM patients is associated with renal function derangement
Aloy O.C et al Alterations of some hematological and biochemical parameters in type II diabetic patients attending Imo specialist Hospital, Umuguma, Owerri, Nigeria [17]	2022	Imo	Cross-sectional	100	Elevated WBC count, por glycemic control, dyslipidemia, elevated urea nd creatinine and low hemoglobin levels	Elevated urea and creatinine indicate early nephropathy; dyslipidemia and poor glycemic control predict renal progression
Amadi C. et al Characteristics and risk of incident diabetic nephropathy between early- onset versus late- onset Type 2 diabetics of Nigeria origin [18]	2024	Rivers	Retrospective	3111	Longer diabetes duration, poor glycemic control and hypertension	Early – onset type 2 diabetes is associated with higher risk and earlier development of diabetic nephropathy compared to late-onset cases
Amballi A.A. et al Prevalence of microalbuminuria among adults with type 2 diabetes mellitus OOUTH, Sagamu [19]	2018	Ogun	Cross-sectional	325	Duration of diabetes, poor glycaemic control, hypertension and higher BMI	Microalbuminuria is common in T2DM and linked to poor glycemic control and hypertension
Basil et al Hypertension in type 2 diabetes mellitus; prevalence, patterns, determinants and implications for cardiovascular risk prediction in a	2025	Benue	Cross-sectional	200	Hypertension, elevated hs-CRP, gender, BMI, duration of diabetes, dyslipidaemia, obesity and medical use	Hypertension, dyslipidaemia and prolonged diabetes duration increase renal complications

population of Nigerian patients. [20]						
Bello et al Pattern and predictors of urine protein excretion among patients with type 2 diabetes attending a single tertiary hospital in Lagos. [21]	2017	Lagos	Cross-sectional	358	Hypertension and proteinuria	Prevalence of proteinuria among T2DM patients linked to eGFR
Ekun O.A. et al Assessment of electrolytes, markers of glycemic control and renal dysfunction among adult Nigerians recently diagnosed with type 2 diabetes mellitus [22]	2022	Lagos	Cross-sectional	250	Elevated hs-CRP, HbA1c, urea and creatinine; reduced sodium and potassium; poor glyceamic control linked too early renal changes	Electrolytes imbalance and early renal dysfunction occur in newly diagnosed T2DM, emphasizing need for early monitoring.
Eleki B.J et al Relationship between intra- renal resistive index and markers of renal function status in Type 2 diabetic patients in Southern Nigeria. [23]	2023	Port Harcourt	Cross-sectional	142	Age, sex, duration of diabetes, serum creatinine, eGFR and intra-renal RI	IRI is a useful non-invasive tool for predicting risk for DN in T2DM patients
Ikem R.T et al The burden of diabetic complications in subjects with type 2 diabetes attending the diabetes clinic of Obafemi Awolowo University Teaching Hospital. Ile-Ife, Nigeria- a cross-sectional study [24]	2022	Ile ife	Cross-sectional	400	Longer duration of diabetes, poor glycaemic control (high HbA1c), hypertension and dyslipidaemia are associated with higher complication risk	Chronic complications, particularly nephropathy, are common among Nigerian T2DM patients, emphasizing the need for regular screening and metabolic control
Jibril A.A et al Evaluation of neutrophil gelatinase associated lipocalin (NGAL) in type 2 diabetic patients with diabetic nephropathy [25]	2020	Kano	Cross-sectional	160	NGAL; duration of diabetes	Association between NGAL levels and duration of diabetes
Junaid et al Prevalence f cardiovascular risk factors and their association with renal impairment in elderly patients with type 2 diabetes mellitus in a	2022	Ondo	Cross-sectional	192	Hypertension, dyslipidaemia, albuminuria, duration of diabetes, poor glycaemic control and obesity	Multipl metabolic risk factors contribute to renal failure

