Research Article

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Epidemiology and Predictive Factors of Renal Insufficiency in Diabetic Patients: Retrospective, Analytical Study at the Hospital Charite Maternelle (GOMA/DRC), 2020-2025

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Abstract

Introduction: *Diabetes mellitus is a major public health issue worldwide, and particularly in sub-Saharan Africa. Various renal impairments can occur during diabetes. The objective of this study was to determine the predictive factors of renal insufficiency in diabetic patients.*

Patients and Methods: *a retrospective, analytical, and comparative study of all diabetic patients followed or hospitalized at the Hospital Charite Maternelle from January 2020 to December 2025 who underwent a renal work-up. Factors associated with renal insufficiency were investigated using the chi-square test, followed by univariate and multivariate logistic regression.*

Results: *248 diabetic patients were included, of whom 69 (30.3%) had renal insufficiency (GFR < 60 mL/min/1.73 m²). The mean age of the population was 55.38 ± 17.73 years (range: 11-94 years). Females predominated (M/F sex ratio = 0.72). Type 2 diabetes accounted for 74.8% of cases. Diabetic nephropathy was the most frequent renal impairment among patients with renal insufficiency (46/69, i.e., 66.7%), and acute pyelonephritis accounted for 14.5% of cases. In univariate analysis, advanced age (p = 0.002), type 2 diabetes (p = 0.008), anemia (p < 0.001), hypertension (p = 0.001), and poor glycemic control (p = 0.003) were significantly associated with renal insufficiency; in multivariate analysis, only advanced age remained independently associated (adjusted OR = 3.84; 95% CI [1.05-14.01]; p = 0.04).*

Conclusion: *Renal impairment during diabetes is common and polymorphic in this West African context, with an unfavorable prognosis. Systematic, early renal screening, combined with rigorous glycemic and blood pressure control, remains the cornerstone of prevention.*

Keywords: Diabetes Mellitus, Renal Insufficiency, Hypertension, Diabetic Nephropathy, RDC, Sub-Saharan Africa

1. Introduction

Diabetes mellitus is a major public health issue worldwide and, more particularly, in sub-Saharan Africa, where the steady rise in its prevalence represents a leading concern [1]. According to the American Diabetes Association (ADA), diabetes mellitus is a metabolic disease resulting from environmental and genetic factors that may act jointly, characterized biologically by chronic hyperglycemia above 1.26 g/L [2]. Worldwide, the 11th edition of the Diabetes Atlas of the International Diabetes Federation (IDF) estimates that approximately 589 million adults were living with diabetes in 2024, of whom nearly 60 million were in the Africa region alone; this figure could reach 60 million by 2050 for Africa, representing the largest relative increase of all IDF regions (+142%), with, notably, nearly three-quarters of cases still

undiagnosed on the continent.

This rise in the incidence of diabetes is accompanied by a parallel increase in its micro- and macrovascular complications, which account for its full severity. Diabetes remains, in fact, the leading cause of chronic kidney disease (CKD) worldwide and the leading cause of renal replacement therapy [3,4]. Renal impairments observed during diabetes encompass a set of functional and/or structural renal abnormalities, directly or indirectly related to diabetic disease. The most classically described impairment is diabetic nephropathy (DN), a glomerular lesion whose ultimate stage is renal failure; it would affect 25 to 40% of diabetic subjects and constitutes one of the most frequent and most deleterious complications of diabetes, with a major impact on quality of life [5-7]. A recent African meta-analysis covering 34 studies and more than 20,000 patients confirms the extent of this phenomenon, with a pooled prevalence of nephropathy of 21% (95% CI: 16-28%) among diabetics, ranging from 11% in West Africa to 47% in North Africa.

The main classically reported risk factors for DN are the duration of diabetes, poor glycemic control, hypertension, male sex, obesity, and smoking; several of these factors are modifiable, which justifies the interest of local studies to guide screening and prevention strategies. On the therapeutic front, the 2022 update of the KDIGO guidelines for the management of diabetes in chronic kidney disease has reinforced the role of SGLT2 inhibitors and GLP-1 receptor agonists as pillars of nephroprotection, in addition to glycemic and blood pressure control; however, these innovations remain of limited access in the West African context, which reinforces the interest of early screening and control of classic risk factors. The overall objective of this work was to determine the predictive factors of renal insufficiency during diabetes. More specifically, this study aimed to determine the prevalence of diabetic nephropathy, to identify the other nephropathies present in diabetic patients, and to investigate the predictive factors linked to death secondary to renal impairment in diabetics.

2. Patients and Methods

- **Nature, Setting, and Period of the Study**
  Retrospective study with a descriptive and analytical aim conducted over 5 years covering the period from January 1, 2020 to December 31, 2025, on the records of diabetic patients hospitalized or followed as outpatients at the clinic during this study period, regardless of the reason for consultation.
- **Study Population, Sampling, and Selection Criteria**
  The study covered diabetic patients seen at the hospital Charite Maternelle from January 1 to December 31, 2025

Included were

- Patients with diabetes mellitus
- Who had undergone a minimum work-up comprising serum creatinine and 24-hour proteinuria

Diabetic patients who had not undergone a renal work-up were not included.

