Scientific Research Publishing

# Epidemiological, Clinical, and Evolutionary Profile of Type 1 Diabetics in the Internal Medicine Department of the Abass Ndao Hospital from 2010 to 2021 (about 659 Cases)

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## Abstract

**Introduction**: Type 1 diabetes can have acute complications, sometimes requiring hospitalization. The aim of this study was to describe the epidemiological, clinical and evolutionary aspects of type 1 diabetes in patients at the Abass Ndao National Hospital in Dakar. **Patients and Methods**: This was a cross-sectional, descriptive and analytical study conducted from January 01, 2010 to December 31, 2021. It focused on hospitalized type 1 diabetic patients. Epidemiological, clinical and evolutionary data were evaluated. **Results**: Six hundred and fifty-nine (659) patients were enrolled, representing a frequency of 11.5%. The mean age was 29.47 years, giving a sex ratio (m/f) of 0.95. Average hospital stay was 6.1 days. One hundred and forty-four (144) patients (21.8%) had inaugural diabetes. The average consultation time was 14.89 days. Acute metabolic complications were ketoacidosis in 353 patients (56%), and hypoglycemia in 1.2%. Simple hyperglycemia was noted in 113 patients (18.0%). Infection was present in 522 patients (58.3%), of whom 95 (28.2%) had a skin infection.55 patients (16.3%) had a respiratory infection. 12.3% had a dietary imbalance.176 cases (27.7%) had no imbalance.26 patients (3.9%) died, with infectious pathologies accounting for the majority of decompensation factors among the deceased (57.7%). **Conclusion**: Type 1 diabetes is a cause of morbidity and mortality. It is essential to develop and implement a prevention and management program.

## Keywords

Type 1 Diabetes, Epidemiology, Mortality, Senegal

## 1. Introduction

Diabetes is a state of chronic hyperglycemia linked to absolute or relative insulin deficiency, in connection with genetic and/or environmental factors often acting in concert [1]. It is a truly global pandemic. International Diabetes Federation (IDF) experts predict that 552 million adults will have diabetes by 2030 [1]. In Africa, the prevalence of diabetes is on the rise. In Senegal, prevalence data remain approximate. According to 2015 IDF estimates, 3.24% of the Senegalese population are thought to be diabetic [2] In Senegal, a study carried out in 2015 in Fann showed a hospital prevalence of 3.6% [3]. Diabetes is a condition that predisposes to the occurrence of numerous acute complications. Type 1 diabetes is no exception to this rule. Very few studies have focused on type 1 diabetes (2011) in the field of acute metabolic complications [3] [4].

This prompted us to carry out this study, the general aim of which was to describe the epidemiological, clinical, paraclinical and evolutionary characteristics of type 1 diabetics at the Abass Ndao Hospital in Dakar.

## 2. Patients and Methods

The study was carried out at the Centre Hospitalier Abass Ndao in Dakar. The Clinique Médicale II at the Centre Hospitalier Universitaire Abass Ndao in Dakar, Senegal, comprises the Marc Sankalé Diabetes Center, the Internal Medicine Department, and the outpatient and follow-up unit for internal medicine and endocrine pathologies. Patients admitted to the CMS are hospitalized in the Internal Medicine Department (SMI). This has 34 hospital beds. This was a cross-sectional, descriptive and analytical study conducted at the Abass Ndao National Hospital from January 1 2010 to December 31 2021.

The study population consisted of type 1 diabetic patients hospitalized in the internal medicine and emergency departments of the said hospital.

- **Inclusion criteria:** All patients with type 1 diabetes, hospitalized, were included in our study.
- **Non-inclusion criteria:** Non-diabetic patients, type 2 diabetic patients and incomplete files were not included.
- A form was drawn up to serve as a basis for data collection. It covered marital status, lifestyle, history, type of infection, triggering factor, clinical manifestations and diabetes.
- The data collected concerned:
  - **Socio-professional data:** age, sex, profession; locality, origin, marital status, patient's background
  - **History and associated risk factors:** Personal history (medical/surgical and gynecological/obstetrical). Lifestyle habits such as smoking, alcoholism, terrain, associated diseases and amenities.
  - **Diabetes study:** The diabetes study looked at the type of diabetes, how long it had been present, how well it was controlled, the type of treatment and current treatment.

Clinical data: temperature, weight, height, waist circumference, body mass index (BMI), blood pressure, complaints and comprehensive examination data, as well as length of hospital stay, were recorded.