Nigerian tertiary hospital [26]						
Mohammed J.A et al Elevated high sensitivity C-reactive protein and dyslipidaemia in type 2 diabetes mellitus; implications for cardiovascular risk prediction in Nigerian patients [27]	2025	Abuja	Cross-sectional	300	Elevated hs-CRP, dyslipidaemia and poor glycaemic control	Inflammatory and lipid abnormalities correlated with renal dysfunction in diabetes
Okeji I.E et al Prevalence and correlates of clinical nephropathy in patients with type 2 diabetes at Abia state specialist hospital and diagnostic centre, Umuahia, Nigeria: A cross-sectional study [28]	2025	Abia	Cross-sectional	255	Lipid profile, glyceamic control and hypertension	Poor lipd and glycaemic control increase renal risk in T2DM patients
Shu'aibu R. B et al Association of micr-albuminuria with retinopathy and glycated haemoglobin among type II diabetes patients attending a hospital in Bauchi, Nigeria [29]	2023	Bauchi	Cross-sectional			Prevalence of microalbuminuria among T2DM patients significantly related to high HbA1c and retinopathy.
Sulaimon J.I et al Prevalence of microalbuminuria and associated risk factors among type 2 diabetes patients attending some selected hospitals in Kano state, Nigeria [30]	2025	Kano	Cross-sectional	168	Poor glycaemic control, HbA1c	HbA1c is a strong biochemical predictor of diabetes nephropathy
Ufuoma et al Prevalence and risk factors of microalbuminuria among type 2 diabetes mellitus: A hospital-based study from Warri, Nigeria. [31]	2016		Prospective	200	Age, duration of diabetes, high HbA1C, elevated LDL- cholesterol, lipid profile, smoking and history of hypertension	Longer diabetes duration and high LDL were significant predictors of renal dysfunction

Table 2 Summary of Predictors Categories

Categories of Predictors	Variables
Clinical	Hypertension, BMI, Duration of diabetes, Obesity
Biochemical/Novel Biomarkers	Poor glycemic control (HbA1c), NGAL, hs-CRP, Dyslipidemia, Albuminuria, Lipid profile, Antioxidant
Socio-demographic	Age, Sex, and Gender
Lifestyle	Smoking, History of Diabetes

Table 3 Regional variations of predictors of renal failure in T2DM patients extracted across the studies.

Region	Main predictors identified
North- west	NGAL: Duration of diabetes; low SOD, GPx; poor glycemic control
North- East	Elevated HbA1c; poor glycaemic control
North-central	Hypertension; elevated hs-CRP; gender; BMI; duration of diabetes; dyslipidaemia; obesity
South- west	High triglyceride; glycaemic index; duration of diabetes; poor glycaemic control; hypertension; higher BMI, proteinuria; elevated hs-CRP; HbA1c; urea and creatinine; reduced sodium and potassium; dyslipidaemia; albuminuria; obesity
South – East	Elevated WBC count; poor glycaemic control; dyslipidaemia; elevated urea and creatinine; low haemoglobin; lipid profile; hypertension
South – South	Age; sex; duration of diabetes; high HbA1c, elevated LDL-cholesterol; lipid profile; smoking serum creatinine; eGFR; intra- renal RI; poor glycaemic control; hypertension

4. Discussion

This study integrated evidence from various perspective, retrospective, and cross-sectional across the Nigeria region published between 2016 and 2025, covering various geographic regions, including Kano, Lagos, Ondo, Ogbomosho, Abia, Port Harcourt, and Akwa Ibom. These studies [15–31] collectively indicate the combination of clinical, biochemical, and demographic factors drives the risk of kidney failure among individuals diagnosed with type 2 diabetes mellitus in Nigeria. However, poor glycemic control (elevated HbA1c), duration of diabetes, hypertension, dyslipidemia, and obesity are the most common reported predictors. Recent findings also highlight the potential diagnostic value of novel biomarkers, including high-sensitivity C-reactive protein and neutrophil gelatinase-associated lipocalin (NGAL), as predictors of diabetic nephropathy [25].

Several studies [18–21, 24, 26, 28] have identified clinical factors such as high blood pressure, having diabetes for a long time, and obesity as key contributors to kidney dysfunction. Patients diagnosed with diabetes for more than 10 years persistently indicated higher levels of albuminuria and reduced glomerular filtration (eGFR) [31]. Comparably, the simultaneous existence of hypertension and obesity significantly leads to increased renal strain via glomerular hyperfiltration and endothelial injury. These findings emphasize the need for broad cardiac risk management in T2DM to prevent the progression of nephropathy.

