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Decentralised Management of Type 2 Diabetes in a Decentralised Centre for the Management of Type 2 Diabetes

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Abstract

Introduction: Diabetes mellitus is a heterogeneous metabolic disorder characterized by the presence of chronic hyperglycemia due to a lack of secretion and/or action of insulin on the target tissues. Type 2 diabetes accounts for 90% of all diabetics. Despite the few specialists, there is a policy of decentralization of these patients. **Patients and Methods**: This was a retrospective cross-sectional study of the records of diabetic subjects followed in ambulatory at the internal medicine department of the EPS of Mbour. The recruitment of our patients took place over a period of sixty-three (63) days (from 03 May 2021 to 05 July 2021). **Results**: During the study period we collected 163 patients and most of those were female with a sex ratio of 0.68. The most represented age group was 46 - 55 years; 82.8% of patients came from Mbour. Diabetes was initially discovered in 65 patients (39.9%) and known in 98 patients. 72 patients in our population had previous follow-ups in a health facility; Almost all of the 146 patients had at least one FDR of T2D, *i.e.* 89.6%. Cardiovascular risk factors were present in 96 patients. The majority of patients (138) came for simple follow-up, 11 for acute complications and 16 for chronic complications. 36 patients in our population had at least one microangiopathic complication of diabetes, 18 a macroangiopathic complication and 18 an infectious complication. In our study, 102 patients had a very high cardiovascular risk, 42 patients had a high risk, and 19 patients had a moderate risk. **Conclusion**: Diabetes is a real public health emergency because of its magnitude and complications. A strengthening of the policies of decentralization of the management will allow better management of patients who are not from Dakar.

Keywords

Type 2 Diabetes, Complications, Decentralization, Mbour

1. Introduction

Diabetes is a syndrome involving a set of different metabolic diseases but all characterized by chronic hyperglycemia leading to micro- and macro-vascular complications. Hyperglycemia is always the result of an abnormality of secretion and/or action of insulin in relation to genetic and environmental factors often entangled [1].

It is a real public health problem because of its magnitude and complications. According to the International Diabetes Federation (IDF), the number of diabetic patients worldwide was about 366.3 million in 2019 [2]. The majority of diabetic patients are type 2 with at least 90%, diabetic states.

In Africa, 1 in 22 adults (24 million) lives with diabetes. He was responsible for 416,000 deaths in 2021 [3]. Senegal is not immune to this pandemic. According to the STEPS survey conducted in 2015, 3.4% of the Senegalese population suffers from diabetes [4].

Diabetes is a disease that can be associated with other cardiovascular and metabolic diseases, making its management more complex and requiring a multidisciplinary approach.

Senegal is a country with a high concentration of populations and care in the capital that is the city of Dakar which brings together the major centers for diabetes management, sometimes leaving people living outside Dakar stranded. We focused on the management of diabetes in the periphery in a diabetes management center at the Thierno Mouhamadou Mansour Barro public health facility of MBOUR.

2. Patients and Methods

This was a cross-sectional, descriptive study of patients with type 2 diabetes following the public health facility Thierno Mouhamadou Mansour Barro of MBOUR which is a level 2 public health facility, over the period from 03 May 2021 to 05 July 2021. The survey, which was conducted using a standard questionnaire, was designed to serve as a data collection basis for patients included in the study. We included all type 2 diabetic patients followed up in the hospital. Data were collected from the files of patients meeting the inclusion criteria during the study period. The questionnaires were completed with the patients and completed from their consultation file reporting the clinical and paraclinical elements of the patients.

Data analysis was performed with SPSS software version 20.0. For the descriptive part, data were presented as a percentage for qualitative variables and averaged for quantitative variables.

3. Results

During the study period, we collected one hundred and sixty-three (163) patient records from the internal medicine department of the Thierno Mansour Barro Public Health Institution in Mbour.

The majority of patients were female and accounted for 59.5% (97). The male sex was a minority and represented only 40.5% (66) of patients with a sex ratio of 0.68.

Figure 1 shows the distribution of the population by gender.

