

Study of the Risk Factors of Erectile Dysfunction in Diabetic Subjects at the University Hospital of Libreville

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Abstract: *Introduction:* The objective of this study was to describe the risk factors of erectile dysfunction (ED) in diabetic patients at the University Hospital of Libreville. *Material and Methods:* This was a prospective descriptive-analytical study of type 1 and 2 diabetic patients aged over 18 years whose erectile function was assessed using the French translation of the IIEF-5 score. *Results:* 396 patients were selected with a mean age of 53 ± 13.6 years. People with type 2 diabetes represented 84.1% of the cases. Of the patients selected, 186 (47%) had diabetes for less than 5 years. Erectile dysfunction was found in 79.8% of patients ($n=316$), with a severe form in 19.7% of cases. Among the patients affected, 74.4% ($n=235$) had not sought medical advice before the onset of ED. Several risk factors were found, such as duration of diabetes ($p<0.001$), alcohol ($p<0.001$), diabetic retinopathy ($p<0.001$), diabetic nephropathy ($p=0.004$), and heart disease ($p=0.004$). In multivariate analysis, only advanced age, unbalanced diabetes, alcohol consumption, microangiopathy, mixed degenerative pathology, and duration of diabetes greater than 10 years remained statistically significant in ED. *Conclusion:* The prevalence of erectile dysfunction is significant in people with diabetes. Several factors associated with ED are clearly identified. They should be sought at the time of diagnosis of diabetes to make patients aware of the risk of ED associated with it. This would allow the physician to talk to the patient about ED, thus short-circuiting any difficulty the patients may have in discussing it voluntarily even when they are suffering from it.

Keywords: Erectile Dysfunction, Diabete, Risk Factor, Libreville

1. Introduction

Diabetes is a chronic metabolic disease that is widespread throughout the world. Its evolution is marked by the occurrence of microangiopathy, macroangiopathy, and mixed complications. Among the mixed complications is erectile dysfunction (ED), defined as the inability to obtain and/or maintain an erection sufficient for satisfactory sexual activity for at least three months [1]. It is often of organic origin due to vascular, neurological, or metabolic lesions, or sometimes psychogenic due to depression, relationship difficulties, or

performance anxiety [2]. Several studies have shown that diabetic patients have more ED appearing at an earlier age than non-diabetic patients [3, 4]. This ED is an additional difficulty in diabetes management because it is frequently the cause of increased difficulties in adherence to antidiabetic treatment [5]. In addition, it can be a source of significant anxiety and relationship instability, which can manifest itself in abandonment, infidelity, divorce, and depression.

Several risk factors for ED have been identified, such as age, alcohol, type of diabetes, and duration of diabetes [6, 7]. They increase the severity of ED, further degrading the

quality of life of these patients. Thus, our study aimed to analyze the risk factors of ED in people with diabetes at Libreville University Hospital.

2. Patients and Methods

This cross-sectional observational study with descriptive and analytical aims was conducted from May 1 to July 31, 2021.

The study population consisted of diabetic patients seen in the endocrinology and urology departments of the Libreville University Hospital (Centre Hospitalier Universitaire de Libreville, CHUL). The CHUL, located in the capital city of Libreville, is the largest hospital in Gabon.

Inclusion criteria:

1. Type 1 and 2 diabetic patients seen in the endocrinology and urology departments of CHUL;
2. Patients ≥ 18 years old;
3. Patients with sexual activity in the last six months;
4. Patients who gave informed consent.

Non-inclusion criteria:

1. Patients with higher-function disorders;
2. Patients unable to answer the questionnaire;
3. Patients with an incomplete biological assessment: absence of glycated hemoglobin (HbA1c), cholesterol and its fractions, and triglycerides in the three months preceding the beginning of the study.

In the absence of data on the prevalence of diabetes in men in the general population, we estimated the sample size using the open-source software, OpenEpi version 3, <http://openepi.com/SampleSize/SSPropor.htm> (visited on April 25, 2021), at 384 persons by empirically taking into account an expected frequency of 50%, with a confidence level of 95% and a precision of 5%.

Data analysis was based on information collected through survey forms previously established in two parts. One provided information on the patient and their disease, and the other was based on the international index of erectile function.

We assessed erectile function using the French version of the International Index of Erectile Function (IIEF-5). This is a widely-validated, self-administered questionnaire. For patients who had difficulty understanding the questions on the form, we assisted in answering them.

A physical examination was performed to collect clinical data: weight, height, BMI, blood pressure, search for heart disease, diabetic neuropathy, arteriopathy of the lower limbs, and fundus examination to search for diabetic retinopathy.

For calculating BMI, we used the Quételet formula: $BMI = \text{Weight (kg)} / (\text{Height in m})^2$.

Data were collected using a standardized form and then entered into a computer via the professional software, Excel 2016.

Data analysis was performed using the STATA 12.0 software.

Qualitative variables were described as percentages and quantitative variables as mean \pm standard deviation.

Using Pearson's chi-squared test or Fisher's exact test, percentage comparisons were made. Comparisons of means were made using the Student's t-test.

A stepwise and top-down logistic regression analysis was used to search for risk factors for ED. All statistically significant variables and those with $p < 0.25$ were included in the model.

For all analyses, the significance level was set at 5%.

Before starting the study, we obtained the agreement of the general management of the CHUL and the various heads of the departments concerned. For each patient, we conducted a reading followed by a signing of informed consent before their inclusion. Thus, the purpose and scientific interest of the study was explained to them, and the anonymity of the collected information was ensured. The refusal of the patient to participate in this study did not prevent their care and follow-up in the services concerned.