Initial paraclinical workup: blood glucose, HbA1c with an IN 2it device, hemogram and C-reactive protein for signs of infection (hyperleukocytosis, leukopenia, thrombocytopenia or thrombocytosis); ECBU (for possible urinary tract infection), thick blood drop; other investigations were performed according to profile.

Data were entered into Microsoft Office Excel and analyzed using epi info 2000 version 3.3.2.

We carried out a global and analytical analysis of the various epidemiological, clinical and diagnostic aspects, as well as therapeutic and evolutionary modalities within our study population.

All data provided in this study are anonymous. The work has been carried out with respect for confidentiality.

## 3. Results

### 3.1. Epidemiological Data

During the study period, we hospitalized five thousand seven hundred and twenty (5720) patients in the internal medicine department. Of these, six hundred and fifty-nine (659) were type 1 diabetics, representing a prevalence of 11.5%. The year 2016 represents the largest number of patients with one hundred and ten (110), *i.e.* 16.7%, followed by 2012 and 2013 with ninety-eight (98) and ninety-five (95) patients respectively, *i.e.* 14.9% and 14.4%. 2017 was the least represented year, with twenty (20) patients, *i.e.* 3% (Table 1). July had the highest number of patients (109), *i.e.* 16.6%, followed by August, September and October with 10%, 8.9% and 6.6% respectively (Figure 1). The mean age was 29.47 years, with extremes of 20 and 70 years. The standard deviation was 10.71. The mean age of men (29.17 years) and women (29.47 years) was almost equal, with no significant difference (P = 0.714). The [20~29] age group was the most represented, with two hundred and forty-nine (249) patients, or 37.8%. Subjects aged over seventy represented three (3) cases or 0.5%. The female gender was the most represented, with three hundred and thirty-eight (338) women (51.3%) versus three hundred and twenty-one (321) men (48.7%), *i.e.* a sex ratio of two hundred and sixty-two (262) married (39.7%) and three hundred and seventy-seven (377) single (57.3%). Shopkeepers were the most represented profession with 111 patients (16.8%), followed by housewives and schoolchildren (15.8% and 14.7% respectively). 616 patients (93.5%) were mainly from Dakar (Table 2).

### 3.2. Clinical Data

The average consultation time was 14.89 days, with extremes ranging from 1 to 365 days. One hundred and twenty (120) patients, or 27.1%, consulted after 15 days. The average consultation time for men (15.21 days) was almost equal to that for women (14.59 days), with p equal to 0.840.

Table 1. Patient distribution by year.

| Year | Workforce | Percentage (%) |
|---|---|---|
| 2010 | 26 | 3.9 |
| 2011 | 39 | 5.9 |
| 2012 | 95 | 14.4 |
| 2013 | 98 | 14.9 |
| 2014 | 34 | 5.2 |
| 2015 | 59 | 9 |
| 2016 | 110 | 16.7 |
| 2017 | 20 | 3 |
| 2018 | 67 | 10.2 |
| 2019 | 40 | 6.1 |
| 2020 | 32 | 4.9 |
| 2021 | 39 | 5.9 |
| Total | 659 | 100 |
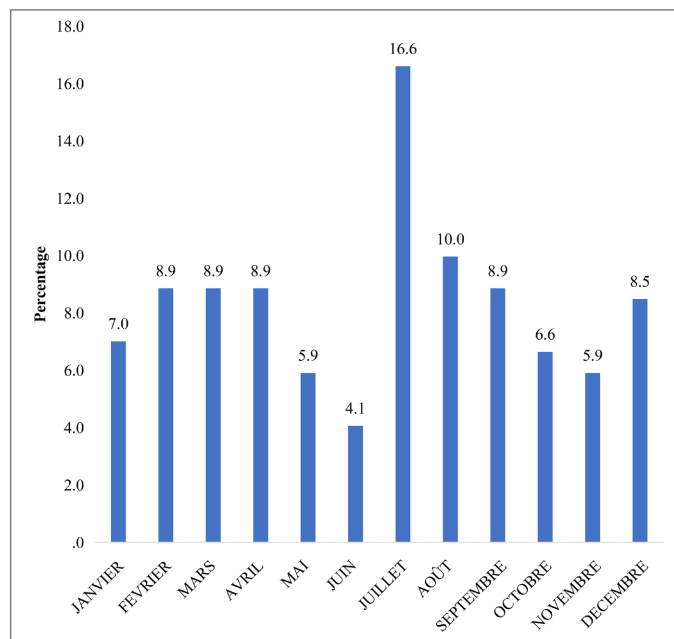


Figure 1. Patient distribution by month of the year.