The most represented age group was 46 - 55 years (34.4%), followed by those 56 - 65 years with 31.9%. Moreover, 2.5% of the population were under 35 years old. Table 1 shows the age distribution.

The origin was not specified in 11.7% of patients. Almost all patients came from Mbour and accounted for 82.8%.

Regarding diabetes, it was inaugural the discovery in 65 patients (39.9%) and known in 98 patients. Among patients with an inaugural discovery, 38 patients were of chance discovery, and 27 patients had presented cardinal signs.

The diabetic disease was known in 98 patients or 60.1%.

In this population of known diabetics, the age of diabetes was 1 to 4 years in 37 patients or 37.7%. It was 34.7% from 5 to 10 years. Note that 9 patients had a duration of type 2 diabetes less than one year (Table 2).

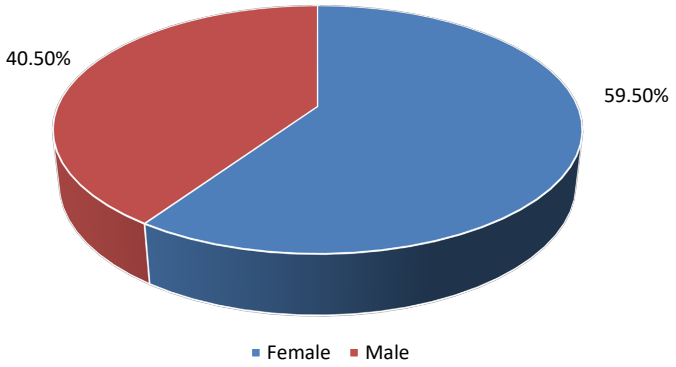

Figure 1. Distribution of patients by gender.

Table 1. Age distribution of patients.

Age	Headcount	Percentage	Valid percentage	Cumulative percentage
25 - 35 years	4	2.5	2.5	2.5
36 - 45 years	19	11.7	11.7	14.1
46 - 55 years	56	34.4	34.4	48.5
56 - 65 years	52	31.9	31.9	80.4
66 - 75 years	30	18.4	18.4	98.8
over 75 years of age	2	1.2	1.2	100.0
Total	163	100.0	100.0	

Table 2. Duration of diabetes in our patients.

Age of diabetes	Headcount	Percentage (%)
<1 year	12	12.23
1 - 4 years	37	37.7
5 - 10 years	34	34.7
>10 years	15	15.5
Total	98	100

Therapeutically, among our patients, 72 patients of our population had a previous follow-up in a health structure of which 55 were in a hospital or 76.3% and 17 in a health center or 17.3%.

Non-insulin antidiabetic drugs were used in 67 patients or 41.1%. Among 67 patients 60 were on metformin, 15 on sulphonamides hypoglycemic, 6 on IDPP4 and 3 on GLP1 analogues shown. GLP1 analogues were initiated in some patients who had already had a cardiovascular event or kidney failure, following a donation of drugs received by the hospital. The treatment could not be continued because of the stock shortage because the donations did not follow. Unfortunately despite their effectiveness especially in cardio-renal protection, GLP1 analogues are not available in Senegal.

Insulin was taken by 17 patients or 10.4%. Of these 17 patients, 11 were on premix insulin, 3 on rapid insulin, 2 on rapid analogues, 3 on slow analogues and 2 on slow insulin shown in Table 3. It should be noted that only one patient could be on several types of insulin.

Risk factors for type 2 diabetes have been systematically investigated. Almost all 146 patients had at least one risk factor for type 2 diabetes, or 89.6%. Only 10.4% did not. A single patient could have multiple type 2 risk factors

We represent in Table 4 risk factors such as age fetal macrosomy and family diabetes at first degree in the general population.

Risk factors were present in 96 patients or a frequency of 58.9%. Note that a single patient could have several factors. Figure 2 shows the distribution of cardiovascular risk factors.

The number of patients with or without hypertension was substantially equal. 82 patients had hypertension or 50.3%.

