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Diabetic Macroangioapathy at the Internal Medicine Department of the Abass Ndao Hospital Center (About 359 Cases)

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Abstract

Introduction: Macroangiopathy plays an important role, with a high prevalence of morbidity and mortality in diabetic patients. The aim was to study the epidemiological, clinical, paraclinical, therapeutic and evolutionary profile of macroangiopathy in diabetic patients in the internal medicine department of the Abass Ndao hospital. **Patients and methods:** This was a descriptive and analytical cross-sectional study. Our investigations were recruited over a 7-year period (January 1, 2016 to December 31, 2022). **Results:** Three hundred and fifty-nine (359) patients (10.22%) were enrolled. The mean age was 62.83 years, with extremes ranging from 17 to 98 years. The [60 - 69] age group was more representative (37.32%). Women accounted for 180 cases (50.1%), with a sex ratio (m/f) of 0.99. The average duration of diabetes was 11.86 years. Average consultation time was 38.07 days, with extremes ranging from 1 to 368 days. Average hospital stay was 7.65 days. Inaugural diabetes was noted in 12 cases (3.34%). Type 2 diabetes accounted for 95.82% (n = 344) of patients. Hypertension was present in 150 patients (41.8%). Patients with 2 risk factors accounted for 173 cases (48.18%). Nineteen patients had already had a stroke (5.29% of cases). Fourteen (14) patients (4.2%) were amputees. Obliterative arteriopathy of the lower limbs (AOMI) was noted in 193 patients (54%). Stroke was noted in 101 patients (28%). Ischemic heart disease (IHD) was noted in 38 patients (11%). AOMI was more common in males (110 patients, 57%) than in females (43%). Seventy-three (73) patients (20.3%) died. Predictors of death were age over 60 and the existence of more than two cardiovascular risk factors. **Conclusion:** Diabetic macroangiopathy is a major cause of morbidity and mortality. The development and implementation of a prevention and management program is essential.

Keywords

Macroangiopathy, Diabetes, Risk Factors, Senegal

1. Introduction

Diabetes is a state of chronic hyperglycemia linked to absolute or relative insulin deficiency, in relation to genetic and/or environmental factors often acting in concert [1]. It is a truly global pandemic. According to the International Diabetes Federation (IDF), an estimated 366.2 million adults worldwide have diabetes. Of these, 14.7 million live in Africa. IDF experts predict that 552 million adults will have diabetes by 2030 [2]. In Africa, the prevalence of diabetes is on the rise. Africa has the highest proportion of undiagnosed diabetes, estimated at at least 78% [2]. In Senegal, prevalence data remain approximate. According to the results of the 2015 IDF WHO STEPS national survey, 3.24% of the Senegalese population are thought to be diabetic [3]. Diabetes is a condition that predisposes to the occurrence of numerous complications, notably cardiovascular. Classically, there are two groups of cardiovascular complications: microangiopathy and macroangiopathy, with lesions of the large vessels responsible for myocardial infarction, stroke and ischemia of the lower limbs. These macroangiopathic complications are distinguished in diabetics by their severity, and can evolve on their own account.

Macrovascular complications are the main cause of morbidity and mortality in patients with type 2 diabetes. In the first ten years after diagnosis of type 2 diabetes, complications of macro angiopathy predominate [4] [5]. Among diabetes-related complications, cardiovascular events remain the most formidable. They are the leading cause of mortality in diabetics. In Saint Louis, stroke occurred in 2% of diabetics and coronary heart disease in 12.2% [6]. In fact, around one in two diabetic patients dies of cardiovascular disease [7] [8].

In the USA, 77% of hospitalizations for cardiovascular disease are attributable to diabetes [9]. In a study carried out at the Fann Hospital, the association between diabetes and cardiovascular disease was 9.2% [10]. Arteriopathy of the lower limbs is a classic complication of diabetes that can lead to amputation.

In view of the high prevalence of diabetic macroangiopathy (DMA), we thought it would be interesting to take stock of macroangiopathic complications in diabetic patients in the internal medicine department of the Abass Ndao Hospital. The general objective was to describe the epidemiological, clinical, paraclinical, therapeutic and evolutionary characteristics of our patients.