- **Variable of Interest (*and Judgment Criteria*)**
  The dependent variable was the presence of chronic renal insufficiency assessed by serum creatinine. The creatinine threshold value used is that set by Durie and Salmon, i.e., 20 mg/L. Creatinine clearance or GFR was calculated using the simplified MDRD (Modification of Diet in Renal Disease) formula. The MDRD formula does not take weight into account and is better suited to elderly subjects, obese patients, and in the presence of edema. It is also more effective for the diagnosis and staging of chronic kidney disease.

GFR = 175 (Creatinine ∗ 0.0113) -1,154 ∗ age-0,203 ∗ 0.742 (if female) ∗ 1.212 (if Black or of African origin)
GFR: Glomerular filtration rate in mL/min/1.73 m². Serum creatinine: in mg/L. In diabetics, GFR will be less than 50% of normal before the serum creatinine level reaches abnormal values [5].

The following operational definitions were adopted:

- **Renal Insufficiency**
  was defined and linked to diabetes by a serum creatinine of 20 mg/L (177 µmol/L) and/or a GFR below 60 mL/min/1.73 m².
- **Acute Renal Insufficiency**
  (ARI) was defined according to the universal KDIGO (kidney disease: Improving Global Outcome) 2012 definition of acute renal insufficiency as an increase in serum creatinine of more than 3 mg/L (26.4 µmol/L) or an increase of more than 50% over 48 hours, or a urine output below 0.5 mL/kg per hour for six hours.
- **Chronic Kidney Disease (CKD)**
  was defined by the presence, for more than 3 months, of renal insufficiency defined by a glomerular filtration rate < 60 mL/min/1.73 m², and/or a morphological or histological renal abnormality (reduction in kidney length < 80 cm or poor corticomedullary differentiation), and/or an abnormality in blood composition (anemia) or urine secondary to renal impairment (proteinuria (> 2+) and/or leukocyturia and/or hematuria). Diabetic kidney disease: Or diabetic nephropathy was retained, in the absence of renal biopsy, by the presence of a urinary albumin excretion rate > 30 mg/24 hours, with or without altered GFR, and in the absence of any other renal and/or general condition that could explain the renal impairment the parameters of interest encompassed sociodemographic, clinical, paraclinical, and therapeutic variables.
- **Data Collection and Analysis**
  A standardized data collection form was used to review the records, with reformulation of certain data for standardization purposes. Data entry was performed using EpiData 3.1, and statistical analysis using SPSS version 20 and Microsoft Excel 2016. Qualitative variables were expressed as percentages, and quantitative variables as mean ± standard deviation when their distribution was normal, or as median and interquartile range otherwise. Associated factors were investigated using Pearson's chi-square test or Fisher's exact test depending on expected counts. Explanatory variables selected after verifying the absence of collinearity were then entered into

a multivariate logistic regression model, ranked according to the odds ratio (OR) value and its 95% confidence interval (95% CI). The statistical significance threshold retained was $p < 0.05$.

➢ **Ethical Considerations**

Written authorization was obtained from the management of the Hospital Charite Maternelle; patient anonymity was respected throughout the study.

3. Results

➢ **General Characteristics of the Population**

Over the period from January 1, 2020 to December 31, 2025, 684 diabetic patients were hospitalized or followed at the Hospital Charite Maternelle; of these, 248 (34.3%) had undergone a complete renal work-up and were retained for analysis. Renal insufficiency (GFR < 60 mL/min/1.73 m²) was identified in 89 patients, i.e., a prevalence of 30.3% within the study population.

- **Age**

The mean age in the general population with a renal work-up was 55.38±17.73 (range 11-84 years). The mean age among diabetics with renal insufficiency was 63.68±15.68 (range: 20-84) and 51.78±17.45 among diabetics without renal insufficiency.

- **Distribution by Sex**

The population comprised 153 women and 95 men, i.e., a sex ratio of 0.72 (M/F). Among patients with renal insufficiency, the sex ratio was 0.53, i.e., 34.8% men to 65.2% women.

➢ **Clinical Factors Associated with Renal Insufficiency**

Table 1 presents the comparison of sociodemographic characteristics and history according to GFR. Only advanced age, type 2 diabetes, and hypertension were significantly associated with the presence of renal insufficiency in this diabetic population.

		GFR below 60		**GFR above 60**		**P value**
		N= 69	**N%**	**N= 159**	**N%**	
Age (Years)	< 40	6	8.7	34	21.5	**0.0000**
	[40-50]	2	2.9	33	20.9	
	[50-60]	19	27.5	30	19	
	[60-70]	15	21.17	37	23.4	
	70 and above	27	39.1	24	15.2	
Sex	Male	24	34.8	71	44.9	**0.15**
	Female	45	65.2	87	55.1	
BMI	Underweight	1	1.4	5	3.2	**0.23**
	Normal	1	1.4	4	2.5	
	Overweight	4	2.5	3	1.9	
	Obesity	1	1.4	6	3.8	
Diabetes	Type1	3	4.34	26	16.35	**0.008**
	Type2	61	88.4	119	74.84	
	Gestational	2	2.89	5	3.14	
	Other	3	4.34	8	5.03	
Family history of diabetes 0.65	3	4.3		15		**9.1**
Hypertension 0.001	46	66.7		68		**43.3**
Sedentary lifestyle 0.24	0	0		3		**1.9**
Death	7	10.1		2	1.3	**0.006**

