

## Original Research Article

# Clinical, Epidemiological and Therapeutic Aspects in Elderly Congolese Diabetics

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**Abstract: Background:** The global growth in the number of elderly people is associated to the increasing of CVD and their complications. The Congolese population is predominantly young, with predominance of diabetes between 40 and 60 years of age. This study highlights the particularities of diabetes in elderly congolese diabetics. **Aim of the study:** To describe clinical, epidemiological and therapeutic aspects of elderly Congolese diabetics. **Method:** Retrospective study based on the analysis of the records of patients aged 65 and above admitted from 2010 to 2016 to Adolphe Sicé General Hospital. The studied parameters are: sociodemographic, duration of diabetes, CVRF, complications, glycaemia, HbA1c, treatment and evolution. The analysis was done by Epi info 7.2.1.0, using Student's and Chi-2 tests with  $p < 0.05$  significant. **Results:** A total of 2816 patients were admitted, among them 326 patients (8.64%) were aged 65 and above. 53.70% women and 46.30% men, the mean age was  $72.77 \pm 5.83$ . Sex ratio is 0.8. Mean duration of diabetes was 5.7 years. 60.00% were known diabetics, with mean duration of 9.5 years and 40.00% were newly diagnosed. T2DM represents 98.00%. Hypertension was found in 63.50% of patients and metabolic syndrome (30%). Macro and microvascular complications: stroke (24.54%), PAD (21.00%), neuropathy (51.00%) and nephropathy (42.40%). Hyperosmolar coma represented 20.20% of acute complications, hypoglycemia (7.36%). Mean glycaemia was  $3.44 \pm 1.25$  g/l and HbA1c  $9.94 \pm 3.54$ . Mortality was 8.00%. **Conclusion:** This study shows that diabetes in the elderly Congolese subject is not rare. Its association with CVRF is frequent, increasing the risk of cardiovascular complications.

**Keywords:** Diabetes, Elderly, Congo.

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## BACKGROUND

The World Health Organization (WHO) defines the elderly subject as a person whose age is between 60 -75 years [1].

The world population is experiencing a growth in both the number and the proportion of elderly people.

Between 2015 and 2050, the proportion of people aged 60 and above in the world population will almost double, from 12% to 22%. In 2020, the population over 60 was estimated at 1 billion people, it exceeded that of children under 5 years.

In 2050, 80% of elderly people will live in low- and middle-income countries. The aging of the population is one of the major challenges for socio-sanitary systems [2].

Age is a non-modifiable risk factor for non-communicable diseases (NCDs), including type 2 diabetes mellitus (T2DM), cardiovascular diseases, and degenerative diseases.

These diseases are associated with serious disabling and sometimes fatal consequences.

In low- and middle-income countries, NCDs are responsible for three-quarters of deaths (31.4 million) [3].

In addition, while aging is not always associated with disability or dependency, the management of chronic diseases in the elderly is often complex because they are associated with cognitive problems (depression, confusion, etc.) and loss of autonomy, requiring permanent assistance [3].

In developed countries, the majority of type 2 diabetics are patients over 65 years of age. In France, the prevalence of type 2 diabetes increases in the different age groups of the population, reaching 17.7% in men and 11.5% in women aged 70 to 79 [4].

In sub-Saharan Africa, diabetes and risk factors predominate in the 40-60 age group and considerably reduce life expectancy.

In Cote d'Ivoire (2006), an epidemiological study reported that diabetes affected 16.2% of subjects over 60 years old [5].

Congo is a country of 6,142,180 inhabitants, with a predominantly female population, mostly young (76% under 35 years old) with an average age of 23 years. Life expectancy is 63 years and the age group over 65 years represents 2.86% of the population, i.e 175,977 people.

The Congolese population is predominantly urban and is found in the two largest cities (58.2%) of the country [6, 7].

The WHO-STEPS survey conducted in 2004 in Brazzaville found a prevalence of diabetes of 7% of the adult population [8].

The Congolese diabetic population is relatively young, the hospital series of Monabeka *et al.*, found a proportion of 61% of cases of diabetes in the 40-60 age group [9].

The authors describe in this study the epidemiological, clinical and therapeutic aspects of diabetes mellitus in subjects aged over 65 years in the population of Pointe-Noire.

### **Aim of the Study**

To describe the clinical, epidemiological and therapeutic aspects of elderly Congolese diabetics.