2. Materials and Methods

The study was carried out in the internal medicine department of the Abass Ndao Hospital in Dakar. It was a descriptive and analytical cross-sectional study of diabetic subjects hospitalized for diabetic macroangiopathy. Our patients were

recruited over a 7-year period (January 01, 2016 to December 31, 2022). The DAM was stroke, AOMI and/or coronary artery disease.

Not included in our work:

- All diabetic patients without diabetic macroangiopathy
- Clinically and/or paraclinically incomplete files were not included in the final evaluation.

A standard questionnaire was drawn up to serve as the basis for data collection for patients included in the study. Data were collected from the charts of patients meeting the inclusion criteria.

The data collected concerned**:** Socio-demographic characteristics, clinical and paraclinical characteristics, study of diabetes mellitus, evolution and therapeutic aspects.

Data collection procedure

❖ **Collection tools**

A standard questionnaire was drawn up to serve as the basis for data collection for patients included in the study. It covered marital status, clinical and paraclinical manifestations, diabetic study and evolution during hospitalization.

❖ **Sources of collettes**

Data were collected from the records of patients fulfilling the inclusion criteria.

Study variables

The data collected concerned:

Socio-economic characteristics: age, gender, profession, place of origin

- Clinical characteristics: The study of diabetes mellitus focused on the type of diabetes, how long it had been present, and its glycemic control,
- Cardiovascular risk factors were also studied. These included hypertension, smoking, obesity, dyslipidemia and anemia.

Patients were considered hypertensive if systolic blood pressure was greater than or equal to 140 mmHg and/or diastolic blood pressure greater than or equal to 90 mmHg, or if blood pressure figures were normal on antihypertensive treatment [11]. Classification of hypertension was based on the WHO [11]. Dyslipidemia was defined as total hypercholesterolemia > 2 g/l, HDL hypocholesterolemia < 0.35 g/l, LDL hypercholesterolemia > 1 g/l and/or hypertriglyceridemia > 1.5 g/l, or in a patient already known and/or treated for dyslipidemia.

Diabetes typing, in the absence of immunology and C-peptide assay, was presumptive based on clinical and evolutionary arguments (patient's age, morphotype, time to onset of symptoms, family history and evolution under treatment).

History and vitals: blood pressure, pulse, temperature, diuresis, capillary glucose, glucosuria and ketonuria.

The diagnosis of diabetic macroangiopathy was retained if the patient presented with one of the following cardiovascular conditions: stroke, coronary insufficiency and/or arteriopathy of the lower limbs. For this study, we selected all patients for whom the diagnosis of macroangiopathy was confirmed on the basis of clinical and paraclinical criteria (electrocardiogram, cardiac Doppler ultrasound, cerebral CT scan and arterial Doppler ultrasound of the lower limbs).

- Paraclinical characteristics

These included blood count, creatinine and uremia levels, CRP, HbA1C, fasting blood glucose, lipid profile, blood ionogram, electrocardiogram (ECG), cardiac Doppler ultrasound, Doppler ultrasound of the lower limbs, foot X-ray, chest X-ray and brain scan.

- Evolutionary characteristics (mean length of hospital stay, mortality) were noted.

Data capture and analysis

Data were entered using Microsoft Office Excel and then analyzed using epi info 2000 version 3.3.2 to compare two proportions.

For descriptive analysis, data were presented as percentages for qualitative variables and as averages for quantitative variables.

Ethical considerations: The hospital ethics committee approved our study.

3. Results

3.1. Epidemiological Aspects

During the study period, three thousand five hundred and fourteen (3514) patients were hospitalized in the internal medicine department of CHU Abass Ndao. Of these, 359 were carriers of diabetic macroangiopathy (DMA), a frequency of 10.22%. The year 2016 recorded the majority of cases, with 115 patients (32%), while 2018 and 2021 recorded 62 cases (17.3%) and 53 cases (14.8%) respectively. The majority of patients came from the Dakar region, accounting for 334 (93%). The mean age was 62.83 years, with extremes ranging from 17 to 98 years, and a standard deviation of 12.06. The 60 - 69 age group was more representative (37.32%, n = 134). Thirteen patients (13) were under 40, *i.e.* 3.60%. Women accounted for 180 cases (50.1%), with a sex ratio (m/f) of 0.99. The majority had no occupation (50.6%) (Table 1).