The most common reasons for consultation were vomiting (134 patients or 20.41%), followed by polyuria and polydypsia in 150 patients (22.7%), abdominal pain in 67 patients (10.16%) and weight loss in 3.79% of cases (Table 3). Amputation was noted in 12 cases (1.9%). Associated pathologies included heart disease (2.6%), gastritis (0.15%), hypothyroidism (0.15%) and lupus (0.15%). Mean systolic blood pressure was 12.02 and diastolic 7.33. Mean temperature was 37.14. Four hundred and thirty-five (435) patients had fever, *i.e.* 66%.

Table 2. Socio-demographic characteristics of patients.

| Socio-demographic characteristics | | Numbers (n = 659) | Percentage (%) |
|---|---|---|---|
| Type | Men | 321 | 48.7 |
| | Woman | 338 | 51.3 |
| Age (years) | <20 | 114 | 17.3 |
| | 20 - 29 | 249 | 37.8 |
| | 30 - 39 | 202 | 30.7 |
| | 40 - 49 | 62 | 9.4 |
| | 50 - 59 | 23 | 3.5 |
| | 60 - 69 | 6 | 0.9 |
| | +70 | 3 | 0.5 |
| Marital status | Married | 262 | 39.7 |
| | Single | 377 | 57.3 |
| | Divorced | 11 | 1.3 |
| | widowers | 9 | 1.3 |
| Provenance | Dakar | 279 | 42.3 |
| | Rufisque | 122 | 18.5 |
| | Pikine | 157 | 23.8 |
| | Guédiawaye | 101 | 8.9 |
| Professions | Farmers | 20 | 3 |
| | Drivers | 35 | 5.3 |
| | Retailers | 111 | 16.8 |
| | Teachers | 15 | 2.3 |
| | Household | 104 | 15.8 |
| | Tailors | 34 | 5.1 |
| | No profession | 72 | 10.9 |
| | Students | 97 | 14.7 |
| | Nurses | 17 | 2.6 |
| | Technicians | 62 | 9.4 |
| | Other | 92 | 14 |

Table 3. Breakdown of patients by reason for consultation.

| Reasons for hospitalization | Workforce | Percentage (%) |
|---|---|---|
| Vomiting | 134 | 20.41 |
| Polyuria | 150 | 22.7 |
| Polydypsia | 150 | 22.7 |
| Abdominal pain | 67 | 10.16 |
| Asthenia | 56 | 8.5 |

| | | |
|---|---|---|
| headaches | 41 | 6.2 |
| Fever | 32 | 4.9 |
| Anorexia | 26 | 3.9 |
| Weight loss | 25 | 3.79 |
| Dizziness | 14 | 2.1 |
| Nausea | 11 | 1.7 |

The mean duration of diabetes was 6.1 years. One hundred and forty-four (144) patients had inaugural diabetes, *i.e.* 21.8%. The majority of patients had diabetes for between 1 and 5 years, with one hundred and ninety-two (192) patients (29.1%). Diabetes had been evolving for more than ten years in 145 cases (22%), with capillary blood glucose levels ranging from 0.3 g/l to 6 g/l, with an average of 3.39 g/l. Glycemia above 2 g/L was present in 70% of cases.

Ketoacidosis was noted in three hundred and fifty-three (353) patients (56%). Fourteen (14) cases, or 2.3%, of balanced diabetes, simple hyperglycemia in one hundred and thirteen (113) patients, or 18.0%, and hypoglycemia in eighteen (18) patients, or 1.2%. An unbalanced diabetes factor was noted in (634) patients with unbalanced diabetes.

The main factor decompensating diabetes was infection, found in three hundred and forty-six (346) patients (52.5%). Of these, ninety-five (95) or 28.2% had skin infections, fifty-five (55) or 16.3% respiratory infections, eighty-five (85) or 25.2% urogenital infections, and four (4) or 1.2% digestive infections. Therapeutic discontinuation and diet deviation occurred in 4.8% and 12.3% of patients respectively. Among urogenital infections, cystitis was most frequent (53%), followed by vulvovaginitis (26%) and pyelonephritis (21%). Skin infections. Lesions included abscesses (11 cases), DHB (6 cases), hand phlegmon (76 cases) and diabetic foot (2). Hand lesions were thus present in 76 patients (80%), while foot lesions were present in 2 patients (2.1%). Pulmonary conditions included non-specific bronchopneumopathy (84.6% of cases), *SARS Cov-2* pneumonitis (8.2% of cases), pulmonary tuberculosis (2 cases, 3.6%) and tuberculous pleurisy (2 cases, 3.6%). Cardiovascular risk factors included hypertension in sixty-five (65) patients (9.8%) and smoking in 5 patients (0.7%) (Table 4).