Table 1: Clinical Factors Influencing the Occurrence of Renal Insufficiency

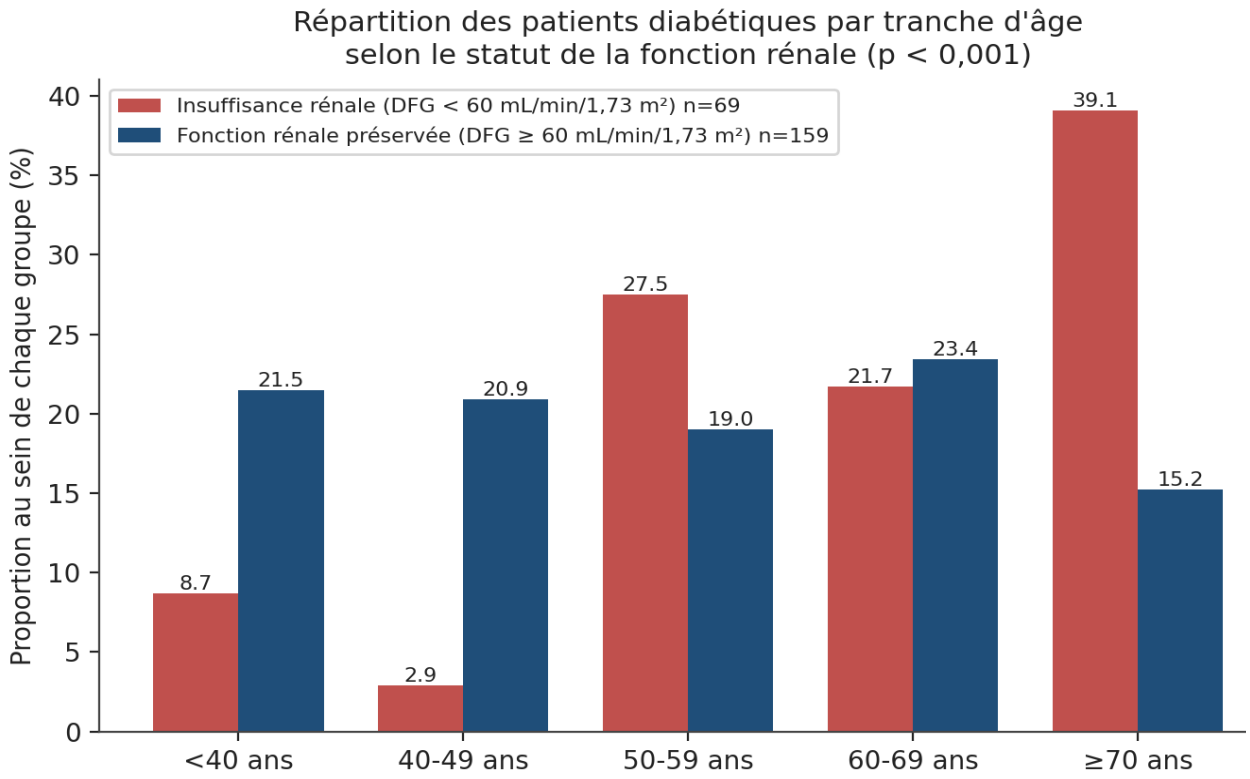

Figure 1: Distribution of diabetic patients by age group according to renal function status (data from Table I). The proportion of patients with renal insufficiency increases markedly with age, reaching 39.1% among those aged 70 and above ($p < 0.001$).

➢ **Biological Factors Associated with Renal Insufficiency**

Regarding the types of renal impairment, 10 cases of acute pyelonephritis (14.5%) and 46 cases of diabetic nephropathy (66.7%) were recorded among the 69 patients with renal insufficiency. Renal insufficiency was acute in nature in 11 cases (15.9%), chronic in 40 cases (58.0%), and of undetermined nature in 18 cases (26.1%), for lack of sufficient follow-up or additional work-up available to distinguish between the two. Table 2 details the biological parameters according to renal status: poor glycemic control, anemia, inflammatory/infectious syndrome, and proteinuria ($p = 0.01$) were significantly related to renal insufficiency, unlike isolated acute pyelonephritis ($p = 0.26$). GFR below 60 GFR above 60 P value

		GFR below 60		**GFR above 60**		**P value**
		N= 69	**N%**	**N= 159**	**N%**	
Glycated hemoglobin	Below 6.5	9	18.4	10	7.7	**0.017**
	[6.5- 7.5]	8	16.3	10	7.7	
	Above 7.5	32	65.3	110	84.6	
Blood glucose (g/L)	Below 1.26	9	13.8	8	5.4	**0.035**
	Above 1.26	56	86.2	141	94.6	
Hb (g/dL)	Below 12	44	63.8	68	43	**0.000**
	Above 12	17	24.6	83	52.5	
Calcemia (g/L)	Below 86	4	44.4	1	14.3	**0.19**
	[86-100]	4	44.4	5	71.4	
	Above 100	1	10.4	1	14.3	
CRP (mg/L)	Below 6	9	13	20	12.7	**0.78**
	Above 6	29	76.3	73	78.5	
WBC (cells/mm3)	Below 4000	5	8.5	14	9.7	**0.001**
	[4000-10000]	27	45.8	103	71	
	Above 10000	27	45.8	28	19.3	

Dyslipidemia		7	10.1	20	12.7	**0.59**
APN		10	14.5	15	9.5	**0.26**
Proteinuria above 2g		46	66.7	78	49.4	**0.01**

Hb= Hemoglobin level, WBC= White blood cell count, sup= above, inf= below, APN= Acute pyelonephritis, CRP: C-reactive protein.

