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Hyperuricaemia in Type 2 Diabetic Patients at the Marc Sankalé Centre of Abass Ndao Hospital (Dakar): Prevalence and Associated Factors

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Abstract

Introduction: Hyperuricaemia is frequently associated with type 2 diabetes and contributes to increased morbidity and mortality, particularly cardiovascular and renal. The aim of this study was to investigate the prevalence of hyperuricaemia and associated factors in patients with type 2 diabetes monitored at the Abass Ndao Hospital Centre in Dakar. **Materials and Methods:** This was a retrospective descriptive and analytical study conducted over a one-year period, from 1 January to 31 December 2022. Data were collected from the medical records of type 2 diabetic patients who had undergone uric acid testing. Statistical analysis was performed using Epi Info 2000 software version 3.3.2. **Results:** Hyperuricaemia was found in 66 patients, representing a prevalence of 16.7%, with a male/female ratio of 0.5. The average age was 60.6 ± 9.7 years. The average duration of diabetes was 10.5 ± 8.4 years. Hypertension was associated in 57.6% of hyperuricaemic cases compared with 41.6% in non-hyperuricaemic cases ($p = 0.017$). Renal impairment (22.7%) and anaemia (29.5%) were significantly more common in hyperuricaemic patients. Gout was found in 6% of patients. **Conclusion:** Hyperuricaemia is relatively common in patients with type 2 diabetes and is associated with several cardiometabolic and renal risk factors. Systematic screening and integrated management could help reduce morbidity and mortality in diabetic patients.

Keywords

Hyperuricaemia, Type 2 Diabetes, Cardiovascular Risk Factors, Senegal

1. Introduction

Type 2 diabetes is a major global public health problem, with a rapid increase in its prevalence, particularly in low- and middle-income countries. According to the World Health Organisation, the number of people living with diabetes could reach 882 million by 2045, reflecting the growing scale of this disease worldwide [1]. It is associated with numerous chronic complications responsible for high morbidity and mortality, particularly cardiovascular, renal and metabolic complications [2]. Hyperuricaemia, defined as elevated serum uric acid levels, has long been considered a simple biological abnormality associated with gout. However, earlier studies have already highlighted its close link with diabetes, insulin resistance and cardiovascular disease [3]. Uric acid is now recognised as a metabolic marker involved in endothelial dysfunction, oxidative stress and low-grade chronic inflammation, thereby contributing to high blood pressure, diabetic nephropathy and cardiovascular events [4].

Several epidemiological studies have shown that hyperuricaemia is frequently associated with components of metabolic syndrome, including abdominal obesity, dyslipidaemia, high blood pressure and poor glycaemic control [5]. In patients with type 2 diabetes, it is associated with faster progression of kidney damage and increased cardiovascular risk [6].

In sub-Saharan Africa, nutritional transition, rapid urbanisation and sedentary lifestyles have led to a concomitant increase in type 2 diabetes and its comorbidities. In this context, hyperuricaemia appears to be an emerging comorbidity that has not yet been sufficiently studied. However, data from Africa are beginning to highlight its clinical importance. In Nigeria, Ogbera *et al.* reported a high prevalence of hyperuricaemia in patients with type 2 diabetes, significantly associated with high blood pressure, obesity, poor glycaemic control and chronic kidney disease [7]. Similarly, in Morocco, El Aziz *et al.* showed that hyperuricaemia was independently associated with components of metabolic syndrome and renal failure in type 2 diabetics [8]. Despite these international and African data, information remains limited in West Africa, particularly in Senegal, where few studies have assessed the frequency of hyperuricaemia in diabetic patients and its associated risk factors. This prompted us to conduct this study at the Marc Sankalé Centre, the aim of which was to investigate hyperuricaemia in type 2 diabetic patients followed at the Abass Ndao Hospital Centre in Dakar and to identify the associated risk factors.

