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Prevalence and Risk Factors of Hypertension in Type 2 Diabetics in Benin

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Abstract

Background: Couple High Blood Pressure (HBP)-Diabetes is a morbid association and a public health problem. The aim of this study was to determine the actual epidemiological profile of HBP in type 2 diabetic. Methods: A cross-sectional, prospective, descriptive and analytical study was conducted at Banque d'insuline of Cotonou, Polyclinique Atinkanmey and CHUD-Ouémé-Plateau. The study took place over a period of 06 months from March 01 to August 30, 2014. The study included patients with type 2 diabetes mellitus seen at consultation who agreed to participate in the study. Results: The survey involved 400 individuals. Among them, 34% were male and the sex ratio was 0.48. The mean age was 55.6 ± 10.3 years (range 28 - 87 years). The prevalence of hypertension in type 2 diabetic patients was 70%. The risk factors significantly associated with HBP were age above 55 years ($p = 0.000$), abdominal obesity ($p = 0.036$), a diabetes duration above 10 years ($p = 0.009$). Complications significantly associated with HBP were stroke ($p = 0.013$) and diabetic foot ($p = 0.044$). Conclusion: HBP-type 2 Diabetes association is frequent in Benin.

Keywords

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1. Introduction

Diabetes mellitus (DM) represents a global public health challenge. Its prevalence particularly the prevalence of type 2 diabetes mellitus is improving in the world.

DM affects 381.8 million persons in the world according to IDF estimations in 2013 [1]. IDF estimates that the number of diabetics will reach 591.9 million in 2035, a 55.0% ascension [1]. Complications linked with that important risk factor will also increase because of the rise of its principal risk factor as obesity. The last obesity risk of HBP worsens the prognosis of diabetic patient by increasing the cardiovascular risk and chronic complications [2]. HBP represents a very frequent co-morbidity, affecting 20% to 60% of diabetics in the world [3]. Detection and treatment of HBP in diabetic patients are the more effective measures for prevention of related complications. The aim of this study was to determine the actual epidemiological profile of HBP in type 2 diabetic in Benin.

2. Patients and Methods

2.1. Framework and Nature of the Study

This cross-sectional, prospective, descriptive and analytical study was performed at Banque d'insuline of Cotonou, Polyclinique Atinkanmey and CHUD-Ouémé-Plateau. The study took place over a period of 06 months from Marsh 01 to August 30, 2014.

Created in January 1996, "Banque d'insuline" is the main center of diagnosis and ambulatory follow-up of diabetes mellitus in Cotonou. "Polyclinique Atinkanmey" is a private hospital in Cotonou where several specialist doctors carry out medical consultations. CHD OP is the Teaching Hospital of Porto-Novo City.

2.2. Studied Population and Data Collection

Were included, the type 2 diabetes followed as outpatients in the different centers studied.

We have included all type 2 diabetics who were consulted by diabetologists who participate to the study (two diabetologists).

During the six months that the study lasted, 400 people were included.

Included Patients were assessed using a survey form designed for this purpose. The clinical records of these patients were also used for the collection of additional data.

Blood pressure was taken in all patients using an electronic sphygmomanometer (OMRON® Blood Pressure Monitor) after five minutes of rest.

2.3. Studied Variables

Were studied:
- Socio-demographic characteristics: age, sex, occupation, place of residence, marital status;
- Tensional Profile: hypertension was defined by the blood pressure higher or equal to 140/90 mmHg, or pre-hypertension;
- Obesity: were considered obese people with BMI $\geq$ 30 kg/m^2;
- Abdominal obesity: abdominal obesity was defined using IDF 2005 standards (waist circumference $\geq$ 94 cm in Men and $\geq$80 cm in Women);
- Characteristic of type 2 diabetes: duration of diabetes, diabetes imbalance;
- Complications or other associated risk factors: dyslipidemia, micro albuminuria, diabetic neuropathy, diabetic retinopathy, stroke, diabetic foot, ischemia cardiopathy.

2.4. Statistical Analysis

Data were entered and analyzed using SPSS 18.0 software. Categorical variables were expressed as a percentage and quantitative variables averaged together with a standard deviation.

The relation between HBP and investigated factors was studied by calculating the Odd Ratio (OR) with 95% confidence interval.

We used the Chi-square test for the comparison of the percentages. A *p* value < 0.05 was considered significant.