3.2. Study of Diabetic Macroangiopathy

3.2.1. Clinical Data

The mean duration of diabetes was 11.86 years. Less than 1 year was noted in 55 patients (15.33%). Duration of more than 10 years was noted in 124 patients (34.54%). Inaugural diabetes was noted in 12 cases (3.34%). Nineteen patients had a previous DALY (5.29%). Surgical history was found in 43 patients, including 14 (4.2%) who were amputees. The average consultation time was 38.07 days, with extremes ranging from 1 to 368 days. The average hospital stay was 7.65 days. Diabetes was less than 1 year old in 86 patients (23.95%). Diabetes was more than 10 years old in 109 patients (33.36%). Type 2 diabetes accounted for 95.82% (n = 344) of patients. Previous treatment for diabetes was specified in only 83 patients. Of these, 54 (15%) were on oral antidiabetic drugs (OADs), compared with 8.1% (n = 29) on insulin. The mean HbA1c was 7.73%, and glycemia above 2 g/l was noted in 120 cases (33.4%).

Hypertension was present in 150 patients (41.8%). Smoking was present in 3.9% of cases. Alcoholism was present in 2 patients (1.9%).

Table 1. Epidemiological characteristics of patients.

Epidemiological characteristics of patients (n = 359)	
Women	180 (50.1%)
average age	62.83 [17 to 98] years old
Age < 40	13 (3.62%)
Age between 60 and 69	134 (37.32%)
Age > 60	(65.44%)
From Dakar	334 (93%)
Outside Dakar	25 (7%)
No profession	113 (50.6%)
2016	115 (32%)
2017	44 (12.3%)
2018	62 (17.3%)
2019	13 (3.6%)
2020	21 (5.8%)
2021	53 (14.8%)
2022	51 (14.2%)
Hypertension	150 (41.8%)
Active smoking	4 (3.9%)
Amputation	14 (4.2%)
Previous DALY	19 (5.29%)
Type 2 diabetes	344 (95.82%)
Inaugural diabetes	12 (3.34%)
Average HbA1c	7.73%
Blood sugar over 2 g/l	120 (33.4%)

Patients with 2 risk factors accounted for 173 cases (48.18%). The clinical signs noted were dominated by the wound, which affected 84 patients (23.4%). Polyuria and polydipsia were noted in 41 patients (11.42%) (Table 2). Mean systolic blood pressure was 135 mm Hg, with extremes of 80 and 220 mm Hg. The mean diastolic blood pressure was 78 mm Hg, with extremes of 50 mm Hg and 110 mm Hg; grade 3 and grade 2 systolic hypertension concerned 26 patients (8.6%) and 50 patients (16.7%) respectively.193 patients (54%) had an OSA, with a mean age of 63.4 years.101 patients (28%) had a stroke. The average age of these patients was 65.8 years.38 patients (11%) had ischemic heart disease. AOMI was more common in males (110 patients or 57%) than in females (43%) (Table 3). The difference was significant (p = 0.004). Three(3) patients had both stroke and ischemic heart disease, and 6 patients had both AOMI and ischemic heart disease (Table 4).

Table 2. Distribution of functional signs.

Functional signs	Workforce	Percentage (%)
Foot wound	84	23.4
Vomiting	41	11.4
Motor deficit	28	7.8
Consciousness disorder	21	5.8
Polyuria Polydipsia	41	11.42
Weight loss Anorexia	32	8 .91
Dyspnea	14	3.9
Dysarthria	10	2.8
Aphasia	7	1.9
Epigastralgia	4	1.1
Chest pain	3	0.8

Table 3. Distribution of macroangiopathy by gender.