### **Specific objectives**

- Describe the clinical and epidemiological profile of elderly Congolese diabetics.
- Estimate the prevalence of Cardiovascular Risk Factors (CVRF) and complications in elderly Congolese diabetics.

- Evaluate the therapeutic aspects and the evolution

## **PATIENTS AND METHOD**

### **Type and Framework of the Study**

This is a retrospective cross-sectional study, with a descriptive aim, carried out during the period from December 2010 to December 2016 (6 years) in the metabolic and endocrine diseases department of the Adolphe SICE general hospital in Pointe-Noire, the second largest city in the Republic of Congo.

### **Inclusion and Exclusion Criteria**

#### **Inclusion Criteria**

All records of patients aged 65 and above admitted to hospital or received for outpatient consultation, with confirmed diagnosis of diabetes mellitus after measuring fasting or casual capillary or venous blood glucose according to the criteria (ADA 1997/WHO 1999).

The type of diabetes were defined based on clinical, epidemiological and evolutionary arguments under treatment.

Type 2: patient with a history of diabetes in the family, overweight or obese, whose onset is slow and insidious and/or treated with oral antidiabetic, with good evolution.

Other types: Diabetes induced by a condition (treatment) or pathology for which we have a certain diagnosis or a cause-effect link.

**Exclusion Criteria:** All incomplete files due to the absence of interpretable data.

#### **Studied Parameters:**

**Sociodemographic:** age, sex, duration of diabetes.

**Clinical, Biological and Evolutionary:** Type of diabetes, blood sugar, glycated hemoglobin (HbA1c), profile of complications, associated CV risk factors and treatment.

#### **Data collection and analysis**

Data were collected from 2010 to 2016 from the files of patients aged 65 and over admitted to hospital or received for outpatient consultation.

Blood pressure was measured twice in the patient at rest, with an interval of five minutes by a manual or automatic OMRON (Japan) blood pressure monitor. The average of the figures was calculated, in case of doubtful figures, a third reading was applied.

Hypertension was defined as a systolic pressure of 140 mm Hg or more and a diastolic pressure of 90 mm Hg, or a patient known to be on antihypertensive treatment beyond two weeks in the history.

Metabolic syndrome was defined according to the criteria of the International Diabetes Federation (IDF) [10].

**Statistical Analysis**

Data were collected with Epi-data 3.1 software, then converted to Excel sheet.

The analysis was performed with Epi-info 7.2.1.0 of the Center for Disease Control (Atlanta, USA).

Quantitative variables are presented as mean ± standard deviation and proportions (frequencies) for qualitative (categorical) values.

Two comparative statistical tests were used:

The Student t-test was used to compare means between groups and associations between qualitative variable and quantitative variable.

The Chi-square test was used to evaluate associations between 2 qualitative variables, allowing to compare the frequencies of the two unpaired groups.

The difference was considered significant for a p-value less than 0.05.

**RESULTS**

During the study period, a total of 2816 patients were admitted to hospital and received in outpatient consultation in the department, among them 326 patients (8.64%) were aged 65 and above.

The general characteristics of the diabetic population aged 65 and over are shown in Table 1.

