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Prevalence and Factors of Renal Prognosis of Diabetic Kidney Disease in Senegalese Patients

Mbengue Mansour[1], Ciss Omar[2], Ouanekpone Cédric[3], Dieng Ameth[4], Cissé Mouhamadou Moustapha[5]

[1,2,3,4]Nephrology Resident, Department of Nephrology, Aristide Le Dantec University Hospital, Dakar, Senegal.

[5]Nephrology professor, Department of Nephrology, El hadji Amadou Sakhir Dieguene Hospital, Dakar, Senegal.

**Corresponding Author:* *Mbengue Mansour, Nephrology Assistant Professor, Department of Nephrology, Aristide Le Dantec University Hospital, Dakar, Senegal.*

Abstract

Introduction: *The aim of this study was to describe the prevalence of diabetic kidney disease and to determine the factors of poor renal prognosis at 3 months in the nephrology and internal medicine departments of El Hadji Amadou Sakhir Ndieguène hospital in Thies.*

Patients and Methods: *We performed a retrospective, descriptive and analytical study, including diabetic patients, carried out during the period from January 1, 2016 to April 30, 2019 in the nephrology and internal medicine departments of El Hadji Amadou Sakhir Ndieguene hospital in Thies. The diagnosis of diabetic kidney disease was retained according to the criteria of Kidney Disease Outcomes Quality Initiative. Diabetes was defined as fasting blood glucose ≥ 1.26 g/L confirmed by a second lab dosage.*

Results: *We included 106 patients with diabetic kidney disease out of 639 diabetic patients, representing a hospital prevalence of 16.58%. The mean age was 60.87 years. The sex ratio was 0.71. Hypertension was found in 81.13% of patients. The mean glycated hemoglobin was 9.50% ± 3.05. Micro albuminuria was noted in 36.80% of patients. Nephrotic proteinuria was found in 20.80% of patients. Chronic renal failure was found in 74.50% of patients, of which 19.80 % were to end-stage renal disease. The factors of poor renal prognosis after 3 months of follow-up were hypertension (p = 0.022) and nephrotic proteinuria (p = 0.037).*

Conclusion: *Diabetic kidney disease was relatively common in our patients. Hypertension and nephrotic proteinuria were factors of poor renal prognosis at 3 months.*

Keywords: diabetic kidney disease, hypertension, nephrotic proteinuria

Introduction

Diabetes mellitus is a major public health problem, both in developed and developing countries [1]. In 2015, an estimated 8.8% or 415 million people were living with diabetes worldwide, almost double the 4.6% (151 million) estimated in 2000, and that number is expected to increase to 10.4% (642 million) by 2040 [2].

People with diabetes have a higher risk of chronic kidney disease (CKD) than those without diabetes. Odds ratios for CKD vary between 1.3 and 4.6 depending on the region of the world, and this risk is aggravated by the presence of hypertension [3]. A systematic review showed that the overall prevalence of CKD ranged from 11% to 83.7% with an incidence of albuminuria of 94.9% after 10 years of follow-up [4]. CKD is one of the fastest growing causes of death in the world. It is estimated that at the current rate of growth, it will become the second most frequent cause of death before the end of the century in certain developed countries [5]. Diabetic kidney disease (DKD) is a key contributor to CKD mortality, and is the most common cause of need for renal replacement therapy in the world [6]. According to Global Burden of Disease data, DKD was responsible for more than

425,000 deaths in 2017, an increase of 37% over the past decade, and accounted for 35% of deaths from CKD in the world [7]. DKD progresses to end-stage renal disease (ESRD), and this is accelerated by the effect of certain progression factors of CKD, notably hypertension and proteinuria.

We carried out this study with the objective to determine the prevalence of DKD and to find the factors of rapid progression of diabetic kidney disease.

