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Research Article

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Study of the Glycemic Control and the Biochemical Profile in the Gabonese Diabetic Patient

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Abstract

Background: *Management of diabetes remains a challenge in Africa.*

Objective: *The aim of this study was to evaluate the glycemic control in diabetics patients with diabetes in Gabon sub-Saharan country.*

Methods: *This study involving 87 diabetic patients (Men25 ; Women : 62) were investigated anthropometric parametres, glycemic control and biochemical profil.*

Results: *All our results show that with an average age of 53±11.02 years diabetic Gabonese patients present a poor glycemic control (P <0.0001): Glycemia (Control: 4.95 ± 1.16 mmol/l vs Diabetic : 10.27 ± 4.47 mmol/l) ; HbA1c (Control : 5.05 ± 0.46% vs Diabetics : 7.40 ± 2.36%) associated with a hepatic steatosis : Alat (Alat : Control: 17.25 ± 13.7u/l vs Diabetic: 25.84 ± 13.19 u/l), Asat (Control: 18 ± 13.20 u/l vs Diabetic: 36.93 ± 17.87 u/l).*

Conclusion: *Is evidence, a high proportion of patients with diabetes remains poorly controlled. This is the case in Gabon diabetic patients.*

Keywords: Diabetes, HbA1c; Glycemic control, sub-Saharan Africa

Introduction

About 18 million people die each year of cardiovascular diseases often related to risk factors such as diabetes mellitus or hypertension [1]. Unlike a widespread opinion that considers diabetes mellitus as a disease of only wealthy nations, the disease is now increasingly becoming a major concern in developing countries, particularly in sub-Saharan Africa. The World Health Organization (WHO) recognizes several causes of this phenomenon, in particular, the aging of the population and rapid urbanization, one cause of inactivity in modern African societies [2-4].

Several large clinical trials have demonstrated the beneficial effect of glycemic control on the development of long-term complications of diabetes [5]. Despite this evidence, a high proportion of patients with diabetes remains poorly controlled. This is the case in Africa where a large number of people with diabetes do not reach the recommended HbA1c targets [6]. Diabetes hyperglycaemia contributes to blood vessel damage and complications such as coma, blindness, renal insufficiency, coronary artery disease, and stroke [7-8].

The prevalence of diabetes in Gabon is 5%, making it the third of the sub-Saharan Africa countries most affected by the disease [9]. Recent study showed that social status associated with the physiological consequences of urbanization was a risk factor for diabetes prevalence in Libreville [10].

Nowadays no studies have been evaluated the poor glycemic control in Gaboneses diabetic patients. The aim in this study is to evaluate the glycemic statuts of diabetic Gabonese patients and to etablish the biochemical profile associated.

Methods

Subjects

The study was conducted in Libreville, which is located in northeastern Gabon. It is the nation's capital and has 850000 inhabitants. Our study was carried out within the laboratory of the Army Training Hospital Omar BONGO ONDIMBA during the period from 15 October to 21 December 2015 and sampling was carried out over a period of three (3) weeks starting from 30 November to 21 December 2015. The study was established on 87 patients mainly diabetic, including 25 men and 62 women, received at the Laboratory of Medical Analysis to make a biochemical assessment with the aim of evaluate their biochemical profile.

The definition of cases on diabetic subjects by following the criteria is:

- **Inclusion criteria:** All patients previously known to have diabetes, regardless of the type of diabetes and their age, who are on medication or food, and who have consented freely to participate, were included in this study.
- **Exclusion criteria:** All persons not previously diagnosed with diabetes and those with other conditions other than diabetes were not considered useful for this study.

Antropometric characteristics

Height (**H**) was measured to the nearest 0.1 cm using a stadiometer (seca 210, seca, Hamburg, Germany) and weight was measured to the nearest 0.1 kg (GL-6000-20, G-tech, Uijungbu City, Korea). Body mass index (**BMI**) was calculated as body weight (kg) divided by height^2 (m^2).

Biochemical study

Blood samples were drawn from the antecubital vein in the morning after fasting for at least 8 hours. Samples were properly processed, immediately refrigerated at 2-8°C, and sent to a central laboratory. Total cholesterol, HDL-C, low density lipoprotein cholesterol (**LDL-C**), triglycerides (**TG**), and fasting glucose were measured enzymatically method using Automatic BA88 (Mindray Biochemestry Analyser) [11-14].