Table 2: Biological Factors Influencing the Occurrence of Renal Insufficiency

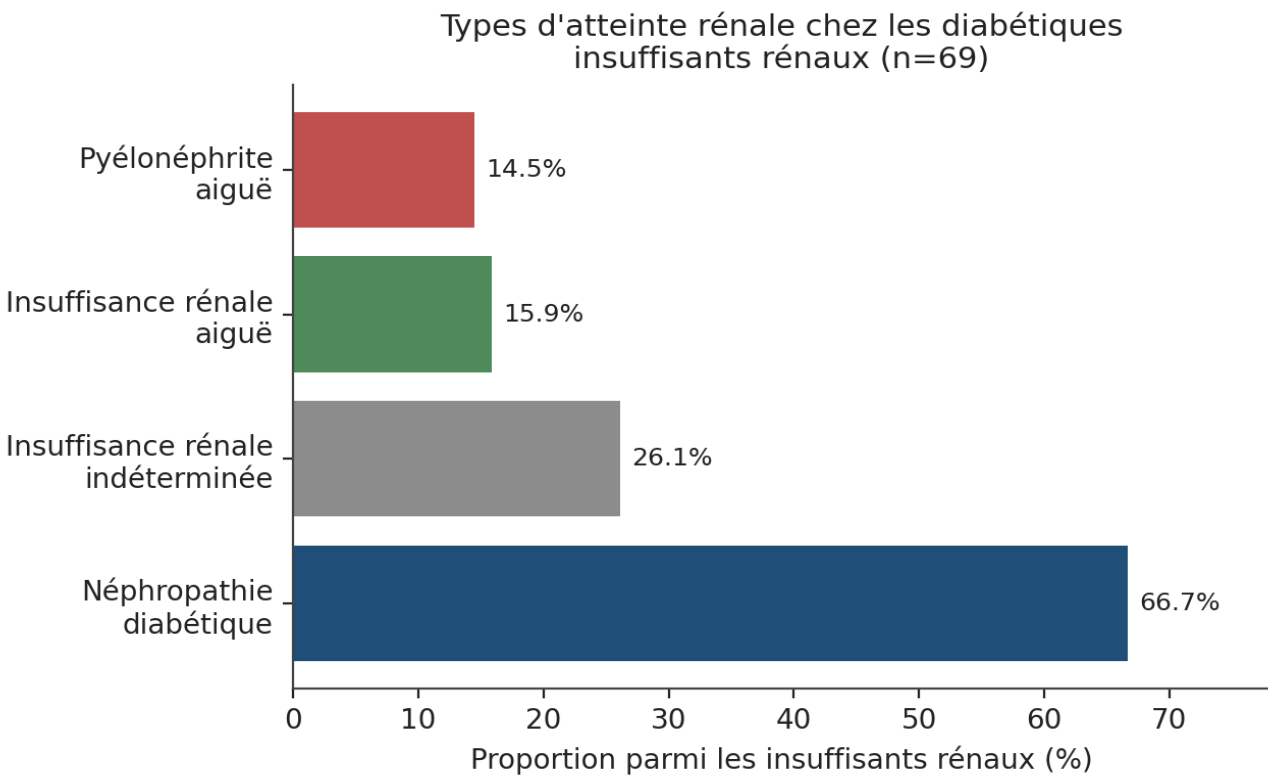

Figure 2: Distribution of the types of renal impairment among the 69 diabetic patients with renal insufficiency. Diabetic nephropathy dominates the etiological picture by far, well ahead of acute pyelonephritis

- Predictive Factors of Chronic Renal Insufficiency
  Table 3 presents the results of the univariate analysis. Advanced age ($p = 0.002$), type 2 diabetes ($p = 0.008$), hypertension ($p = 0.001$), anemia ($p < 0.001$), hyperglycemia ($p = 0.035$), and poor HbA1c control ($p = 0.003$) were significantly associated with the occurrence of renal insufficiency.

Study	Country	N Patients	PTH target attained (%)	VC (%)	Next-generation binders
Present (2024) study	Resource-limited country	120	43.3%	65.0%	Not available
Mazzaferro et al., 2025	Europe	428	61.2%	48.4%	Sevelamer Etelcalcetide +
Tsai et al., 2024	Taiwan	315	57.8%	51.1%	Sevelamer Cinacalcet +
Salera et al., 2025	Italy	286	59.1%	44.2%	Sucroferric ox. Paricalcitol +
Pelepenko et al.,2025	Brazil	501	38.5%	67.3%	Limited access
Ketteler et al.(KDIGO), 2025	International	Review	Variable	40-70%	Recommended

PTH target: 150-600 pg/mL for dialysis patients per KDIGO 2017/2025. VC = vascular calcification; N / A = not applicable. * Data adapted from the cited publications.