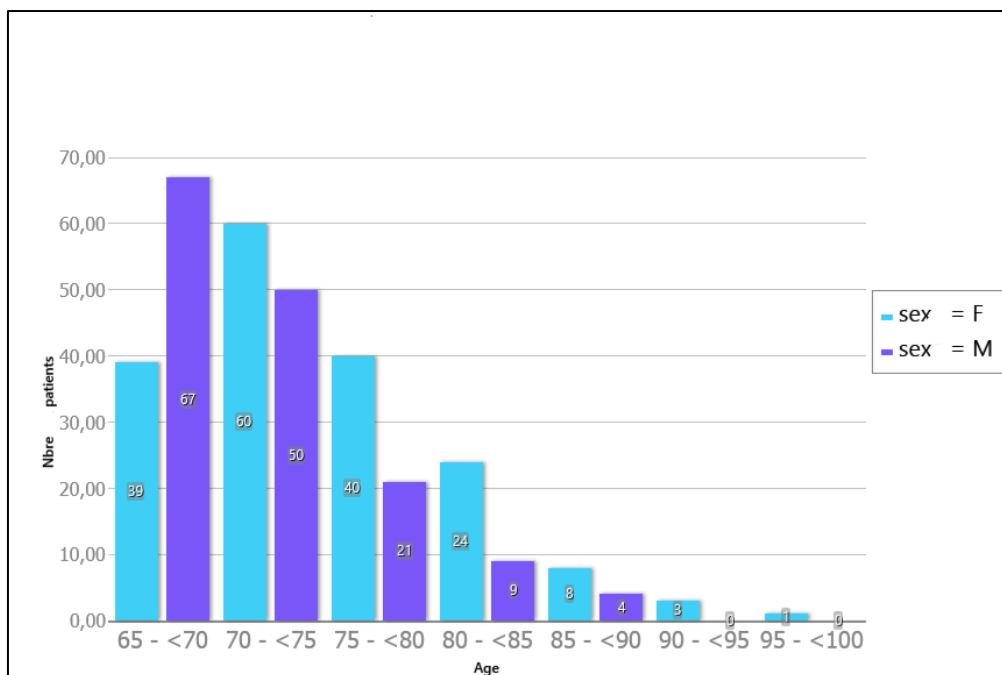
The mean age is 72.77 years, the sex ratio M/F is 0.8. and the mean duration of diabetes is 5.7 years. In 58 patients (17.80%) diabetes has a duration of more than 10 years.

**Table 1: The general characteristics of the diabetic population**

	Female	Male	Total	p
Study population	175 (53.70%)	151 (46.30%)	326 (100%)	ns
Mean age	74.05±6.20	71.29±5.01	72.77±5.8	0.000
Mean duration of diabetes	4.6 years	6.90 years	5.70 [0-36 years]	0.01
Known diabetic patients	96	99	195 (60%)	ns
Mean age	73.70±5.81	70.92±4.48	72.30±5.35	0.000
Mean duration of diabetes	8.40 years	10.52 years	9.5 [0.3-36 years]	0.07
Newly diagnosed patients	79	52	131 (40%)	
Mean age	74.46± 6.65	72.00±5.87	73.48±6.45	0.026

Figure 1 shows the distribution of patients by sex and age range 216 patients (66.25%) in our series (117 women and 99 men) are aged less than or equal to

75 years, and 49 patients (15.00%) (36 women and 16 men) are aged ≥ 80 years



**Figure 1: Distribution of patients by sex and age range**

Type 2 diabetes (T2DM) predominates in 98.00% of cases and 2% other types of diabetes

Hypertension was found in 63.50% (n=207) of patients. Smoking in 4.00% (n=13) of patients.

The lipid profile was performed by 171 patients and essentially found: total cholesterol > 2g/l in 13% of patients (n=13), HDLc < 0.40 g/l in 39.2% of patients (n=67) and triglycerides > 1.50 g/l in 16.95% of patients (n=29).

Metabolic syndrome, defined according to the IDF criteria, was found in 30% of patients. Macrovascular complications are represented by stroke (24.54%), peripheral arterial diseases (PAD) (21.00%) and myocardial ischemia (6.44%).

The profile of microvascular complications is represented by: neuropathy (51.00%), nephropathy (42.40%) including 32.8% at the renal failure stage and retinopathy (30.77%). The details of ocular disorders are shown in Table 2.

**Table 2: Profile of ocular damage in patients**

Type of lesion	n (%)
Cataract	6 (7,70%)
Mild non-proliferative retinopathy	7 (8,97%)
Moderate non-proliferative retinopathy	10 (12,82%)
Proliferative retinopathy	3 (3,85%)
Blindness	4 (5,13%)

Acute complications of diabetes were found as follow: hyperosmolar coma (20.20%), hypoglycemia (7.36%), ketosis (12.88%), ketoacidosis (1.53%)