Patients and Methods

We performed a retrospective, descriptive and analytical study, carried out in the nephrology and internal medicine departments of the El Hadji Amadou Sakhir Ndieguene Regional Hospital in Thies, during the period from January 1, 2016 to April 30, 2019. Patients with DKD were included. Patients with incomplete records and diabetic patients diagnosed with non-diabetic nephropathy were not included. Epidemiological, clinical and biological parameters were collected using a questionnaire. The diagnosis of diabetic kidney disease was retained according to the criteria of Kidney Disease Outcomes Quality initiative (KDOQI) [8], which are the presence of micro albuminuria or macro albuminuria and / or renal failure associated to:

-the following anamnestic, clinical and biological arguments:

Diabetes evolving for more than 5 years

Existence of diabetic retinopathy

Absence of microscopic hematuria

Absence of explosive nephrotic syndrome

Absence of rapidly progressive renal failure

No signs of general illness other than diabetes

-or a concordant histology (the renal biopsy was indicated in front of the absence of one or more of the elements of this bundle of argument).

Diabetes was defined as fasting blood glucose ≥ 1.26 g/L confirmed by a second lab dosage.

Nephrotic proteinuria was defined by 24h proteinuria greater than 3 g / 24h.

The glomerular filtration rate (GFR) was estimated by using the MDRD equation.

By comparing the demographic, clinical, biological and evolutionary data of the patients, we divided the patients into 2 groups (A and B) in order to obtain the factors of poor renal prognosis after 3 months of follow-up:

-Group A: patients who had a reduction in estimated glomerular filtration rate (eGFR) of more than 5 ml / min after 3 months of follow-up.

-Group B: patients who had stabilization or a reduction of less than 5 ml / min of eGFR after 3 months of follow-up.

Data entry was made using software “The Sphinx” version 5.1.0.2.

Data analysis was performed using SPSS software (Statistical Package for Science Social) version 18.

The means and percentages were compared using the Chi-square test according to their applicability conditions.

Any difference less than 0.05 was considered statistically significant.

Results

We included 106 patients with DKD out of 639 diabetic patients, representing a hospital prevalence of 16.58%. Type 2 diabetes was found in 90.60% of our patients. The mean age was 60.87 years. The sex ratio was 0.71. The mean time to onset for DKD was 11.40 years in type 2 diabetics and 14.14 years in type 1 diabetics. Hypertension was found in 86 (81.13%) patients. Renal symptoms were dominated by edema, found in 44.3% of patients. Diabetic retinopathy was found in 36.80% of the patients. The mean glycemia was 1.84 g / l ± 0.99. The mean glycated hemoglobin was 9.50% ± 3.05. The mean albumin level was 27.28 g / L ± 7.09. Micro albuminuria was noted in 36.80%. The mean proteinuria was 2.50 g / 24h ± 2.25. Nephrotic proteinuria was found in 20.80% of patients. The mean glomerular filtration rate was 42.79 ml / min / 1.73 m2 ± 31.46. Chronic renal failure was found in 74.50% of patients at the start of treatment, including 19.80% were to ESRD. Dyslipidemia was present in 48.10% of patients. Oral anti-diabetic drugs were prescribed as monotherapy in 26 patients and in combination with insulin therapy in 9 cases. Forty-two patients were on insulin therapy alone. The renin angiotensin-aldosterone system blockers (RAAS) were used in 62.2% of our patients. The factors of poor renal prognosis after 3 months of follow-up were

hypertension (p = 0.022) and nephrotic proteinuria (p = 0.037) (Table).

Table. *Factors of poor renal prognosis at 3 months*

	Group A	Group B	p
Sex ratio	0.4	1.25	0.067
Age over 60 years	16	10	0.916
Phytotherapy	7	4	0.560
Type de diabetes	28	18	0.436
Obesity	7	3	0.387
Hyperuricemia	16	10	0.563
Nephrotic proteinuria	11	3	0.037
Hypertension	17	6	0.022
Anemia	22	14	0.380

Discussion

In our study, the prevalence of DKD was 16.58%. Among diabetics, the prevalence of kidney disease varies considerably by country [9,10], with estimates ranging from 27.1% in Shanghai, China to 83.6% in Tanzania [11 , 12]. In the United States, according to the National Health and Nutrition Examination Survey (NHANES), the prevalence of CKD was 26.2% in adults with diabetes [13]. In Senegal, a study carried out in Dakar, found a hospital prevalence of DKD of 7.6% [14]. A more recent study, carried out in Saint-Louis, another region of Senegal, showed a prevalence of 3.7% [15]. This diversity in prevalence is related to the differences in the criteria for defining DKD in these different studies.