Dyslipidemia was present in 68 patients or 41%. Smoking was noted in six decimal seven percent (6.7%) of patients in our population. As for overweight and obesity, they were noted in seventy-two patients (55.8%) of our population were overweight or obese. The majority of patients reported not being sedentary or 60.1% of patients.

In terms of cardiovascular risk factors, only 40 patients had received treatment for their cardiovascular risk factors associated with type 2 diabetes, or 24.5% (Figure 3).

For anti-HTA treatment 36 patients were on Converting enzyme inhibitors; 2

Table 3. Distribution by type of insulin.

Insulin type	Headcount
Premix	11
Rapid insulin	3
Fast analogue	2
Slow analogue	3
Slow insulin	2

Table 4. Distribution by different type 2 diabetes risk factors.

Type 2 diabetes risk factors	Headcount
Age	114
Fetal macrosomy	24
Family diabetes at first and second degree	90

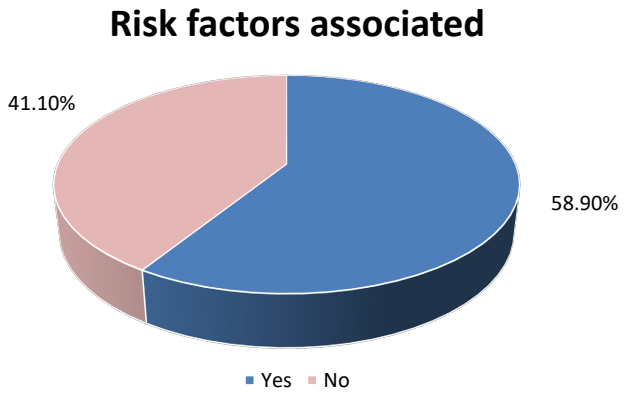

Figure 2. Distribution of patients by cardiovascular risk factors.

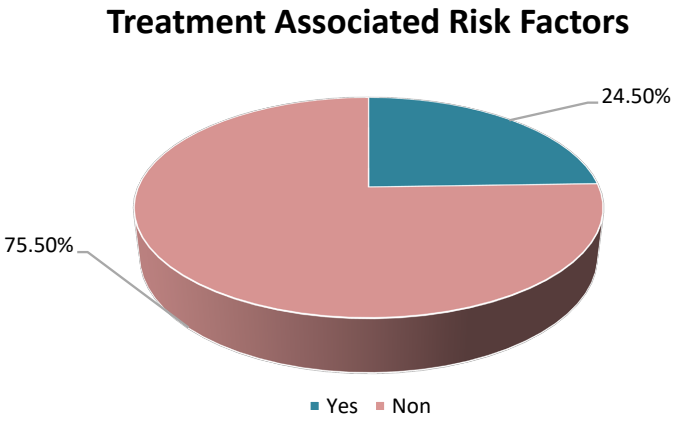

Figure 3. Treatment distribution of cardiovascular risk factors.

under angitenssin 2 receptor antagonist (ARA2), 11 under Calcium channel blockers, 24 under diuretic and 4 under beta-blocker. Thirteen (13) patients in our population were on statins or 8%. Six (6) patients in our population were on an-

tiplatelet drugs.

Complications were sought and eleven (11) patients in our population were received for an acute complication.

Including 7 for ketotic decompensation and 4 for hyperosmolar hyperglycemia.

Sixteen patients were received for degenerative complications of diabetes or 9.8% of which 8 for microangiopathy (6 for nephropathy, 4 for neuropathy and 3 for diabetic retinopathy) and 12 for diabetic macroangiopathy (8 for stroke, 1 for limb amputation, 2 ischemic heart diseases and one dilated).

10 patients had an infectious complication or 6.1% including an infection skin and 9 foot infections.

In the study population, 85 people or 52.1% had normal blood pressure; 78 people or 47.9% had high blood pressure. Abdominal obesity was present in 58 patients or 35.6% and obesity was found in 44 patients of the population or 27.7%. Paraclinical explorations found a mean HbA1C was 8.61%. Out of a total of 151 patients who performed the test; 131 patients or 80.1% had HbA1c > 7%. Table 5 represents the distribution of patients according to HbA1c.