Table 3: Comparison of the Present Study's Findings with Recent Comparable Studies (2024-2025)

Reported as such in the original analyses; to be interpreted with caution given the small sample size of certain strata. In multivariate analysis (Table 4), only advanced age (≥ 65 years) remained independently associated with renal insufficiency (adjusted OR = 3.84; 95% CI [1.05-14.01]; p = 0.04), with type 2 diabetes, hypertension, anemia, and hyperglycemia losing their statistical significance once adjusted for one another.

	OR	95% CI	P
Age group	3.84	[1.05-14.01]	**0.04**
<65			
≥65			
Type of diabetes	6.71	[0.76-59.7]	**0.08**
Type 1			
Type 2			
Comorbidities (Hypertension)	1.57	[0.46-5.32]	**0.46**
No			
Yes			
Anemia	2.37	[0.75-7.51]	**0.14**
No			
Yes			
Blood glucose	3.75	[0.45-35.03]	**0.22**
<1.26			
>1.26			

Table 4: Multivariate Analyses Using the Logistic Model of Sociodemographic, Clinical, and Paraclinical Characteristics of Renal Insufficiency Cases

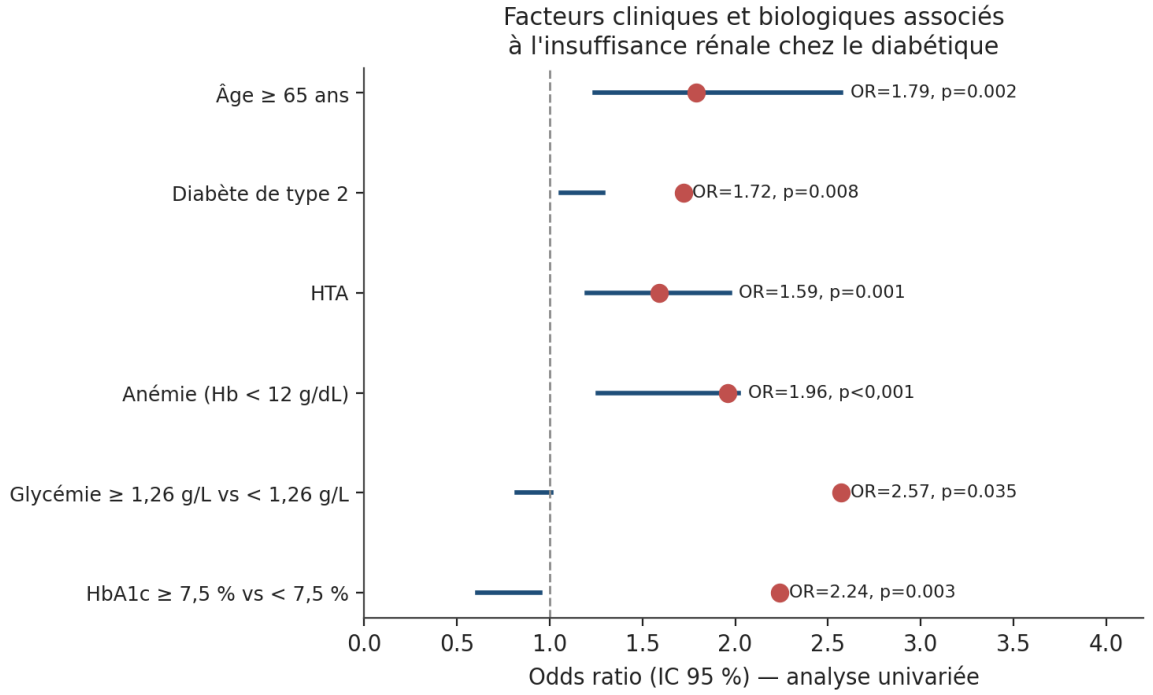

Figure 3: Odds Ratios (95% CI) of the Main Factors Associated with Renal Insufficiency in Diabetics in Univariate Analysis (Table 3). The vertical dotted line corresponds to no effect (OR = 1); intervals crossing this line should be interpreted with caution

➢ **Predictive Factors of Death**

Nine deaths occurred during the study period. In univariate analysis (Table 5), only elevated serum creatinine (p = 0.001) and anemic syndrome (p = 0.004) were significantly associated with death.

	Univariate model				
	n/N	**%**	**OR**	**95% CI**	**P values**
Age					**0.123**
< 65 years	4/9	44.4	0.64	[0.96-3.31]	
≥ 65 years	5/9	56.6	1.78		
Sex					**0.605**
Male	3/9	33.3	0.79	[0.71-1.85]	
Female	6/9	66.6	1.15		
Type of diabetes					**0.71**
Type 1	1/9	11.1	0.71	[0.83-1.33]	
Type 2	8/9	88.9	1.05		
Comorbidities (Hypertension)					**0.703**
No	5/9	55.6	1.13	[0.41-1.83]	
Yes	4/9	44.4	0.87		
Anemic syndrome					**0.004**
Hb <12	0/9	0		[1.71-2.24]	
Hb ≥ 12	9/9	100	1.96		
Infectious Syndrome					**0.001**
No	0/9	0		[1.94-4.45]	
Yes	9/9	100	1.30		
Blood glucose					
≥ 1.26	0/8	0			**0.38**
< 1.26	8/8	100	1.09		
HbA1c					**0.08**
≥ 7.5	4/9	44.4	2.19		
< 7.5	5/9	66.6	0.69	[0.99-4.83]	

Table 5: Univariate Analyses Using the Logistic Model of Sociodemographic, Clinical, and Paraclinical Characteristics of Death Cases

In multivariate analysis (Table 6), only elevated serum creatinine remained associated with death (p = 0.02); the other variables lost their significance. The aberrant value obtained for CRP (a cell with a null count) reflects statistical instability related to the small size of the death sample (n = 9) and should be interpreted with the utmost caution, without inferential value.