In our study, hypertension was found in 81.13% of patients. This high frequency of hypertension is in phase with what has been found in the literature. In a study carried out in Morocco, the frequency of hypertension was 81.73% [16]. In Spain, according to Ridao et al. the prevalence of hypertension in patients with DKD was 87% [17]. In Japan, the prevalence of hypertension in type 2 diabetic patients with nephropathy was 71% [18]. In Senegal, in 2009, Tmar [15] found a prevalence of 75.2%. In our study, hypertension was a factor of poor renal prognosis after 3 months of follow-up (p = 0.022). Hypertension represents a risk factor for progression associated with DKD. And this has been observed in the results of studies in Morocco [19], Lebanon [20] and Germany [21].

The kidney, which is often the cause of hypertension, can in turn be victim of the latter through its repercussions (fibrous endarteritis and arteriosclerosis). This makes hypertension a factor in the progression of CKD. When it is transmitted to the glomerular capillaries, it worsens intra-glomerular hypertension and precipitates the progression of renal failure. This transmission is facilitated by the almost constant vasodilation of the afferent arteriole. Administration of antihypertensive drugs to animals with nephronic reduction and hypertension more or less significantly reduces glomerular sclerosis and the progression of renal failure [22].

In our study, 36.8% of patients had micro albuminuria. The prevalence of micro albuminuria varies in the literature. It was 47.5% in Morocco [16], 33% in a Lebanese series [23] and 59.2% in a study previously carried out in Senegal [15].

In our study, nephrotic proteinuria (p = 0.037) was a factor in poor renal prognosis after 3 months of follow-up. Like hypertension, proteinuria is both a consequence and a major factor in the progression of CKD. Indeed, on the one hand, it depends on the importance of the glomerular capillary pressure and on the other hand, it induces by itself tubular and interstitial lesions, through its direct action on the tubules, in particular the proximal tubule [22].

Studies have shown that controlling these progression factors by prescribing RAAS blockers can slow the decline in GFR and reduce all-cause mortality in diabetic patients [24]. In type 2 diabetes, several studies have shown the effectiveness of inhibiting RAAS in improving the progression of DKD [25,26]. In most experimental protocols, the nephroprotective effect of angiotensin converting enzyme (ACE) inhibitors has been shown to be superior to that of other antihypertensive agents, for the same degree of lowering of blood pressure. This effect has been attributed to an elective decrease in glomerular capillary pressure by vasodilation of the efferent arteriole. Indirectly demonstrating this action, proteinuria decreases, with equivalent blood pressure control (a modification of the permeability coefficient of the glomerular capillary wall partially intervenes in this decrease in proteinuria). Other effects of ACE inhibitors are likely to play a role in the mechanism of this nephroprotection, notably inhibition of the secretion of certain growth factors stimulated by angiotensin II [22].

New therapeutic molecules such as inhibitors of the sodium-glucose co-transporter 2 (SGLT2), have shown interesting results in reducing the progression of CKD and the risk of heart failure and will probably be widely used in the management of the DKD [27]. Physiopathologically, they have advantages over the blockers of the RAAS. By lowering renal intracellular glucose, they could potentially reduce the formation of advanced glycation products (AGEs), which are the main factors involved in the etiopathogenesis of DKD. In addition, by increasing natriuresis, they decrease the activation of RAAS which is constantly observed and implicated in the occurrence of DKD [28]. Finally, SGLT2 inhibitors improve hemoglobin levels by stimulating erythropoiesis unlike the blockers of the RAAS which inhibits erythropoiesis (remind that anemia is a factor in progression to CKD). However, SGLT2 inhibitors have adverse effects, notably urinary tract infections and the risk of dehydration in the elderly by their diuretic effect. It would be interesting to carry out randomized clinical trials comparing the nephroprotective effect of SGLT2 inhibitors with RAAS blockers one.

Conclusion

DKD was relatively common in our patients. Hypertension and nephrotic proteinuria were factors of poor renal prognosis at 3 months. The population must be made aware of screening in order to make the diagnosis in the early stages. Adequate management of progression factors could slow the progression to ESRD.

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