3. Results

3.1. General Characteristics

Women represent 66% of the study population. Sex-ratio is 0.52. Mean age of patients was 55.6 ± 10.3 years with extremes of 28 to 87 years. Three hundred and eighty four patients (95%) lived in urban city. Customers are the more represented with a 52.5% proportion. Three hundred and nineteen patients (79.8%) lived in couple. The diabetes was balanced (HbA1c < 7%) in 31.28% of 243 patients who tested HbA1c.

3.2. Frequency of HBP

Frequency of HBP by measure at consultation in diabetic patients was 70% (see **Table 1**).

3.3. Risk Factors (Table 2)

1) Gender
Gender would not be a factor related to HBP occurrence in type 2 diabetics ($p = 0.059$).
2) Age
Age above 55 years look significantly associated with occurrence of HBP in type 2 diabetics ($p = 0.000$). Frequency of HBP in diabetic patients aged less than 55 years was at 50.5% while it was at 86.2% diabetics aged above 55 years.
3) Seniority diabetes
The diabetes duration vary from 1 year to 33 years with a mean duration at 8.27 ± 6.78 years. The older is the diabetes, the higher is the risk to develop HBP. The frequency of HBP in diabetic who has less than 10 years of diabetes duration was at 64.1%. Between 10 - 20 years duration of diabetes, it was at 77.3% ($p = 0.009$). Frequency of HBP in type 2 diabetic who has more than 20 years of diabetes duration was at 91.7%. ($p = 0.006$).
4) Abdominal obesity
Abdominal obesity is significantly associated with occurrence of HBP in type 2 diabetics ($p = 0.036$). The frequency of HBP in diabetics with abdominal obesity was at 71.8% while it was at 57.1% in those without abdominal obesity.
5) Dyslipidemia
Dyslipidemia do not feel to be associated with occurrence of HBP in type 2 diabetics ($p = 0.426$).
6) Diabetes imbalance
Diabetes imbalance do not seem to influence occurrence of HBP in type 2 diabetics ($p = 0.198$).
7) Degenerative complications of diabetes
Among degenerative complications of diabetes only stroke ($p = 0.013$) and diabetic foot ($p = 0.044$) seem to be linked with HBP in our study.

4. Discussion

There was preeminence of female diabetics (66%) in our study population with sex-ratio at 0.52. The result was comparable with Jimoh *et al.*'s (62%) [4] and Adebisi *et al.*'s (60%) in Nigeria [5]. This female preeminence is probably explained by a more marked care of female than male about health. Male would consult less often for silent disease like diabetes mellitus and HBP. Preeminence in male was noticed by Dibia in Nigeria [6].

Mean age of patients was at 55.6 ± 10.3 years with extremes of 28 to 87 years. Two hundred and eighteen patients (54.5%) were older than 55 years. This mean age in our study is similar to those of Dibia in Nigeria (58.5 years) [6], Ralison *et al.* in Madagascar (51 years) [7] and Lokrou *et al.* in Ivory Cost (49.67 years) [8].

Table 1. Prevalence of HBP in diabetics.

Tensional Profile	Number	Percentage
HBP	280	**70%**
No HBP	120	30%
Total	400	100%

Table 2. Summary of relation between HBP and investigated factors.

Factors		HBP		OR	IC (95%)	*p*
		Present	Absent			
Sex	Male	87	49	0.6	0.4 - 1.0	0.059
	Female	193	71			
Age	<55 years	92	90	6.1	3.8 - 9.3	**0.000**
	≥55 years	118	30			
Abdominal obesity	Present	252	99	1.9	1.0 - 3.5	**0.036**
	Absent	28	21			
BMI	< 25	63	26	1		
	25 - 29.99	102	55	0.8	0.4 - 1.3	0.350
	≥30	115	39	1.2	0.8 - 2.2	0.510
Dyslipidemia	Present	83	28	1.3	0.7 - 2.3	0.426
	Absent	72	31			
Duration of diabetes	<10 years	159	89	1		
	10 - 20 years	99	29	1.9	1.2 - 3.1	**0.009**
	>20 years	22	02	6.2	1.4 - 26.8	**0.006**
Diabetes imbalance	HbA1c ≥ 7	117	50	0.6	0.3 - 1.2	0.198
	HbA1c < 7	60	16			
Micro albuminuria 24 h	Present	57	14	1.5	0.7 - 3.2	0.380
	Absent	65	24			
Diabetic neuropathy	Présent	214	90	1.1	0.7 - 1.8	0.759
	Absent	66	30			
Diabetic retinopathy	Present	42	08	2.1	0.9 - 4.8	0.131
	Absent	94	37			
Stroke	Present	14	00	1.4	1.3 - 1.5	**0.013**
	Absent	266	120			
Diabetic foot	Present	23	03	3.4	1.0 - 11.1	**0.044**
	Absent	257	117			
Ischemia cardiopathy	Present	08	02	1.5	0.3 - 7	0.729
	Absent	97	37			

HbA1c: glycated hemoglobin; OR: odd ratio; CI: confidence interval.