2. Patients and Methods

The study was conducted at the Marc Sankale Centre at the Abass Ndao Hospital in Dakar. This is a retrospective descriptive study on the prevalence and associated risk factors of hyperuricaemia among type 2 diabetics at the Marc Sankalé Diabetes Care Centre. Our patients were recruited over a one-year period from 1 January 2022 to 31 December 2022. The study population consisted of known type 2 diabetic patients followed at the Abass Ndao Centre.

Our study included adult patients aged 30 years and older with type 2 diabetes who had their uric acid levels measured during the recruitment period.

- Exclusion criteria: Type 2 diabetics with incomplete records.

A form was created to serve as a basis for data collection. The data collected included: Socio-professional data: age, gender, occupation, ethnicity and address. History and associated risk factors: family history and personal history (medical, surgical, gynaecological and obstetric). Habits and lifestyle factors such as smoking, alcohol consumption and physical inactivity. The diabetes study focused on the duration and control of diabetes and complications.

Paraclinical assessment: fasting blood glucose, HbA1c, renal assessment, lipid profile, uric acid, electrocardiogram.

- A review of cardiovascular risk factors

Those considered in this study, given that all patients are diabetic, were: age (>55 years for men and 60 years for women), active smoking, sedentary lifestyle, blood pressure above 130 mmHg, obesity, dyslipidaemia, hypercholesterolaemia > 2 g/l, hypoHDLemia < 0.5 g/l, hypertriglyceridaemia. Lipid profiles were measured during check-ups. Patients were considered to be glycaemic control if: HbA1C was below 6.5% according to the IDF and below 7% according to the ADA [9]. High blood pressure was diagnosed if systolic blood pressure was ≥ 140 and/or diastolic blood pressure was ≥90 mmHg [10] [11]. Overweight is defined as 24.9 < BMI < 30 kg/m^2 and obesity as BMI > 29.9 kg/m^2 [12]. Waist circumference is an indicator of cardiovascular risk. In our study, we used the 2001 NCEP-III values. Dyslipidaemia was defined by the presence of one or more of the following abnormalities and/or a known history of dyslipidaemia according to the National Cholesterol Education Program Adult Treatment Panel III: Total cholesterol > 2 g/l, triglycerides > 1.5 g/l, HDL cholesterol < 0.5 g/l in women and < 0.4 g/l in men, LDL cholesterol > 1.6 g/l. Cardiovascular risk factors. Those considered in this study were: age, gender, diabetes, high blood pressure, dyslipidaemia, obesity, active smoking, sedentary lifestyle, insufficient consumption of fruit and vegetables, metabolic syndrome. Metabolic syndrome: This was defined, in accordance with the IDF 2005 criteria, as abdominal obesity associated with 2 of the following 4 criteria [13]: Triglyceridaemia ≥ 1.5 g/l, HDL-c < 0.5 g/l in women and < 0.4 g/l in men, fasting blood glucose > 1.21 g/l, systolic blood pressure ≥ 130 mmHg and/or diastolic blood pressure > 9.

3. Results

3.1. Epidemiology

Hyperuricaemia was found in 66 patients, representing a prevalence of 16.7%. Males accounted for 22 patients (33.3%), with a male/female sex ratio of 0.5. The prevalence of hyperuricaemia was 16.0% in women and 17.1% in men. Among non-hyperuricaemic patients, 107 were male (32.5%).

The mean age of hyperuricaemic patients was 60.62 ± 9.68 years, with extremes ranging from 38 to 85 years. The 60 - 69 and 50 - 59 age groups were the most represented, with 23 patients (34%) and 21 patients (32%) respectively (**Figure 1**).

Unemployed patients accounted for 32 cases (49%). Among them, 17 (25.8%) were homemakers.