Results

Anthropometric parameters

In order to assess the mean age and sex distribution of diabetic Gabonese subjects, studies were carried out and recorded in Table 1 and 2. These different results show that the average age of diabetic men was 51.04 ± 13.81 years and that of women was 54.95 ± 19.35 years

Table 1: **Distribution of diabetics by sex and age**

Sex	Men (Mean±SD)	Women (Mean±SD)
Mean age	51.04±13.81	54.95±19.35
Number (Percentage)	25(28.74%)	62(71.26%)

Table 2: Distribution of diabetics according to age group

Age	25-40	41-65	66-80	>80
Percentage (%)	15.62	62.50	15.62	6.25

(**Table 1**). The age group most affected by the disease was that between 41-65 years (**Table 2**). Moreover, the occurrence of diabetes in the Gabonese subject was not associated with a modification of the anthropometric parameters (**Table 3**) studied (P> 0.05) in particular the weight (Control : 64 ± 12.23g vs Diabetic: 67 ± 17.85g), the height (Control : 1.60 0.06m vs Diabetic : 1.63 ± 0.08m) and BMI (Control : 25.01 ± 2.3kg/m^2 vs Diabetic : 24.10 ± 6.3 kg/m^2).

Table 3 : Anthropometric parametres

Parametres	Control (Mean±SD)	Diabetic (Mean±SD)	P-value
Weight (Kg)	64±12.23	67±17.85	0.48
Height(m)	1.60±0.06	1.63±0.08	>0.05
BMI (kg/m^2)	25±2.3	24.10 ± 6.3	>0.05

Biochemical Study

Subsequently, a biochemical study was carried out to evaluate the statuts of glycemic patients (Table 4). The results show that there is an increase (107%) in glycemia in the diabetic subject (10.27 ± 4.47 mmol/l) compared (P <0.0001) to control (4.95 ± 1.16 mmol/l). This increase of glycemia was correlated with the percentage of glycation of hemoglobin in diabetic subjects (7.40 ± 2.36%) compared to control (5.05 ± 0.46%).

On the other hand, there was no difference in the lipid profile (**Table 4**) between controls and patients (Cholt: 5.05 ± 0.46mmol/l vs 4.77 ± 1.14mmol/l ; LDL: 2.18 ± 1.2014mmol/l vs 2.24 ± 0.814mmol/l ; HDL: 1.65 ± 0.35 mmol/l vs 1.83 ± 3.99 mmol/l; IA: 3.1 ± 0.23 vs 2.6 ± 0.33, TG: 1.03 ± 0.58 mmol/l vs 1.38 ± 0.79 mmol/l).

Table 4 shows no effect on renal function in diabetic subjects. There was no difference in plasma urea concentration (Control: 5.25 mmol/l ± 0.75 vs Diabetic: 7.49 ± 0.68 mmol/l) and Creatinine (Control: 75 ± 25.4 mmol/l vs Diabetic: 119.63 ± 139.4 mmol/l). On the other hand, there is a 50% increase in the transaminases, Alat (Control: 17.25 ± 13.7u/l vs Diabetic: 25.84 ± 13.19 u/l), Asat (Control: 18 ± 13.20 u/l vs Diabetic: 36.93 ± 17.87 u/l).

Moreover, the comparative study on the antrhopometric parameters (**Table 5**) and biochemical profile between men and women (**Table 6**) showed no difference (P> 0.05).

Table 4 : Biochemical profile

Parametres	Control	Patients	P-value
Gly (mmol/l)	4.95±1.16	10.27±4.47	<0.0001*
HbA1c (%)	5.05±0.46	7.40±2.36	<0.0001*
Cholt (mmol/l)	5.05±0.46	4.77±1.14	0.26
LDL (mmol/l)	2.18±1.20	2.24±0.8	0.74
HDL (mmol/l)	1.65±0.35	1.83±3.99	0.8
IA (Cholt/Chol HDL)	3.1±0.23	2.6±0.33	0.065
TG (mmol/l)	1.03+0.58	1.38±0.79	0.05
Urea (mmol/l)	5.25±0.75	7.49±0.68	0.08
Creat (mmol/l)	75±25.4	119.63±139.4	0.079
ALAT (U/l)	17.25±13.7	25.84±13.19	0.01*
ASAT (U/l)	18±13.20	36.93±17.87	<0.0001*

Gly: Glycemia; HbA1c: glycated hemoglobin. CHOLt: Total cholesterol. LDLc: LDL cholesterol; HDLc: HDL cholesterol; TG: triglyceride; CREAT: creatinine; ASAT: aspartate aminotransferase; ALAT: alanine aminotransferase. *P<0.05 when different control.