Lipidogram made in patients showed that 78 patients had a high total cholesterol level or 47.9%, 85 patients a high LDL level or 52.1%, 35 had a low HDL level or 21.5% and 24 had high triglycerides or 14.7%. Table 6 shows the distribution by lipid profile.

Of the 148 patients who benefited from the creatinine assay the assay in our population, 32 patients had high creatinine 21 and eight patients had high urea out of the 29 who performed the test. Uricemia was measured in 66 patients and 15 patients had hyperuricemia, or 22.7%.

Table 5. Distribution of patients by glycated hemoglobin.

Glycated hemoglobin rate	Headcount	Percentage
Less than 7%	30	19.9%
7% - 8%	16	10.6%
8.1% - 9%	19	12.6%
9.1% - 10%	19	12.6%
Over 10%	67	44.3%
Total	151	100%

Table 6. Distribution by lipid balance.

Lipids	Headcount
High total cholesterol	78
High LDL	85
Low HDL	35
High triglycerides	24

The dosage of microalbuminuria on 143 patients who performed the thirty-three (33) tests had a micro-albuminuria > 30% or 23%.

The albuminuria to creatinine ratio was measured in 16 patients in our population or 9.8%.

The fundus was performed in 44 patients or 27% of our patients.

In our population, one hundred and twenty-eight (128) patients received an ECG and various signs were noted (Table 7).

In our study population, 35 patients of our population had done cardiac ultrasound or 21.5, taking into account the indications of realization.

Complications were noted in our patients, among them were microangiopathic complications and Thirty-six patients in our population had at least one microangiopathic complication of diabetes or 22.1%.

Among these complications, we noted that twenty patients in our population had at least one ophthalmic complication or 19.8%. Table 8 shows the distribution by ophthalmic complication.

12 patients had neurological complications, or 7.4%.

It can also be macroangiopathic complications, with 18 patients in our population having a macroangiopathic complication, accounting for 11%. Table 9 shows the distribution of macroangiopathic complications.

Infections pose real problems in our contexts eighteen patients in our population had an infectious complication, or 11%. Table 10 shows the distribution by infectious complication.

The systematic search for metabolic syndrome was carried out in our patients and sixty patients in our population had metabolic syndrome, *i.e.* 36.8% (Figure 4).

Diabetic patients have variable risk profiles with some patients more exposed than others to major cardiovascular events. Table 11 represents the distribution according to the RCV.

Table 7. Results noted at the level of the different ECGs.

ECG	Headcount	Percentage
Arrhythmia	1	0.78
Low peripheral voltage	2	1.6
BBDC	1	0.78
BBDI	1	0.78
HVG	8	6.2
Subepicardial ischemia	14	10.9
Necrosis Q wave	2	1.6
Normal	95	74.2
Under ST shift in inferolateral	1	0.78
ST segregation overlaps	2	1.6
TACFA	1	0.78
Total	128	100

Table 8. Distribution by ophthalmic complication.

Ophthalmic complication	Headcount
Proliferating retinopathy	07
Non proliferative retinopathy	08
Cataract	06
Glaucoma	06
Total	27

Table 9. Distribution by macroangiopathic complications.

Macroangiopathic complications	Headcount	Percentage
Recent stroke	8	44.4%
Stroke sequelae	2	11.1%
Ischemic cardiomyopathy	7	39%
Hypertensive heart disease	1	5.5%
Total	18	100%

Table 10. Distribution according to infectious complication.

Infection	Headcount	Percentage
Cutaneous	5	27.9%
ORL	1	5.5%
foot	7	38.9%
pulmonary	1	5.5%
Stomatology	2	11.1%
Urinary	2	11.1%
Total	18	100%

Table 11. Distribution according to RCV.

Cardiovascular risk	Workforce	Percentage
Very high risk	102	62.6%
High risk	42	25.7%
Moderate risk	19	11.7%
Total	163	100%

Therapeutically, 40 patients were put on insulin, *i.e.* 24.5%, including 24 on transient insulin therapy, 16 on definitive insulin therapy.