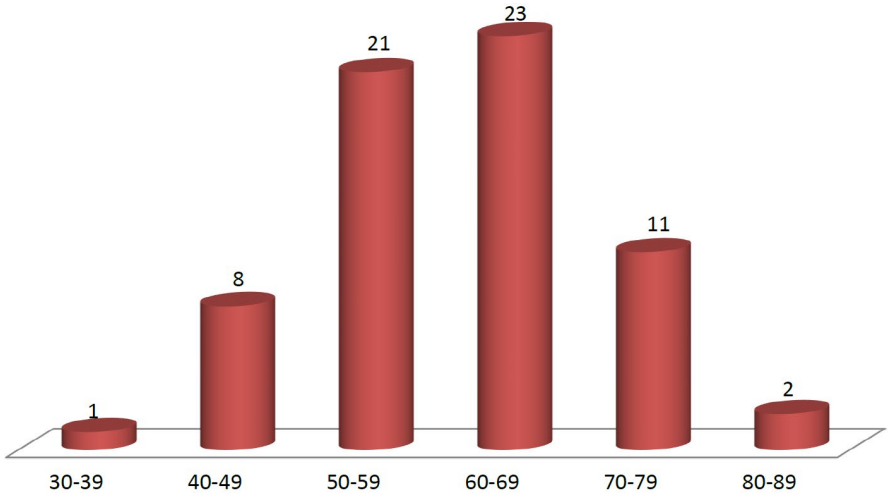

Figure 1. Distribution of hyperuricaemic patients by age group.

3.2. Clinical Aspects

Diabetes Study

The average duration of diabetes in hyperuricaemic patients was 10.48 ± 8.46 years. Twenty-two patients (33.3%) had had diabetes for between 0 and 5 years, while 13 patients (19.7%) had had it for between 6 and 10 years.

Among non-hyperuricaemic patients, 174 patients (53.5%) had a duration of diabetes between 0 and 5 years, with a statistically significant difference ($p = 0.02$) (**Table 1**). The mean fasting blood glucose level was 1.68 ± 1.49 g/L. Thirty-nine per cent of patients (59%) had a fasting blood glucose level > 1.21 g/L, indicating uncontrolled diabetes (**Table 2**). The mean HbA1c was 9.77 ± 7.7%. Among hyperuricaemic patients, 35 patients (60.3%) had HbA1c > 7%. This proportion was comparable in non-hyperuricaemic patients (169 patients, 64.3%), with no statistically significant difference ($p = 0.575$).

Cardiovascular Risk Factors

High blood pressure was present in 38 hyperuricaemic patients (57.6%), compared with 137 patients (41.6%) among non-hyperuricaemic patients, with a statistically significant difference ($p = 0.017$). Dyslipidaemia was observed in 41 hyperuricaemic patients (70%), compared with 236 patients (72%) among non-hyperuricaemic patients, with no significant difference ($p = 0.738$). The mean BMI was 26.03 ± 4.28 kg/m^2. Two patients (3.5%) were underweight, 23 patients (36.5%) were overweight and 14 patients (19.3%) were obese. Among non-hyperuricaemic patients, 72 patients (22%) were obese. Among the 86 obese patients, 13 were hyperuricaemic (16.3%).

Metabolic syndrome was found in 38 hyperuricaemic patients (59%), compared with 178 patients (54%) among non-hyperuricaemic patients. One case of smoking (1.5%) and three cases of alcoholism (4.5%) were found among hyperuricaemic patients.

3.3. Paraclinical Aspects

The mean uric acid level was 49.03 mg/L. Renal impairment was observed in 15 hyperuricaemic patients (22.7%), compared with 25 patients (7.6%) among non-hyperuricaemic patients, with a statistically significant difference. Anaemia was found in 13 hyperuricaemic patients (29.5%), compared with 33 patients (15.1%) among non-hyperuricaemic patients, with a significant difference (p = 0.0219) (Table 3).

A history of stroke was noted in 5 patients (7.5%). Two cases of lower limb arterial occlusive disease (2%) and 2 cases of diabetic nephropathy (3.0%) were recorded. An abnormality was found on the electrocardiogram in 67% of patients. Five (5) patients had gout (6%). An association with dysthyroidism was noted in 5 patients (8%).