	OR	95% CI	P
Age group			**0.42**
<65	0.51	[0.1-2.61]	
≥65			
Anemia			**0.99**
No			
Yes	0.0	[0.00-0]	
Creatinine			**0.02**
<14			
>14	0.12	[0.021-0.738]	
HbA1c			**0.52**
< 7.5			
>7.5	1.74	[0.31-9.89]	
CRP			**0.99**
< 6			
>6	116468	[00-00]	

Table 6: Multivariate Analyses (Logistic Model) of Factors Associated with Death

Unstable estimates due to null-count cells in the death subgroup (n = 9); these values should not be interpreted as real associations.

4. Discussion

- **Limitations of the Study**

  Like most retrospective studies, our work was confronted with missing data in the medical records and the absence of a computerized record management system, which complicated document retrieval and patient traceability. Most patients came from the general medicine department, which is not a reference department for the management of renal insufficiency, whereas the management of diabetes is inherently multidisciplinary, involving a diabetologist, internist, general practitioner, nutritionist, ophthalmologist, podiatrist, and nephrologist [8,9]. The absence of detailed biology, cytology, and pathology data, useful for the diagnosis of certain nephropathies, constitutes an additional limitation. These elements expose the study to a risk of bias and do not allow our results to be generalized to the entire Congolese diabetic population. Our study nonetheless retains its full relevance, as it remains, to our knowledge, one of the few Congolese studies providing epidemiological and evolutive data on renal impairment during diabetes.

- **Comparison of our Results with Those of Other Authors**

- **Socio-Demographic and Clinical Characteristics**

  In our study, the mean age was 55.38 ± 17.73 years (range: 11-84 years), with the 50-and-older age group being the most represented. This result is close to that of Mossi et al., who reported a mean age of 55.87 ± 12.48 years (22-93 years) in a Togolese study on diabetes complications conducted from 2011 to 2016 [10]. It is, however, lower than that reported by Hué et al. in Côte d'Ivoire (60 years, range: 11-87 years) [10,11] and by Djibril et al. in Togo (60.74 years, range: 39-86 years) [12]. The literature recognizes the role of advanced age in the occurrence of renal insufficiency, whether or not related to diabetes; the aging of the population and the lengthening of life expectancy expose a growing number of elderly subjects across all medical disciplines, particularly in nephrology, where the incidence of renal impairment tends to increase year after year. Our study is no exception: advanced age was very significantly linked to renal insufficiency, with 39.1% of patients with renal insufficiency aged 70 or older. Karimi et al. reported a comparable result, with 32.9% of patients with renal insufficiency aged 65 and older in a Moroccan study on elderly hemodialysis patients [13].

  Female sex predominated in our study (58.3% women versus 41.7% men, M/F sex ratio = 0.72), a trend also found by Hué et al. and Hamat et al. (M/F sex ratio of 0.92 and 0.88, respectively) [1,11]. Conversely, Djibril et al. [12] and Mossi et al. reported male predominance (M/F sex ratio of 1.38 and 1.43, respectively). This difference could be explained by the private nature of our study facility, as opposed to the public facilities of the other series, whose patient population is larger and more diverse due to the economic context of the populations concerned. Type 2 diabetes was largely predominant in our series (74.8% of cases), consistent with data from the literature [4]. Table 7 compares this distribution with that observed in other West African and Ivorian series.

	Percentage	Year	Country
Diallo I. et al. [14]	78.97%	2019	Dakar
Mossi et al. [10]	84.12%	2019	Togo
Djibril et al. [12]	88.7%	2018	Togo
Hue et al. [15]	98.64%	2018	Côte d'Ivoire
Our study	**74.84** %	**2020-2025**	**Goma/DRC**

Table 7: Proportion of type 2 diabetes reported in various sub-Saharan African studies

This predominance of type 2 diabetes is explained by the increase in obesity and sedentary lifestyle in the general population, the main risk factor for this type of diabetes [3], a trend further accentuated by the nutritional transition and increasing urbanization observed in sub-Saharan Africa over the past decade. Clinically, the literature classifies lower-limb edema at stage 4 of diabetic nephropathy according to the Mogensen classification; 54 cases of lower-limb edema were recorded in our series, without it being possible to specify the characteristics that would formally link them to a renal origin.

- **Comorbidities and Glycemic Control**

  The global morbidity and mortality profile of diseases is evolving worldwide, in both developed and emerging countries: non-communicable diseases, including diabetes and hypertension, are now major causes of mortality and morbidity [14-17]. In our study, 50.4% of patients (135 diabetics) had hypertension, a proportion reaching 66.7% among patients with renal insufficiency, with a statistically significant association ($p = 0.001$). This result is comparable to that of Ramilitiana et al. in Madagascar, who reported 59.8% hypertension in a population with chronic renal insufficiency [18]. Besides hypertension, the other cardiometabolic risk factors found were dyslipidemia (11.4%), abdominal obesity (9.2%), and sedentary lifestyle (1.35%). Hypertension and type 2 diabetes constitute two major global public health problems due to their frequency, the need for long-term follow-up and treatment, and their shared vascular complications; associated in nearly 80% of cases, these two conditions are more common in the elderly, with a peak between 66 and 69 years, and increase overall cardiovascular risk [2,3].