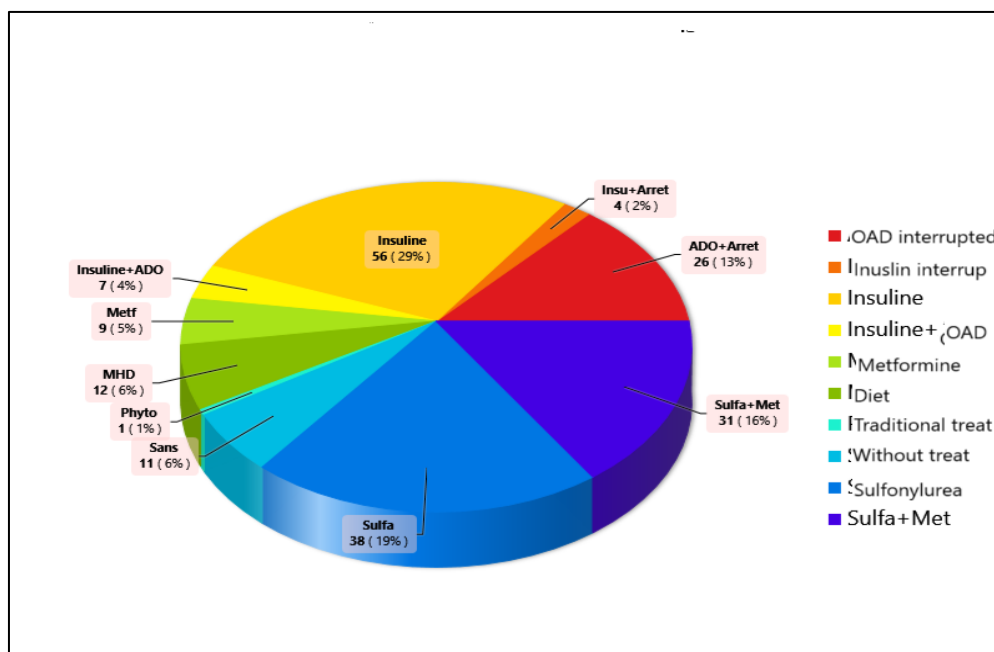
The mean glycemic level was 3.44±1.25 g/l (in known patients: 3.09±1.65 g/l [ext 0.20- 6.00 g/l] and in newly diagnosed patients: 3.96± 1.50 g/l [ext.1.27- 6.24 g/l])

The mean HbA1c level was 9.94±3.54 [ ext. 4.20- 20.30] (n = 88), including 25% of patients < 7%,

17% of patients between 7% and 8% and 58% of patients above 8%.

The mortality rate was 8.00% (14 men and 12 women, p = 0.58). 42.31% of the deceased patients had a stroke episode and 65.40% were hypertensive.

Figure 2 shows the treatment of the patients. Treatment interruption was observed in 15% of patients



**Figure 2: Treatment of the patients**

## DISCUSSION

### Epidemiological Profile

Our study is a first study specifically including elderly subjects in congolese hospital settings, the

prevalence of diabetes 8.64% found in this age category seems underestimated and lower than the data reported in the literature.

In the literature, the prevalence of diabetes in elderly subjects varies between 10 and 20% [11-14].

Monabeka *et al.*, in Brazzaville reported among 955 cases, including diabetics of all ages, found diabetes in subjects aged 60 and over in 16.2% of cases [9].

In similar studies reported by Djrolo *et al.*, (Benin, 2014) [15] and Sevin *et al.*, (USA, 2006) [16] this prevalence is respectively 28.20% and 15.30%.

The low prevalence of diabetes in this population in Congo can be explained by the life expectancy of the Congolese population (63 years), with barely 2.86% of the population aged 65 and over [6, 7].

The peak of diabetes in elderly subjects in Congo is between 65 and 70 years (Figure 3), unlike the French population where this peak is between 75 and 85 years (Figure 4).