Table 5 : Distribution of biochemical parameters by sex

	Men	Women	P-Value
Gly (mmol/l)	10.8±4.83	9.8±4.22	0.97
HbA1c (%)	7.1±2.43	7.8±3.72	0.57
Cholt (mmol/l)	2.3±0.85	2.2±0.80	0.47
LDL (mmol/l)	1±0.46	2.5±5.44	0.80
HDL (mmol/l)	1.3±0.57	1.5±0.96	0.30
IA (Cholt/Chol HDL)	1.8±0.06	1.5±0.02	0.5

TG (mmol/l)	8.1±8.06	6.9±5.13	0.76
Urea (mmol/l)	81.6±24.15	153.2±185.98	0.33
Creat (mmol/l)	38.1±26.23	35.9±12.13	0.61
ALAT (U/l)	23.5±11.98	28.1±14.17	0.15

Gly: Glycemia; HbA1c: glycated hemoglobin.CHOLt: Total cholesterol. LDLc: LDL cholesterol; HDLc: HDL cholesterol; TG: triglyceride; CREAT: creatinine; ASAT: aspartate aminotransferase; ALAT: alanine aminotransferase. *P<0.05 when different control.

Discussion

Unlike the widespread opinion that considers diabetes as a disease of wealthy nations, this condition is now becoming a major concern in developing countries, particularly in sub-Saharan Africa.

Anthropometric parametres

Our results show that the number of women for diabetes were higher than that of men. These results are in agreement with previous studies in Libreville and other African capitals. This may be explained by the fact that, in Africa, women are more likely to be obese than men. Indeed, the prevalence of obesity in type 2 diabetes varies between 14% and 35% [15-16]. Yet, obesity prevalence among women with diabetes has been reported to be 80% for women and 20% for men, and has also been associated with andropause and menopause, two conditions known for having an impact on the onset of diabetes and cardiovascular disease [17-20].

Glycemic control

Moreover, despite the observed medical follow-up biochemical studies showed that diabetic subjects had a very high glycemia concentration associated with a high percentage of hemoglobin glycation. This result reflects poor glycemic control in Gabonese diabetic subjects. Similar results have already been observed in other population groups in sub-Saharan Africa but also in the African American community [5-6]. Several causes were identified: ethnic minority, age, male, marital and socio-economic status. Indeed, in the US, studies revealed that ethnic minorities (blacks, Indians and Hispanics) had poor glycemic control. According to a meta-analysis, HbA1c is the highest among African-Americans compared to non-Hispanic whites [21-23]. These racial / ethnic disparities in the quality of diabetes care persist even after adjusting for socioeconomic status and access to care [24]. These results corroborate those previously found to be precocious, which showed that social status had an impact on the occurrence and development of diabetes in the Gabonese subject [10].

Biochemical profile

The results observed also show that diabetes was not associated with a change in anthropometric parameters correlated with an absence of changes in the lipid disorder. This can be explained by medical follow-up and appropriate diet [25-28].

In addition, an increase in the level of transaminases is observed. This can be explained by the presence of a steatosis liver frequently encountered in the diabetic patients. Indeed, nonalcoholic fatty liver disease is the most common cause of elevated transaminases during type 2 diabetes [29-32]. The risk of Alat increases in the diabetic population than in the non-diabetic.

In conclusion, is evidence, a high proportion of patients with diabetes remains poorly controlled. This is the case in Gabon diabetic patients. The social status and limited access to HbA1c monitoring appears to be a contributing factor. These findings suggest that increased access to an HbA1c test could be an important step in health policies to improve glycemic control in patients diabetes from Sub Sahara Africa.

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