### 3.3. Paraclinical Data

The mean hemoglobin level was 11.94 g/dl, with extremes ranging from 2.6 to 25.9 g/dl. Anemia was found in 60 patients (9.1%), with a mean white blood cell count of 17003.74 g/l. Hyperleukocytosis was found in one hundred and six (106) patients (51.46%), leukopenia in seven (7) patients (3.4%), and platelets averaged 320120.48 g/l. Thrombocytosis was present in eight (8) patients (1.2%). Thrombocytosis occurred in eight (8) patients (1.2%), thrombocytopenia in twenty-nine (29) (4.4%), and CRP levels averaged 104.27 mg/l, with extremes of 4 and 1342 mg/l. CRP was elevated in 230 patients (34%). It was elevated in 230

Table 4. Characteristics of the diabetes study.

| Diabetes study | | Numbers (n = 659) | Percentage (%) |
|---|---|---|---|
| Frequency | | 659 | 11.5 |
| Seniority | Inaugural | 144 | 21.8 |
| | <1 year | 66 | 10.1 |
| | 1 - 5 | 192 | 29.1 |
| | 6 - 10 | 112 | 17 |
| | >10 | 145 | 22 |
| History | Familial diabetes | 5 | 0.8 |
| | HTA | 17 | 2.5 |
| | Amputation | 12 | 1.9 |
| | AVC | 2 | 0.3 |
| | RCM | 1 | 0.15 |
| Imbalance factors | Infectious | 346 | 52.5 |
| | Speed deviation | 81 | 12.3 |
| | Therapeutic break | 31 | 4.8 |
| | Not found | 13 | 8.13 |
| Associated pathologies | Anemia | 60 | 9.2 |
| | Heart disease | 17 | 2.6 |
| | Asthma | 13 | 2 |
| | Sickle cell disease | 2 | 1.5 |
| | Gastritis | 1 | 1.5 |
| | Hypothyroidism | 1 | 1.5 |
| | Lupus | 1 | 1.5 |
| | Chron's disease | 1 | 1.5 |

patients (34.9%). Seventy-nine (79) patients (12.0%) had impaired renal function, with creatinemia above 13 mg/l. Thirty-one (31) patients had a normal ECBU, *i.e.* 72.1%, *Escherichia Coli* was found in seven (7) patients, *i.e.* 16.3%, candida albicans in two (2) patients, *i.e.* 4.7%, Acinobacter in one (1) patient, *i.e.* 2.3%, Staphylococcus Aureus and Streptococcus were found in 2.3% each.

### 3.4. Evolution

The average hospital stay was 6.1 days, with extremes ranging from 1 to 66 days. The majority of patients had a hospital stay of less than 7 days: four hundred and seventy-three (473), or 79.4%. The mean length of hospitalization for men (6.09) and women (6.92) was almost equal (P = 0.807), with 26 deaths (3.9%). The mean age of deceased patients was 31.66 years. Deaths were more frequent among women (eighteen patients, 69.3%). The mean age of deceased patients was 31.66. Patients aged between 30 and 39 accounted for the largest proportion

of deceased patients (55.9%), followed by those aged between 20 and 29 (22.2%). Patients under 20 years of age accounted for 7.4% of deaths, and those between 40-49 for 14.8%. There were no deaths over the age of 50. Diabetes was inaugural in three patients (11.5%). The average consultation time was 30.25 days. The average length of hospital stay for deceased patients was 3.68 days. Infectious pathologies (57.7%) were the most important precipitating factor for diabetes in deceased patients (Table 5).

## 4. Discussion

### Study limits

Our study has certain limitations, as some of our patients' investigations were incomplete. Patients also faced financial difficulties in obtaining the most common tests.

### 4.1. Epidemiological Data

In our study, the prevalence of type 1 diabetes was 11.5%; in Senegal in 2011, a study by Sarr *et al.* found a much higher prevalence of type 1 diabetes than ours, at 55.3% [4]. In Benin, a study by Kaossarath A *et al.* found a lower prevalence (0.9%) than our study [5], with an average age of 29.47 years. The study by Sarr *et al.* found a similar result to ours, with an average age of 25.7 years [4]. In the study by Niang *et al.* concerning a paediatric population with type 1 diabetes in Dakar, the mean age was 7.8 years, with extremes ranging from 1.3 to 15 years [3]. In our study, the age group [20~29] was the most represented, accounting for 37.8% of patients. However, in the study by Kaossarath A *et al.* the age range [8~16] was the most represented, with 69.9% of patients [5]. This difference may be linked to the mixed (adults and children) study population of Kaossarath A *et al.* whereas our study population was composed exclusively of adults.