Biochemical markers offer a deep understanding of early renal and blood vessel disruption. Studies [25, 27] reported a significant increase in NGAL and hs-CRP level among T2DM patients with nephropathy, indicating these markers as predictors of early renal failure. Additionally, modification in lipid profile, notably elevated LDL cholesterol and triglycerides, is deeply associated with the risk of nephropathy [16, 27, 28, 31]. Dyslipidaemia deteriorates atherosclerotic and microvascular damage, which has a negative effect on renal function as reported [17, 20, 24, 26, 27]. As illustrated in a previous study, antioxidant deficiency also fueled nephropathy risk, identifying oxidative stress as a mechanistic pathway in worsening renal function [15].

Age and gender are among the most frequently identified socio-demographic factors contributing to kidney deterioration [20, 23, 31]. Aged individuals and males were mostly at higher risk, due to prolonged disease duration and poorer glycemic control. Lifestyle variables such as physical inactivity, unbalanced eating, and medication non-adherence were subsequently observed but inconsistently reported across studies. The inconsistency validates the need for multicenter, long-term studies that integrate both data on lifestyle and biochemical markers.

Overall, the distribution indicates that research concentrates on biochemical and clinical parameters, with socio-demographic and lifestyle factors receiving less attention. This disparity highlights the importance of a more comprehensive approach in future research—the incorporation of biological, clinical, behavioral, and social aspects in research to better reflect the multifactorial nature of renal impairment in type 2 diabetes mellitus.

The reviewed studies assessed renal function using biochemical tests and imaging techniques. The urinary albumin to creatinine ratio (ACR) was the most used diagnostic test as an early and sensitive indicator of microalbuminuria and incipient nephropathy in patients with type 2 diabetes mellitus. Furthermore, the serum creatinine and approximate glomerular filtration rate (eGFR), estimated by the use of either the Modification of Diet in Renal Disease (MDRD) or Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equations, were commonly used to assess the condition of the kidneys and categorize the stages of chronic kidney disease (CKD). Glycaemic control, a key factor in kidney health, was frequently assessed by measuring glycated haemoglobin (HbA1c) and fasting blood glucose (FBG), both of which provide valuable information about metabolic status and its impact on renal outcomes.

Further methods like renal Doppler ultrasonography were employed to measure the intrarenal resistive index, which provided an opportunity to identify hemodynamic alterations in the kidneys that could drive biochemical indicators of kidney failure [23]. Likewise, neutrophil gelatinase-associated lipocalin (NGAL) assays served as an early sign of tubular injury and detected subclinical renal damage that could go unnoticed by other conventional markers [25]. Other biochemical indicators, including high-sensitivity C-reactive protein (hs-CRP), lipid profiles [27], and oxidative stress markers [15], were also included to determine the level of inflammatory and metabolic milieu that has led to the renal dysfunction.

These tools vary in sensitivity, specificity, and predictive value, yet their use in clinical practice in Nigeria remains inconsistent. A considerable proportion of tertiary hospitals continue to use serum creatinine and eGFR-based tests, which, despite their pragmatic and universal nature, are potentially underestimating early renal dysfunction, as they lack specificity to identify subtle nephron loss. As a result, combining the new biomarkers and imaging with traditional practice might bolster early detection, in addition to creating better risk stratification and early interventions in patients with diabetes at risk of renal failure.

5. Conclusion

Renal failure arises from poor blood sugar management, high blood pressure, abnormal lipid levels, oxidative stress, and duration of diabetes. Alongside the classic clinical and biochemical predictors, newer biomarkers like neutrophil gelatinase-associated lipocalin (NGAL) and high-sensitivity C-reactive protein (hs-CRP) have also been demonstrated to add extra predictive value and allow earlier identification of patients at risk of nephropathy prior to the development of overt renal dysfunction.

Acknowledgements

Special thanks to Dr. Onaselu Oluwaseun Abiodun of Pathology Department, Olabisi Onabanjo University Teaching Hospital for his encouragements.

Compliance with ethical standards

This article is a review of previously published studies. No new studies involving human participants or animals were conducted by the authors. Therefore, ethical approval and informed consent were not required.

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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