Non-insulin treatments were also used and the majority of patients in our population benefited from treatment with non-insulin antidiabetics (133) or 81.6% and distributed as follows (Table 12).

Other therapies were used, among these, antihypertensives, statins and anti-platelet treatment was used in Forty-four patients of patients or 27%.

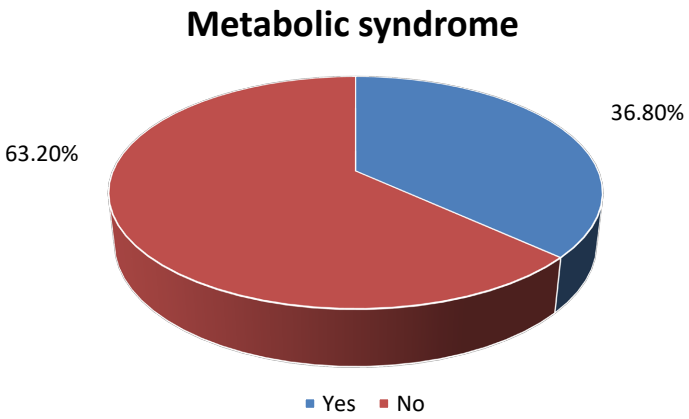

Figure 4. Distribution according to the presence or absence of metabolic syndrome.

Table 12. Distribution according to type of non-insulin antidiabetic.

Non-insulin antidiabetics	Workforce
Metformin	129
Sulphonylureas	78
IDPP4	14
Incretins	3

As part of their follow-up, one hundred and thirty-four patients in our population had regular follow-up in the department, *i.e.* 82.2% and 29 patients lost to follow-up. Among these 134 patients, 108 had glycemic control, 6 had presented a complication during their follow-up and one died.

4. Discussion

The average age of our patients was close to that of Fatou. K. N who found in a series of 111 patients an average age of 58.3 years for type 2 diabetics at the main hospital in Dakar [5] and at those in Fatou. D who was found in a series of 71 patients with an average age of 57.4 ± 9.18 years at the Marc SANKALE center in Dakar [6]. Lèye *et al.* reported a mean age of 55.5 years and a sex ratio of 0.71 in their patients in Pikine [7].

The female preponderance could be linked to the fact that women visit health facilities more than men but is also linked to the increase in the prevalence of obesity and a sedentary lifestyle among women.

Concerning the geographical origin, almost all of the patients came from Mbour and represented 82.8% of urban origin. This observation is due to the fact that the reference centers are located in the city of Mbour.

Also note the effectiveness of the policy of decentralization of care for diabetic patients [8], making local care accessible. Regarding the duration of diabetes, variable durations are noted in the literature.

Almost all of the 146 patients had at least one FDR of T2D, *i.e.* 89.6%. Age was

a risk factor found in 114 patients in our series. This result is close to that obtained by the STEPS study carried out in Côte d'Ivoire in 2005 which reported a rate of 54.17% [9].

Ninety patients in our series had a family history of first-degree type 2 diabetes.

Analysis of data from the prospective DESIR study (epidemiological data on insulin resistance syndrome) in 2009 in west-central France estimated the existence of these diabetes FDRs at 18.5% [10].

A sedentary lifestyle was noted in 39.9% of patients. These data matched those of the WHO in 2008; nearly 31% of adults aged 15 and over lacked physical activity [11].

Physical inactivity is very widespread in Africa and around the world. It is therefore essential to encourage populations to practice regular physical activity.

Cardiovascular risk factors could be noted in one or more of the same patient. The prevalence of these other risk factors also varies greatly depending on the study; it depends on the place of recruitment and the diagnostic means used. Exhaustive screening for these risk factors is very difficult to carry out in a hospital environment during a single hospitalization, especially in countries like ours where very few patients benefit from health care.

Overall, we realize that currently in Africa and elsewhere, given the major changes in the eating habits and lifestyle of populations, cardiovascular risk factors are increasing significantly within the population. general. These modifications are first noted in urban areas but also studies find them in rural or semi-rural areas. In Saint-Louis, Senegal, in the general population, Seck *et al.* [12] reported a prevalence of obesity of 23.4%, dyslipidemia of 56% and chronic active smoking of 4.2%.