The UKPDS study showed that better blood pressure control reduced cardiovascular morbidity and mortality by 24% and microangiopathic complications by 37%, while strict glycemic control was associated with a 12% reduction in overall morbidity and mortality and a 25% reduction in microangiopathic impairment [19]. Medico-economic analyses have also shown that strict blood pressure control has a better cost-effectiveness ratio than strict glycemic control in diabetics [20]. The 2022 update of the KDIGO guidelines on diabetes and chronic kidney disease points in the same direction, placing multifactorial control of cardiorenal risk — blood pressure, glycemia, and now new-generation nephroprotective treatments — at the heart of the therapeutic strategy.

The mean blood glucose found in our study was 3.08 ± 1.27 g/L, and the mean HbA1c was 10.12 ± 2.55% (range: 4.1-15.0%), with 78.6% of patients having an HbA1c above 7.5%; this chronic hyperglycemia was significantly linked to renal insufficiency in our series. Lotfi et al. reported more favorable glycemic control values, although still above normal (HbA1c: 8.5 ± 2.6%; fasting glucose: 1.5 ± 1.3 g/L), as did Mossi et al. (mean blood glucose: 2.36 ± 1.20 g/L) [10]. Our HbA1c values, however, align with those of Sow et al. and Mossi et al., who respectively reported an HbA1c above 7% in 52.9% of patients and a mean of 9.19 ± 3.26%, as well as those of Hamat et al., who found an HbA1c above 6.5% in 74.5% of patients. HbA1c, reflecting glycemic balance over three months, appears to be a more reliable indicator than a single blood glucose measurement; the discrepancy observed for blood glucose could be explained by the fact that sampling was not always fasting and by the variable venous or capillary nature of the samples in our context, which nonetheless reflects a real deficit in glycemic control among our patients.

- **Renal Impairment and Predictive Factors**

  Diabetic nephropathy was the most frequent renal impairment among patients with renal insufficiency in our series (66.7%), and acute pyelonephritis accounted for 14.5% of cases within this same subgroup (i.e., 10.96% of the entire cohort of 228 diabetics, regardless of renal status). These proportions should be compared with caution to those of literature, as the denominators used (total population versus subgroup of patients with renal insufficiency) vary from one study to another. Lokrou et al. reported a diabetic nephropathy prevalence of 45% in an Ivorian endocrinology department, compared with 29.8% for Hamat et al. in Chad [1]. The 2025 African meta-analysis of 34 studies places the pooled prevalence of diabetic nephropathy at 21% (95% CI: 16-28%), with marked regional heterogeneity: 11% in West Africa (including Togo), 21% in East Africa, 31% in Central Africa, 33% in Southern Africa, and up to 47% in North Africa [34]. These regional disparities, illustrated in Figure 4, may be related to differences in exposure to nutritional risk factors and Westernized lifestyle, more pronounced in North Africa than in West Africa.

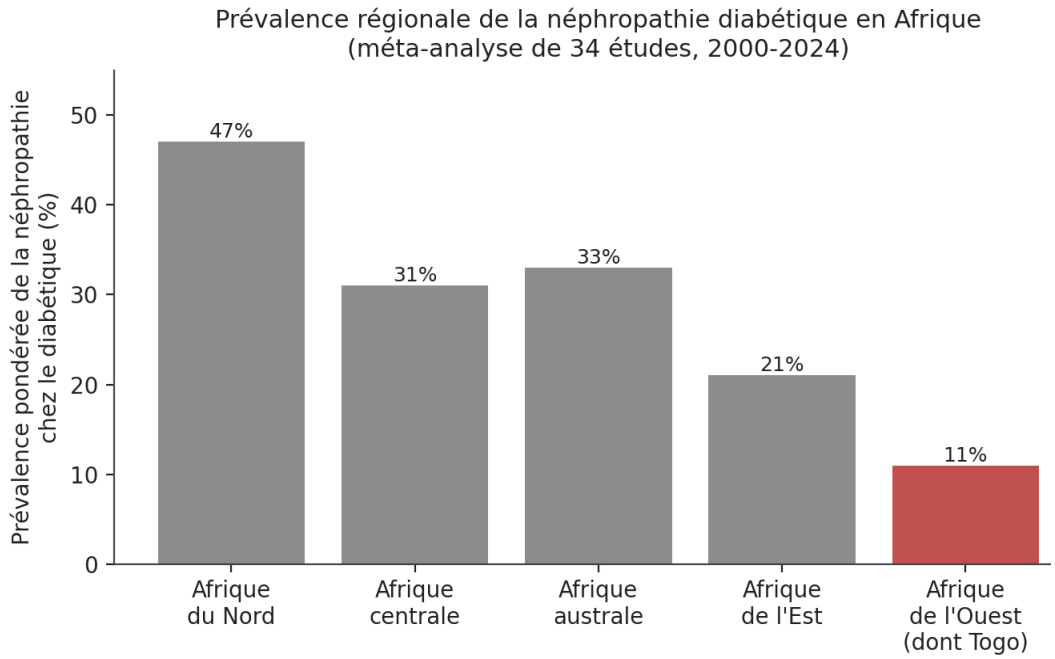

Figure 4: Pooled regional prevalence of diabetic nephropathy in Africa, based on the meta-analysis of 34 studies published between 2000 and 2024 (Adebayo-Gege et al., 2025). The West African context of our study, shown in red, has the lowest pooled prevalence on the continent, although the crude prevalence observed in our cohort (66.7% among patients with renal insufficiency) underscores the severity of the condition among patients referred to nephrology.