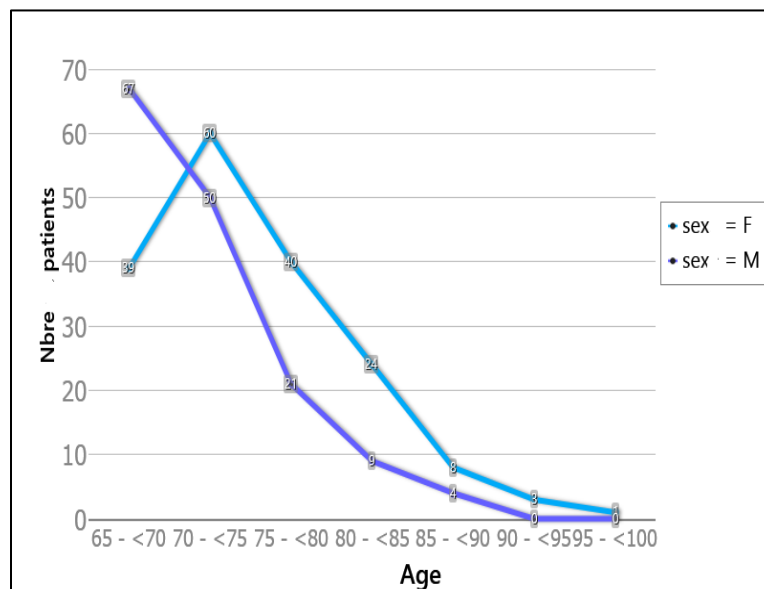


Figure 3 : Patients by age and gender in Congo

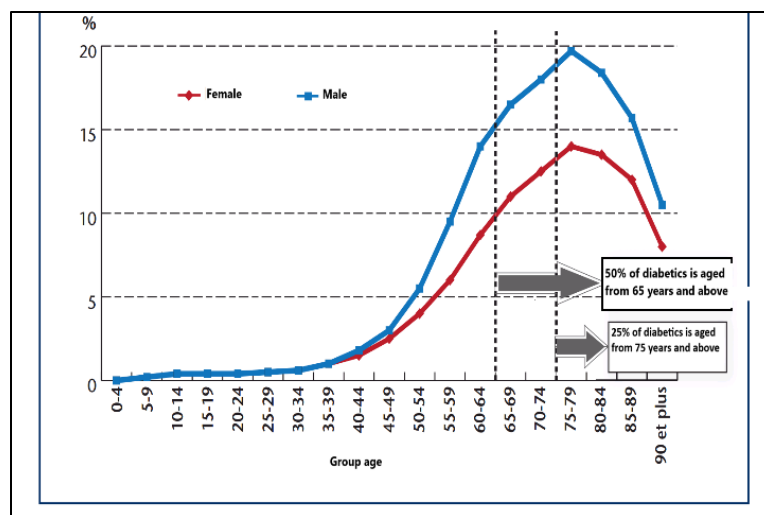


Figure 4: Patients by age and gender in France [4]

**Mean age and predominance**

The mean age of 72.77 years in our study is similar to that found by Djrolo *et al.*, (Benin) and Selvin *et al.*, (USA) who reported respectively the mean age of 71.83 years and 71.7 years [15, 16].

On the other hand, Bauduceau *et al.*, (France) [17] reported a mean age of 77.1 years higher than in our study.

In newly diagnosed patients, the mean age of patients of 73.48 years is slightly lower than that of 77.6 years found by Selvin *et al.*, (USA) [16].

We found a female predominance which corroborates the female predominance in the general Congolese population [6], similar to other studies in France and the United States [16, 17].

**Duration of Diabetes:**

The mean duration of diabetes of 5.70 years [range 0- 36 years] in our patients still reflects the difficulties of diabetes management (access to specialized care, cost of medication, etc.) in our context.

It is lower than that of the studies of Diyane *et al.*, (Morocco, 2013), Fourati *et al.*, (Tunisia, 2004)

Bauduceau *et al.*, (France, 2013) who report respectively 9.3 years, 12 years and 17.8 years [17-19].

**Profile of Cardiovascular Risk Factors and Macrovascular Complications**

Table 3 summarizes the comparison of our results of the prevalence of different cardiovascular risk factors (hypertension, dyslipidemia and metabolic syndrome (Met Sd)) and macrovascular complications.

**Table 3: Comparative prévalence of CVRF and macrovascular complications**

Studies	Hypertension	Stroke	Met Sd	HDL<	TG >	PAD
Our study	63,5%	24,54%	30,0%	39,20%	16,5%	20,85%
Diyane <i>et al.</i> , (Maroc) [18]	67,7%	11,0%		75,90%	14,8%	8,0%
Fourati <i>et al.</i> , (Tunisie) [19]	69,3%	9,30%	63,3%		61,3%	34,3%
Bauduceau <i>et al.</i> , (France) [17]	89 ;9%	15,8%		19,0%	13,1%	25,6%

Hypertension is predominant in elderly Congolese diabetic population like in other studies, however, unlike other studies, stroke is the most common complication.

The predominance of stroke can be explained by the specificity of cerebrovascular involvement of complications of hypertension and diabetes in black subjects but also by the effectiveness of management often marked by compliance problems as reported by

other authors [ 20-22, 25]. This complication is associated with high mortality [23, 24].