Table 1. Distribution of hyperuricaemic patients according to duration of diabetes.

		Hyperuricaemia		Total	p
		No	Yes		
<6 years	Number	174	22	196	0.002
	%	53.5	33.3	50.1	
6 - 10 years	Number	53	13	66	0.503
	%	16.3	19.7	16.9	
>10 years	Number of employees	98	31	129	0.008
	%	30.2	47	33.0	

Table 2. Summary of parameters of hyperuricaemic patients.

	Hyperuricaemia				
	No		Yes		p
	Mean	Standard deviation	Mean	Standard deviation	
Age	56.890	10.580	60.621	9.679	0.01
Duration of diabetes	7.361	7.019	10.485	8.457	0.00
Waist circumference	91.426	12.070	93.969	10.347	0.11
Total cholesterol	2.255	2.285	2.219	0.583	0.90
HDL	0.682	2.132	1.600	5.927	0.03
LDL	1.358	0.420	1.388	0.499	0.63
TG	0.945	0.436	4.274	18.075	0.00
HbA1c	8.796	3.693	9.776	10.354	0.22
Creatinine	9.813	3.775	13.615	7.120	0.00
Calcemic	91.379	15.587	93.767	17.188	0.47
Urea	1.610	8.968	2.161	7.140	0.69
White blood cells	724.144	2.058	1.857	3.292	0.00
Haemoglobin	12.540	2.885	11.935	2.792	0.20

Table 3. Distribution of hyperuricaemic by gender.

Gender	F		M		p
	Mean	Standard deviation	Mean	Standard deviation	
Age	59.068	9.362	63.727	9.765	0.06
Duration of diabetes	10.273	8.541	10.909	8.468	0.78
Waist circumference	93.512	10.990	94.864	9.135	0.62
Total cholesterol	2.325	0.606	2.007	0.479	0.04
HDL	1.596	6.314	1.608	5.226	0.99
LDL	1.426	0.548	1.318	0.395	0.42
TG	4.397	20.648	4.045	12.397	0.94
HbA1c	10.408	12.694	8.575	2.350	0.53
Uric acid	70.090	10.481	83.091	15.530	0.00
Creatinine	13.684	8.269	13.482	4.257	0.92
Calcemia	93.741	20.807	93.822	4.769	0.99
Urea	2.264	7.685	1.949	6.102	0.89
White blood cells	1854.145	3547.774	1863.678	2915.816	0.99
Haemoglobin	11.264	2.828	13.371	2.165	0.02

3.4. Therapeutic Aspects

Among hyperuricaemic patients, 15 patients (22.7%) were treated with sulphonylureas, 30 patients (45.5%) with biguanides, 9 patients (13.6%) with insulin, while 8 patients (12%) were not yet receiving antidiabetic treatment.

In our study, the 5 patients with gout (symptomatic hyperuricaemia), representing approximately 1% of the total study population, were treated with allopurinol combined with analgesics.

4. Discussion

Methodology

Our study has certain limitations. Data collection was not exhaustive in clinical and paraclinical terms, and some patients did not have certain biological parameters measured.

4.1. Epidemiological Aspects

The prevalence of hyperuricaemia in our study was 16.70%. This prevalence is similar to that found by Damoune I. *et al.* in Morocco, which was 16%. Andrade JA *et al.* found a lower prevalence than ours in their study, at 11.4% [14]. Elsewhere, very high prevalences were noted in Cotonou [15].