In our study 51.3% of patients were female, representing a sex ratio of 0.95. This finding is similar to that of some authors [5] [6].

The average hospital stay in our series was 6.1 days. Elsewhere, it averaged 10 days [7].

### 4.2. Clinical and Paraclinical Data

In our study, 57.8% of patients consulted us within 7 days. The study by Aymar Pierre Gildas Oko *et al.* in Congo found a similar proportion to ours. Indeed, 63.6% of patients consulted within 7 days [8]. In our study, polyuro-polydypsic syndrome was the most frequent reason for consultation, accounting for 22.9% of patients, followed by digestive disorders such as nausea and vomiting (20.4%). This result is similar of others study [9].

A family history of diabetes was present in 0.8% of patients in our series. The study by Kaossarath A *et al.* found a similar result to ours. Indeed, a family history of diabetes was present in 1% of patients [5]. However, in the study by *Niang B,* a family history of diabetes was found in 77.3% of patients [3]. The

**Table 5.** Mortality data.

| Mortality | | Workforce | Percentage (%) |
|---|---|---|---|
| Frequency | | 26 | 3.9 |
| Type | Men | 8 | 30.7 |
| | Woman | 18 | 69.3 |
| Factors related to death | Infectious | 15 | 57.7 |
| | Speed deviation | 3 | 11.5 |
| | Therapeutic break | 1 | 3.8 |

latter result was far superior to our own study of childhood diabetes, with a high proportion of type 2 diabetes.

The mean duration of diabetes in our study was 6.1 years and ketoacidosis affected 78.8% of patients. This result is very similar to that of Newton *et al.* in a study carried out in America in 2004, where the prevalence of ketoacidosis in type 1 diabetics was 78% [10].

In Brazzaville, however, ketoacidosis remains one of the main causes of hospitalization in diabetic children [8]. In the study by Balasubramanyam *et al.* the prevalence of ketoacidosis was 53% in black Americans with type 1 diabetes [11]. The incidence of diabetic ketoacidosis in patients with known diabetes varies from study to study, being very low in Sweden (1.6%) and Italy (1%) [9] [12]. Inaugural diabetic ketosis is the classic manifestation of type 1 diabetes. In our series, 21.8% of patients had inaugural diabetes. Other authors have found similar results in 67.2% of cases [11]. Hypoglycemia was present in 1.2% of patients in our series. Fraser J. *et al.* in a tertiary hospital found a prevalence of hypoglycemia in 74.3% of patients [13]. Hypoglycemia requires good therapeutic education to reduce the morbidity and mortality of diabetics. In our study, we noted a high proportion of infectious pathologies (52.5%) as a factor in the decompensation of our patients. This can be explained by the high susceptibility of diabetic patients to infections, due to reduced immunity. This observation is shared by many other authors. Indeed, in the Congo study by Oko *et al.* the prevalence of infectious pathologies was 52.7% of type 1 diabetic patients [8]. In our study, cutaneous infectious pathologies were the most common, representing 28.2% of patients, followed by urogenital pathologies (25.2%) and pleuropulmonary pathologies (8.3%). The location of infections varies according to the authors. In the past, in Dakar, urogenital localization was the most important, accounting for 24.6% of infectious pathologies, followed by pleuropulmonary localization (20.5%) [4]. In Congo, Monabeka *et al.* [14] reported more therapeutic interruptions than infectious factors, at 37% and 22% respectively. In our study, deviations in diet were responsible for decompensation of type 1 diabetes in 12.3% of cases. Therapeutic discontinuation accounted for 4.8% of cases. In the ENTRED study, therapeutic failure was responsible for the decompensation of T1DM in 17% of cases of cases [15].

## 4.3. Evolution

In our study, the proportion of type 1 diabetic patients who died was 3.9%. Evans-Cheung *et al.* in a study conducted in the UK found a prevalence close to our own, at 4.2% [16] In the Benin study by Kaossarath A *et al.*, the prevalence was much higher than ours (34%) [5].

## 5. Conclusion

Type 1 diabetes is a cause of morbidity and mortality. The reasons for hospitalizations in our practice context remain dominated by infections. The development and implementation of a prevention and treatment program is essential.

## Conflicts of Interest

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

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