Eighteen patients in our study had an infectious complication, *i.e.* 11%, including 5 (27.9%) for skin infection, 7 (38.9%) for infectious feet, 2 (11.1%) for urinary infection, 2 (11.1%) for stomatological infection, 1 patient for pulmonary infection and one patient for ENT infection.

We noted in our series a high proportion of infectious, macroangiopathic and microangiopathic complications.

In other hospital series in Senegal and other African countries, a relatively high prevalence of infections was noted [13] [14] [15] [16].

These infections are first favored by the state of chronic hyperglycemia characterizing diabetes; secondarily, the lack of hygienic education among patients or non-compliance with hygienic and dietary measures are incriminated. They jeopardize the functional and vital prognosis of diabetics.

Ketoacidotic coma was the second acute metabolic complication of diabetes in our study. But it was a serious and fatal accident (2 cases out of 7). This seriousness has been reported by other African authors [15].

The majority of patients in our population were put on treatment with non-insulin antidiabetics (133) or 81.6%, including 78 on sulphonylureas, 129 on metformin, 14 on IDPP4, and 3 on GLP1 analogues.

Since 2018, experts on behalf of the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD) have proposed new recommendations. They take into account the results of clinical trials published since 2015, demonstrating cardiovascular (and renal) protection with two classes of drugs, SGLT2 inhibitors (gliflozins) and certain GLP-1 receptor agonists (notably liraglutide) in patients, with atheromatous cardiovascular disease. Therefore, in the event of insufficient control with metformin, the addition of one of these drugs is preferred in the presence of an atheromatous disease. If there is heart failure or kidney disease, preference is given to an SGLT2 inhibitor, provided that the glomerular filtration rate is sufficient (>45 - 60 ml/min/1.73m^2). In all other patients, the choice must be guided by the main objective, set by mutual agreement with the patient: reduce the hypoglycemic risk (gliptin, gliflozin, pioglitazone or GLP-1 receptor agonist), promote weight loss (SGLT2 inhibitor or GLP-1 receptor agonist) or limit the cost (sulfonamide, pioglitazone). If oral treatment fails, the preference for switching to injectable treatment is now given to a GLP-1 receptor agonist rather than basal insulin. Thus, from a glucocentric and metabolic view predominant in the previous recommendations, a paradigm shift is proposed, centered on the prevention of cardiovascular diseases and renal failure, in a personalized approach to the patient [17].

According to the recommendations of experts in sub-Saharan Africa, metformin is the first-line oral antidiabetic agent. To minimize possible side effects, particularly digestive, the prescription will start with the lowest dose of 500 mg per day and will be increased in increments of 500 mg every 7 days up to the maximum tolerable dose, without exceeding 2000 mg. per day. This dose will be maintained as monotherapy as long as the HbA1c remains at the desired objective (<7%). Sulfonylureas and DPP-4 inhibitors will be prescribed, combined with metformin, if the HbA1c goal is not achieved with metformin alone after 3 to 6 months, or immediately if the latter is poorly tolerated or contraindicated. Initial dual therapy (possibly fixed combination) can be started initially if blood sugar levels are greater than 3.00 g/L and/or the HbA1c level > 9%. When switching to insulin in T2DM (line 3 of the proposed algorithm), the ideal is to have a basal insulin analogue available. In many sub-Saharan African countries, however, only human recombinant insulins are currently marketed: rapid, intermediate NPH, and premix. Whatever the regimen and the starting dose, the titration must be progressive with an increase from one to 2 units, once or twice a week, of the dose corresponding to the anomaly to be corrected. The risk of hypoglycemia should always be kept in mind [18].

5. Conclusion

Diabetes is a real public health emergency due to its scale and complications. Strengthening policies to decentralize care will allow better care for patients not from Dakar and will improve morbidity and mortality related to type 2 diabetes and its complications.

Limitations of the Study

- Incomplete explorations for patients
- Irregular follow-up of some of our patients

Conflicts of Interest

We have no conflicts of interest in this article and any fund support.

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