Macro angiopathy		gender		Total	P
		F	M		
AOMI	Workforce	83	110	193	0.004
	%	43.0%	57.0%	100.0%	
AVC	Workforce	56	45	101	0.208
	%	55.4	44.6	100.0%	
Coronary artery disease	Workforce	18	20	38	0.549
	%	48%	52%	100.0%	

Table 4. Distribution of electrocardiographic abnormalities.

Macroangiopathy	Workforce	Percentage (%)
AOMI	193	53.7
AVC	101	28.1
CI	38	10.5

3.2.2. Paraclinical Data

An electrocardiogram was performed in 147 patients (40.94%). Of these, 133 patients showed abnormalities (90.47%). Left ventricular hypertrophy (LVH) was found in 13 patients (9.02%) and ischemia in 24 (18.04%). One patient had a complete BAV (0.75%). Branch block was found in 6 patients (4.5%) (Table 5). Cerebral CT scans were normal in 153 patients and showed ischemia in 101. Arterial echodoppler of the lower limbs showed ischemia in 54% of cases.

Table 5. Distribution of electrocardiographic abnormalities.

Electrocardiographic abnormalities	Workforce	Percentage (%)
Subendocardial ischemia	12	9.02
Subepicardial ischemia	12	9.02
Subendocardial lesion	01	0.75
Subepicardial lesion	02	1.5
Necrosis	07	5.25
Mirror image	00	00
Left ventricular hypertrophy	13	9.75
Right ventricular hypertrophy	04	3
Left atrial hypertrophy	13	9.75
Right atrial hypertrophy	02	1.5
Atrioventricular block	1	0.75
Hemi anterior block	11	8.25
Branch block	6	4.5

3.2.3. Therapeutic Data

With regard to treatment, oral antidiabetics (OADs) and insulin therapy were prescribed in 54 cases (15.04%) and 197 cases (54.87%) respectively. Anticoagulants were prescribed in 117 patients (35.59%) and analgesics in in 13.09% of cases. Antihypertensives were prescribed in 41.8% of cases.

3.2.4. Scalable Data

The evolution of macro angiopathy was favorable, with 72.7% of patients returning home. Twenty-five patients (7%) of the sample were transferred to other hospital facilities. Seventy-three patients (20.3%) died during hospitalization.

Stroke was the leading cause of death, accounting for 24.8%. Death from OIA was noted in 44 cases (22.3%), with age over 60 years (**Table 6**) and the existence of more than two cardiovascular risk factors being predictive of death.

4. Discussion

Our study has certain limitations. Data collection was not exhaustive, due to missing data in the files. Some patients had not had all the paraclinical tests carried out, due to the high cost of these examinations.

Epidemiological aspects:

The frequency of macroangiopathy seems to vary with the recruiting department and sample size. Our result of 10.22% seems to be higher than the data from the team of Abduelkarem *et al.* in Libya, which was 18.8% [12]. In a recent study, Dioum *et al.* [10] found a frequency of 9.0% among cardiology inpatients. Donadji *et al.* found a much lower hospital frequency of 3.98% in Ndjamena [13]. In Senegal in 2002, Charles *et al.*, in their study of elderly diabetics at the same center, found macro angiopathy in 30% of cases [14].

Table 6. Breakdown of deaths by age.

Age		Deaths		Total	P
		No	Yes		
<60	Workforce	121	19	140	0.001
	%	86.4%	13.6%	100%	
>60	Workforce	163	54	217	
	%	75.1%	24.9%	100%	
Total	Workforce	284	73	357	
	%	79.6%	20.4%	100%	