In our study, the prevalence of hyperuricaemia was higher in women than in men, at 18% and 13.95% respectively. This finding is similar to that of other studies. FA. Wanvoegbe *et al.* (Benin) and Damoune I. found a prevalence of 31% in women compared to 25.7% in men and 80.55% in women compared to 19.4% in

men [14] [15]. The same finding was noted by Wun YT *et al.* in China [13]. This finding is shared by FA. Wanvoegbe *et al.* in Cotonou [15]. The average age was 60.62 ± 9. 679. For N. Habak, the average age was 51.58, with a predominance of the 50 - 60 age group [16]. The [60-69] and [50-59] age groups were more represented, with 23 patients (34%) and 21 patients (32%) respectively. This is consistent with Sayad's study, which shows that T2D is observed in most cases after the age of 50 [17]. Age was therefore an important risk factor for hyperuricaemia in our study.

4.2. Clinical Aspects

4.2.1. Diabetes Study

Our average duration of diabetes (10.48 years ± 8.45) was similar to that found by Damoune I *et al.*, which was 11 years [14]. In our study, a long duration of diabetes was a predictive factor for hyperuricaemia ($p = 0.008$). Poor glycaemic control was more common in hyperuricaemic patients (59%) than in non-hyperuricaemic patients (43%). Some authors have suggested that poorly controlled diabetes may lead to hyperuricaemia by inhibiting the excretion of urates by the kidneys [18]. Choi *et al.* showed in their study that the frequency of hyperuricaemia increased with moderate levels of HbA1c and fasting plasma glucose [19].

4.2.2. Cardiovascular Risk Factors

Obesity affected 19.29% of cases. FA. Wanvoegbe and colleagues reported that it was a factor in hyperuricaemia [15]. All alterations in tubular function induced by insulin resistance associated with obesity and the resulting metabolic disorders selectively promote the formation of uric acid stones [20] [21]. In our study, 57.60% were hypertensive compared to 41.60% in non-hyperuricaemic patients ($p = 0.0174$). This is similar to the study by Damoune I *et al.*, who reported a positive correlation between hyperuricaemia and HTN ($p = 0.097$) [14]. Wanjuan in Baltimore and P. Deléaval in Switzerland made the same observation [22] [23]. In our study, 41 patients had dyslipidaemia (70%). This rate was lower than the percentage in the study by Fagot *et al.* [24].

Uric acid levels were lower in patients with metabolic syndrome. This finding is consistent with the data in the literature [25]. Paradoxically, Bekele *et al.* concluded that acid levels rise in metabolic syndrome [26]. Similarly, J.-L. Schlienger found that excess uric acid led directly to the development of markers of metabolic syndrome [27].

4.2.3. Study of Complications

Uric acid therefore tends to accumulate in the kidneys and form stones, which eventually damage the kidneys and cause renal failure, which can be further aggravated by diabetes. Diet, monitoring of blood sugar, uric acid, creatinine and urea levels are therefore essential for preserving kidney function [28]. In our study, 22.7% had kidney damage. A similarity is noted with the results of FA. Wanvoegbe, with a prevalence of nephropathy of 32.3% [15]. Similarly, Weiner [29]

stated that there is an increased risk of developing chronic renal failure depending on uric acid levels. Wung *et al.* [13] in 2008 stated that uric acid was significantly correlated with increased creatinine levels.

Strokes affected 7.5% of patients in our study. Hyperuricaemia is a risk factor for stroke [30]. In our study, 29.5% of patients had anaemia. In their 2009 study, Amani *et al.* found that inflammation was the main cause of anaemia in type 2 diabetics [31]. Gout was present in 6% of cases. According to G. Châles in France in 2011, hyperuricaemia is a necessary but not sufficient condition for the onset of gout. The latter appears to be an independent risk factor for all causes of mortality and morbidity from cardiovascular disease [32]. It is therefore necessary to manage the cardiometabolic and renal comorbidities associated with hyperuricaemia, especially in asymptomatic patients [32].

5. Conclusion

Hyperuricaemia is relatively common in patients with type 2 diabetes and is associated with major cardiovascular and renal risk factors. Its screening and integrated management should be part of the overall follow-up of diabetic patients in order to reduce morbidity and mortality.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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