Other macrovascular complications, including coronary artery disease in our study are found at 6.44%, much lower than those reported by Bauduceau *et al.*, and Diyane *et al.*, who report 31.2% and 29% respectively [17, 18].

The profile of microvascular complications is summarized in comparison with other studies in Table 4.

**Table 4: Comparative summary of microvascular complications**

Studies	Nephropathy	Neuropathy	Retinopathy
Our study	42,40% (RF 32,8%)	51,0%	30,77%
Diyane <i>et al.</i> , (Maroc) [18]	28,00%	65,00%	31,0%
Djrolo <i>et al.</i> , (Benin) [15]	37,80%	59,40%	
Bauduceau <i>et al.</i> , (France) [17]	37, 30% IR	28,2%	26,0%

Moderate renal failure in our study was found in 21.20% of patients, much lower than the series of Bauduceau *et al.*, which reported 33.5% [17] on the other hand in 6.0% of patients, it was severe and higher than the 3.8% found in France.

The difficulties in carrying out the additional assessment may contribute to an underestimation.

The prevalence of diabetic foot in the elderly Congolese population (4.9%) is similar to that of 5.1% found in France by Bauduceau *et al.*, with an amputation rate of 2% amputation [17].

The high frequency of neuropathy is associated with the predominance of risk factors in our study as reported in the literature (female gender, duration of diabetes, retinopathy, stroke, hypertension and dyslipidemia [26].

**Acute Complications**

Hyperosmolar coma found at 20.24% in our study is similarly reported by Djrolo *et al.*, at 20% [15], it is a common complication of type 2 diabetes in this age

category and in our context infections can be the precipitating factor. Unlike Bauduceau *et al.*, [17] reports a much lower rate of 0.9%.

Ketosis and ketoacidosis found in our study at 12.88% and 1.53% in the elderly is not uncommon in the black population.

The rate of hypoglycemia found in our study of 7.36% is much lower than that of 33.6% reported by Bauduceau *et al.*, [17].

**Glycemic control**

In our study, the mean glycaemic level was high at 3.44±1.25 g/l and the mean glycated hemoglobin (HbA1c) level of 9.94±3.54 (n=88), indicating a severe imbalance linked to the delay in diagnosis before admission/consultation.

Also, patients of African (black) origin tend to have high blood sugar levels and high HbA1c [27, 28]. Some physiological specificities of variation in erythrocyte membrane permeability and non-enzymatic glycation, with increased glycated albumin and



fructosamine contribute to this racial difference in blood glucose levels and complications [28, 29].

In the Gerodiab study (Bauduceau *et al.*, [17]), the mean glycaemia of  $1.45 \pm 0.66$  g/l, and the HbA1c level of  $7.56 \pm 1.31$  are significantly lower than those in our study.

Similarly, E. Selvin *et al.*, reported significantly lower means than those in our study of  $1.72 \pm 1.11$  g/l, HbA1c at  $7.4 \pm 0.1$  in known patients and  $1.32 \pm 0.61$  g/l HbA1c at  $6.9 \pm 0.2$  in newly diagnosed patients [16].

### Therapeutic aspects

In our study, 57% of patients were treated with oral antidiabetics (OADs), including 24% in monotherapy and 35% with insulin therapy, including 29% with insulin only.

The use of insulin therapy is explained by the severe imbalance due to the delay in diagnosis and also to advanced complications.

Our data are lower than those reported by Bauduceau *et al.*, who reported 70.7% of patients on OADs, including 39.3% in monotherapy and 57.5% on insulin [17].

On the other hand, Selvin *et al.*, reported an insulin therapy rate of 31.7% [16] close to our study.

The frequency of treatment discontinuations of 15% reflects the difficulties of management and also the need for therapeutic education.

### Mortality

The mortality rate of 8% (n=26) including 30.77% at the discovery of diabetes in our study is much lower than that of 34.10% reported by Djrolo *et al.*, (Benin) [15].

This mortality rate was associated with CVRF and serious cardiovascular complications (65.4% HBP, 42.31% stroke and 23.07% CKD).

In 69.23% of the deceased, diabetes was known with a mean duration of  $14 \pm 8.0$  [1-28 years], similar to that reported by Ioacara *et al.*, (Romania, 2011) [30].