Frequencies of 21.1% 27.6%, and 60.63% were respectively reported in Côte d'Ivoire studies by Lokrou A *et al.* [15], Khanouach *et al.* [16], Kouakou *et al.* [17]. These results are similar to those of Takogue, whose overall prevalence of subclinical macroangiopathy was 76.5% [18]. Imen Sebai's study found 54% macroangiopathy in type 2 diabetics [19]. In our study, a slight predominance of women (50.1%) was noted, with a sex ratio (m/f) of 0.99. Other authors have also found a female predominance [10] [20]. In the study by Imen S and Cederholm *et al.,* men were 2.9 times more likely to develop macroangiopathy than women [19] [21]. This difference is thought to be linked to the higher prevalence of male smoking and the particular estrogenic climate enjoyed by non-menopausal women. Type 2 diabetes accounted for the majority of cases in our study (95.82%). Worldwide, type 2 diabetes accounts for 90% of all cases of diabetes. These results are similar to those of Dionadji, and SOW D in Dakar with a predominance of 89.6% type 2 diabetes [13] [22].

The mean age was 62.83 years, with extremes ranging from 17 to 98 years. Kouakou *et al.* in their study had an age range from 18 months to 81 years, with a mean of 54.62 years, with an average of 54.62 years [16]. Elsewhere, the average age was 57.9 ± 6.6 years [19].

Clinical aspects:

In our study, the mean duration of diabetes was 10.3 years. A similar average was reported in the study by Abdesselem et Coll, where the mean duration of diabetes was 12.98 ± 7.3 years [12]. Inaugural diabetes was noted in 12 cases (3.34%); in the series by Komi Dzidzonu Nemi, stroke revealed diabetes in 3.8% of cases [23]. This rate is close to that of Ouédraogo *et al.* [24] and Djibril *et al.* [25], who reported 4.8% and 6.7% strokes respectively.

In our series, the mean blood glucose level was 2.60 g/l, and blood glucose levels above 2 g/l were noted in 33.4% of patients. These results are below those found in the studies by Yessoufou and Brehima, who found 72% and 100% hyperglycemia respectively [26] [27].

In our study, the mean HbA1c was 7.73%. In the literature, a correlation between unbalanced diabetes and the occurrence of macrovascular complications has been reported. Mitsios *et al.* found that an HbA1C level ≥ 6.5% was asso-

ciated with a high risk of stroke in diabetic patients [28]. Dioum *et al.* found unbalanced diabetes with a mean glycated hemoglobin level of 8.32 ± 2.33 [10]. It is therefore necessary to raise diabetic patients' awareness of the need to follow not only their drug treatment, but also and above all hygienic and dietary measures, in order to avoid the occurrence of vascular complications.

In the literature, macroangiopathy is associated with a number of cardiovascular factors such as arterial hypertension. [19] [29]. In our population, hypertension was found in 41.8% of cases. In Ragul B study, hypertension was present in 30.23% and was the main risk factor associated with diabetes [30]. Aidin Rawshani *et al.* have shown that strict control of glycemic control and cardiovascular risk factors reduces the risk of death, myocardial infarction and stroke [31].

In our series, AOMI predominated (50%). This may be explained by the proximity of the national diabetes management center to the hospital. In Saint Louis, Ndour Mbaye found a prevalence of 14.5% [6]; in Algeria, Belhadj *et al.* found 8.5% of lower limb arteriopathy [32]. In Douala Ndambwe Moussio V, the prevalence of AOMI was 15.1% [33]. In cardiology, coronary syndrome predominated [9]. The prevalence of acute coronary disease was 37.59% [9]. In our study population, 28.1% had suffered a stroke. The mean age of these patients was 65.8 years. - In Saint louis, stroke occurred in 2.0% [6]. The average hospital stay was 7.65 days, due to inpatient investigations and referral to surgery for other types of diagnostic and therapeutic investigations.

Therapeutic aspects:

In terms of therapy, antidiabetic drugs were administered to all patients. Insulin therapy was used in 54.87%. Patients were on conventional medical treatment (aspirin, statins, diuretics and antihypertensives).

Evolution:

Seventy-three patients (20.3%) died during hospitalization, compared with 12.03% and 16.4% elsewhere [10] and [13]. Stroke was the leading cause of death (24.8%), with age and cardiovascular risk factors being predictive of death.

5. Conclusion

This study shows the aspects of diabetic macroangiopathy in our practice context, and the need to strengthen prevention and management strategies for diabetics 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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