The prevalence of HBP in type 2 diabetics in our study was at 70%. This high frequency is similar to those reported by Howards *et al.* in 2006 in Canada (70%) [9], Dibia in 2009 in Nigeria (71.6%) [6], Lokrou *et al.* in 2009 in Ivory Cost (76.82%) [8] and Tanguy *et al.* in 2012 in Limoges (75%) [10].

Contrary to our study, other authors reported lower frequencies of HBP in type 2 diabetes. In this way, Dembele *et al.* reported 16.7% in Bamako in 2000 [11], Ralison *et al.* reported 39.63% in Madagascar in 2007 [7], Ntyonga-Pono reported 40.67% in Gabon in 1996 [12] and Louda *et al.* reported 54.4% in Marocco in 2010 [13]. This difference of frequency would be linked to the methodology used by the authors. In fact, those studies were

retrospective and some authors used old WHO criterions of diagnosis for HBP (160/95 mmHg). It could explain the low frequency of HBP in diabetics in those studies.

We didn't identify gender as risk factor for HBP in type 2 diabetes in our study ($p = 0.059$), but the frequency of HBP in female was higher (73.1%) than in male (64%). Dibia didn't identify gender as risk factor for HBP in type 2 diabetes [6].

Adverse results were reported by Dembele *et al.* [11] and Ralison *et al.* [7] who identified female sex as risk factor for HBP in type 2 diabetes.

Age was identified to a risk factor associated to HBP in type 2 diabetes in our study ($p = 0.000$). Occurrence of HBP increased with age. Other authors reported similar conclusion. In this way, Dibia reported that 67% of diabetics with hypertension had age range between 51 and 70 years [6]; Aassri *et al.* found that HBP and diabetes association was significant between 66 and 69 years [14]; Ralison *et al.* found a pic of HBP in type 2 diabetics above 50 years and particularly between 60 and 69 years [7]; according to Khochtali *et al.* in Tunisia, 77% of diabetics above 65 years had hypertension [15]. This fact would be due to modifications of vascular system observed with age. In effect, an alteration and a relative reduction of elastic fibers occur and are replaced by collagen tissue in arteries wall. This evolution induces more rigidity of arteries contributing to elevate blood pressure.

In our study, the duration of diabetes was a factor associated with hypertension in type 2 diabetes. This trend was confirmed by Dibia in Nigeria [6] and Motala in South Africa [16]. This result may be related to chronic hyperglycemia resulting in endothelial suffering leading to thickening of the arterial wall and to a rise in blood pressure later.

We found that abdominal obesity was significantly associated with the occurrence of hypertension in type 2 diabetic patients ($p = 0.036$). Indeed in our study, the frequency of hypertension in type 2 diabetics with abdominal obesity was 71.9% against 57.1% among those who did not have abdominal obesity. This same observation was made in the general population by Gordon *et al.* [17]. The author has dismantled that abdominal obesity is a risk factor associated with the occurrence of hypertension and type 2 diabetes.

The result of our study could be explained by the fact that type 2 diabetes was usually part of metabolic syndrome.

Our results showed no correlation between dyslipidemia and hypertension in type 2 diabetics.

Conflicting results have been reported in Japan, where a significant correlation is found between the HDL hypocholesterolemia and the occurrence of hypertension in diabetic hypertensive by Miyagi *et al*. [18]. This same observation was made in Morocco by Diyane *et al*. [19]. This could be related to the fact that all patients were unable to make or cholesterol and triglycerides.

Contrary to some published data [10] [19], our study did not identify any microangiopathy as a factor associated with hypertension in type 2 diabetics.

According to the results of our study, history of stroke was found to be correlated with hypertension in type 2 diabetics because all diabetic patients with stroke had hypertension ($p = 0.013$). This observation corroborates those of Diyane *et al.* [19] and Tanguy *et al.* [10]. In addition, a meta-analysis [20] published in 2011 showed that in diabetic type 2, reducing the risk of stroke was proportional to the reduction in SBP.

We also identified the diabetic foot as a factor associated with hypertension in type 2 diabetics. Therefore, special monitoring of the feet will be indicated in diabetic patients with hypertension.

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