## CONCLUSION

This study shows that diabetes in the elderly Congolese subject is not rare in hospital settings, it concerns both known type 2 diabetic patients and newly diagnosed ones. Its association with CVDs mainly hypertension leads to macro and microvascular complications (stroke) and chronic renal failure, increasing mortality. Strategies are required for early screening and specific comprehensive management. A larger and multicenter study is necessary

to bring more evidences concerning diabetes and its risk factors in elderly people in Congo.

### Limitations And Bias

This study conducted in hospital settings does not provide a global and exhaustive assessment of the prevalence in relation to the population class studied.

The difficulty of carrying out the additional assessment (ECG, Echocardiography, Ocular assessment, HbA1c, Arterial Doppler and Systolic pressure index, etc.), supported by the patients, does not provide an exact prevalence of complications and diabetes control.

**Conflict of Interests:** The authors declare no competing interest

### Authors' Contributions

All the authors have been involved in study design and article writing, and approved the final version of the manuscript.

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## REFERENCES

1. OMS. La santé des personnes âgées. Rapport d'un comité d'expert de l'OMS. Série des rapports techniques. 779, Genève, 1989. Retrieved November 22nd 2024 from [https://iris.who.int/bitstream/handle/10665/39539/WHO\\_TRS\\_779\\_fre.pdf?sequence=1](https://iris.who.int/bitstream/handle/10665/39539/WHO_TRS_779_fre.pdf?sequence=1)
2. Aging and health retrieved November 22nd 2024 from <https://www.who.int/fr/news-room/fact-sheets/detail/ageing-and-health>
3. Non communicable diseases Retrieved November 22nd 2024 from <https://www.who.int/fr/news-room/fact-sheets/detail/noncommunicable-diseases>
4. Ricci, P., Blotière, P. O., Weill, A., Simon, D., Tuppin, P., Ricordeau, P., & Allemand, H. (2010). Diabète traité: quelles évolutions entre 2000 et 2009 en France. *Bull Epidemiol Hebd*, 42(43), 425-431.
5. Oga, A. S. S., Tebi, A., Aka, J., Adouéni, K. V., Malan, K. A., Kouadio, L. P., & Lokrou, A. (2006). Le diabète sucré diagnostique en Côte d'Ivoire: des particularités épidémiologiques. *Médecine tropicale*, 66(3), 241-246.
6. Rapport des résultats préliminaires du dénombrement principal du RGPH5 Retrieved November 22nd 2024 from: <https://ins-congo.cg/rapport-preliminaire/>
7. Congo-espérance de vie à la naissance. Retrieved November 22nd 2024 from <https://fr.countryeconomy.com/demographie/espérance-vie/congo>.
8. Kimbally-Kaky, G., Bolanda, J. D., Gokaba, C. H., Loumouamou, D., Bakala, D., & Nzoutani, L. (2004). Enquête sur l'HTA et les autres facteurs de Risque cardiovasculaires à Brazzaville; OMS-