Diabetic patients are also exposed to repeated infectious episodes, particularly urinary. In our series, acute pyelonephritis accounted for 11% of cases, compared with 28.6% for Mekki et al. [21]. It was not possible to isolate glomerular and hypertensive nephropathies given the close pathophysiological link between these two entities; hypertension is indeed an essential risk factor for the development of chronic kidney disease and the main etiology found in several African and Western series [22,23]. Anemia, common in nephrology, is classically observed once GFR falls below 60 mL/min/1.73 m²; its main etiologies in these patients are deficient endogenous erythropoietin production and iron deficiency [24,25]. It was found in 53.1% of cases in our series without it being possible to determine the precise cause, just as hypocalcemia was found in 35.0% of cases; anemia was significantly associated with renal insufficiency.

It was not possible to isolate stages 1 and 2 of chronic kidney disease due to the lack of systematic microalbuminuria testing. The high proportion of renal insufficiency (69/228 patients, i.e., 30.3%) in our study population is largely explained by the late referral of diabetic patients to the nephrologist [26]. Indeed, as Sabi et al. had already shown in 2014, the primary reason for nephrology consultation remains renal insufficiency, far ahead of proteinuria and hypertension, which explains the high proportion of diabetic patients already presenting renal insufficiency at the time of referral. Patients at the stage of end-stage renal failure represented 4.8% of our cohort; these patients did not benefit, at least during the study period, from a renal replacement program despite the first signs of uremic intolerance and a formal indication [27]. Financial coverage of dialysis largely rests on the patient himself, as the only public center where dialysis is partially subsidized is saturated — a structural constraint that remains, to this day, one of the main obstacles to equitable access to renal replacement therapy in West Africa.

Advanced age, poor blood pressure control, infectious complications, obesity, smoking, hypercholesterolemia, degree of proteinuria, and anemia are recognized as risk factors for the progression of renal impairment, as are chronic hyperglycemia and other vascular risk factors (smoking, hypertension, dyslipidemia) [28,29]. In our study, the risk factors for renal impairment found in univariate analysis were advanced age ($p = 0.002$), type 2 diabetes ($p = 0.008$), anemia ($p < 0.001$), hypertension ($p = 0.001$), and poor glycemic control ($p = 0.003$), consistent with classic data from the literature as well as with the more recent 2025 African meta-analysis, which confirms hypertension as a major risk factor for diabetic nephropathy (OR = 3.46; 95% CI: 2.61-4.59). Only advanced age, however, retained an independent association in multivariate analysis, underscoring the need for increased renal vigilance in elderly diabetic patients, even in the absence of other identified risk factors.

- **A look at Recent Literature Data (2022-2026)**
  Several studies published since 2022 corroborate and update the findings of our study. In Ethiopia, a retrospective cohort of 494 diabetic patients followed over 10 years estimated the incidence of chronic kidney disease at 2.16 cases per 100 person-years, with age, duration of diabetes, and poor blood

pressure control as the main predictors, results consistent with our own. In Uganda, Kibirige et al. showed, in patients with a recent diagnosis of diabetes, that a substantial proportion already had subclinical renal impairment, arguing for renal screening from the time of diabetes diagnosis rather than after several years of progression. At the continental level, the 2025 meta-analysis of 34 studies confirms that hypertension remains, by far, the most robust determinant of diabetic nephropathy in Africa, with an odds ratio greater than 3, whereas the duration of diabetes shows no significant association once other factors are accounted for — a finding consistent with the loss of significance of type 2 diabetes in our own multivariate analysis. Therapeutically, the 2022 update of the KDIGO guidelines has consolidated the role of SGLT2 inhibitors as pillars of nephroprotection in type 2 diabetics, including at advanced stages of chronic kidney disease, a major advance in management whose access nonetheless remains limited in our context and which will need to be integrated into future local guidelines for the management of diabetes in Togo [30,31].

5. Conclusion

This study shows that renal impairment during diabetes is common and polymorphic in the Congolese (DRC) context, with a clear predominance of diabetic nephropathy. Advanced age, type 2 diabetes, hypertension, anemia, and poor glycemic control emerged as significant risk factors in univariate analysis, with advanced age remaining the only factor independently associated with renal insufficiency in multivariate analysis. As diabetes management is inherently multidisciplinary, glycemic control and blood pressure balance remain the pillars of treatment to prevent the occurrence and limit the progression of renal impairment, an approach fully supported by the most recent international guidelines [30-35]. Early and systematic renal screening in every diabetic patient, particularly after age 65, along with strengthened access to nephroprotection and renal replacement therapy, are priorities for improving the prognosis of these patients in West Africa.

Conflicts of Interest

None

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