- Congo, Mai 2004. Retrieved november 22nd 2024 from:  
<https://extranet.who.int/ncdsmicrodata/index.php/catalog/623/related-materials>
9. Monabeka, H. G., Kibeke, P., Nsakala-Kibangou, N., & Nkoua, J. L. (2003). Le diabète sucré en milieu hospitalier congolais: étude épidémiologique et clinique à propos de 955 cas. *Annales Université Marien Ngouabi*, 4(1), 131-135.
  10. International Diabetes Federation (IDF), *The IDF consensus worldwide definition of the Metabolic Syndrome*. IDF Communications 2006. Retrieved November 20th 2024 from <https://idf.org/media/uploads/2023/05/attachments-30.pdf>
  11. Meneilly, G. S., & Tessier, D. (2001). Diabetes in elderly adults. *J Gerontol A Biol Sci Med Sci*, 56(1), M5-13.
  12. Maufroy, N. (1996). L'hypertension artérielle du sujet âgé : Mise au point. *Geriatrics- Praticiens ET 3 ème âge*. 121-122.
  13. Hanon, O., Seux, M. L., & Rigaud, A. S. Hypertension artérielle chez le sujet âgé. *EMC-Médecine*, 1(5), p 381-387.
  14. Pennington, J. C., Tecce, M. A., & Segal, B. L. (1998). Prise en charge des facteurs de risqué cardiovasculaires dans la prévention des maladies cardiaques. *Geriatrics-Praticiens et 3ème âge*, 221-226.
  15. Djrolo, F., Gninkoun, J., & Alassani, A. (2014). P113 Caractéristiques du diabète du sujet âgé à Cotonou, Bénin. *Diabetes & Metabolism*, 40, A56. [https://doi.org/10.1016/S1262-3636\(14\)72405-X](https://doi.org/10.1016/S1262-3636(14)72405-X)
  16. Selvin, E., Coresh, J., & Brancati, F. L. (2006). The burden and treatment of diabetes in elderly individuals in the US. *Diabetes care*, 29(11), 2415-2419.
  17. Bauduceau, B., Doucet, J., Le Floch, J. P., & Verny, C. (2013). Cohorte Gérodiab. *Bull Epidémiol Hebd*, (37-38), 485-491.
  18. Diyane, K., El Ansari, N., El Mghari, G., Anzid, K., & Cherkaoui, M. (2013). Caractéristiques de l'association diabète type 2 et hypertension artérielle chez le sujet âgé de 65 ans et plus. *Pan African Medical Journal*, 14(1), 100. doi:10.11604/pamj.2013.14.100.1880
  19. Fourati, M. Les FRCV chez le sujet âgé. *J.I. M. Sfax*, 1 N°5/6; Dec03/Mars 04 : 29-34.
  20. Lavery, L. A., Ashry, H. R., Van Houtum, W., Pugh, J. A., Harkless, L. B., & Basu, S. (1996). Variation in the incidence and proportion of diabetes-related amputations in minorities. *Diabetes care*, 19(1), 48-52.
  21. Harris, M. I., Klein, R., Cowie, C. C., Rowland, M., & Byrd-Holt, D. D. (1998). Is the risk of diabetic retinopathy greater in non-Hispanic blacks and Mexican Americans than in non-Hispanic whites with type 2 diabetes?: A US population study. *Diabetes care*, 21(8), 1230-1235.
  22. Lavery, L. A., Van Houtum, W. H., Ashry, H. R., Armstrong, D. G., & Pugh, J. A. (1999). Diabetes-related lower-extremity amputations disproportionately affect Blacks and Mexican Americans. *Southern medical journal*, 92(6), 593-599.
  23. Weng, C., Coppini, D. V., & Sönksen, P. H. (2000). Geographic and social factors are related to increased morbidity and mortality rates in diabetic patients. *Diabetic Medicine*, 17(8), 612-617.
  24. Tull, E. S., Barinas, E., & Pittsburgh DERI Mortality Study Group. (1996). A twofold excess mortality among black compared with white IDDM patients in Allegheny County, Pennsylvania. *Diabetes Care*, 19(12), 1344-1347.
  25. Venema, H. U., Garretsen, H. F. L., & Van Der Maas, P. J. (1995). Health of migrants and migrant health policy, The Netherlands as an example. *Social Science & Medicine*, 41(6), 809-818.
  26. Won, J. C., Kwon, H. S., Kim, C. H., Lee, J. H., Park, T. S., Ko, K. S., & Cha, B. Y. (2012). Prevalence and clinical characteristics of diabetic peripheral neuropathy in hospital patients with type 2 diabetes in Korea. *Diabetic Medicine*, 29(9), e290-e296.
  27. Golden, S. H., Brown, A., Cauley, J. A., Chin, M. H., Gary-Webb, T. L., Kim, C., ... & Anton, B. (2012). Health disparities in endocrine disorders: biological, clinical, and nonclinical factors—an Endocrine Society scientific statement. *The Journal of Clinical Endocrinology & Metabolism*, 97(9), E1579-E1639.
  28. Dagogo-Jack, S. (2010). Pitfalls in the use of HbA1c as a diagnostic test: the ethnic conundrum. *Nature Reviews Endocrinology*, 6(10), 589-593.
  29. Selvin, E., Steffes, M. W., Ballantyne, C. M., Hoogeveen, R. C., Coresh, J., & Brancati, F. L. (2011). Racial differences in glycemic markers: a cross-sectional analysis of community-based data. *Annals of internal medicine*, 154(5), 303-309.
  30. Ioacara, S., Guja, C., Ionescu-Tirgoviste, C., Fica, S., Sabau, S., Radu, S., ... & Tiu, C. (2011). Improvements in life expectancy in adult type 2 diabetes patients in the last six decades. *diabetes research and clinical practice*, 92(3), 400-404.

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