3. Results

The number of patients included in the study was 396. The average age was 53 ± 13.6 years, and patients over 50 years of age represented the majority of cases, i.e., 56.6% ($n=224$). Moreover, the majority of patients were normotensive (53.8%, $n=213$) and consumed alcohol (72.7%, $n=288$) (Table 1).

It was found that 76.5% ($n=303$) of the patients reported suffering from ED. After evaluation by the IIEF-5 score, ED was found in 79.8% ($n=316$) of the patients with a progressive evolution in 98.3% ($n=390$) of them. Among the patients with ED, 74.3% ($n=294$) had not consulted for this disorder.

Table 1. Clinical characteristics of diabetics at the University Hospital of Libreville in 2021.

Age (years)	Number	%
18-29	18	4.6
30-50	154	38.8
51-69	180	45.5
≥ 70	44	11.1
Associated Pathology		
Hypertension		
Yes	183	46.2
No	213	53.8
Alcohol consumption		
Yes	288	72.7
No	108	27.3
Overweight		
BMI 25-29.9 Kg/m ²	131	33.1
Obesity		
BMI 30 kg/m ²	54	13.6

In our series, degenerative complications were present in 71.2% ($n=282$) of patients with 33.8% ($n=134$) of cases having mixed degenerative pathologies, followed by macroangiopathy-type complications in 22.7% ($n=90$) and microangiopathies in 14.7% ($n=58$) of cases. Type 2 diabetes was found in 84.1% ($n=333$) of patients, with a duration of evolution of less than 5 years in 47% of cases. The majority of patients (79.8%, $n=316$) had unbalanced diabetes (Table 2).

Evaluation by the IIEF-5 score showed normal erection in 20.2% (n=80) of patients, mild ED in 26% (n=103), moderate ED in 34.1% (n=135), and severe ED in 19.7% (n=78).

Of the patients with ED, 74.3% (n=235) had not sought medical attention for their erectile dysfunction.

Univariate analysis identified several risk factors for developing ED in diabetic patients, including age (Tables 2 and 3). Thus, there was a statistically significant relationship between the occurrence of ED and the age of diabetic patients ($p<0.0001$). Patients aged 51-69 years had a higher risk of developing ED than patients under 30 years. In addition, there was a statistically significant relationship between the occurrence of ED and the type of diabetes

($p<0.001$). Type 2 diabetic patients were at greater risk of developing ED than type 1 diabetic patients.

ED was present in 98.4% of patients with a duration of diabetes of more than 10 years. There was a statistically significant association between the duration of diabetes and the occurrence of ED ($p<0.001$). Patients with a duration of diabetes of more than 10 years were more likely to develop ED than those with a duration below 5 years. Alcohol was also a risk factor ($p<0.001$), as was retinopathy ($p<0.001$), nephropathy ($p=0.004$), and heart disease ($p=0.004$) (Tables 2 and 3).

Some factors were not significantly related to ED, such as smoking ($p=0.302$), diabetic control ($p=0.674$), neuropathy ($p=0.023$), and stroke ($p=0.40$) (Tables 2 and 3).

Table 2. Risk factors for erectile dysfunction in the diabetic patients at CHUL.

	Erectile Dysfunction			OR [95% CI]	p
	Total	Yes n (%)	No n (%)		
Age					< 0.001
18-29	18	3 (16.7)	15 (83.3)	1	
30-50	154	105 (68.2)	49 (31.8)	10,71 [2.96 - 38.73]	
51-69	180	164 (91.1)	16 (8.9)	51,25 [13.40 - 196.06]	
> 69	44	44 (100)	0 (0.0)	-	
Type of diabetes					< 0.001
1	63	37 (58.7)	26 (41.3)	1	
2	333	279 (83.8)	54 (16.2)	3,63 [2.03 - 6.48]	
Alcohol					< 0.001
Non-consumer	108	72 (66.7)	36 (33.3)	1	
Consumer	288	244 (84.7)	44 (15.3)	2,77 [1.66 - 4.63]	
Tobacco					0.302
Non-smoker	270	213 (78.9)	57 (21.1)	1	
Smoker	126	103 (81.7)	23 (18.3)	1,2 [0.70 - 2.05]	
Duration of diabetes (years)					< 0.001
< 5	186	118 (63.4)	68 (36.6)	1	
5-10	83	73 (88.0)	10 (12.0)	4,21 [2.04-8.69]	
> 10	127	125 (98.4)	2 (1.6)	36,02 [8.63 - 150.28]	
Diabetes control (HbA1c (%))					0.674
≤ 6,5	80	60 (75.0)	20 (25.0)	1	
6.6-7.5	47	36 (76.6)	11 (23.4)	1,09 [0.47 - 2.54]	
7.6-8.5	50	40 (80.0)	10 (20.0)	1,33 [0.57 - 3.14]	
8.6-9.5	46	37 (80.4)	9 (19.6)	1,37 [0.56 - 3.33]	
>9,5	173	143 (82.7)	30 (17.3)	1,58 [0.84 - 3.02]	

Table 3. Study of the links between diabetes complications and erectile dysfunction.

	Erectile Dysfunction			OR [95% CI]	p
	Total	Yes n (%)	No n (%)		
Retinopathy					< 0.001
No	245	175 (71.4)	70 (28.6)	1	
Yes	151	141 (93.4)	10 (6.6)	5,64 [2.80 - 11.34]	
Nephropathy					0.004
No	238	259 (76.6)	79 (23.4)	1	
Yes	58	57 (98.3)	1 (1.7)	17,39 [2.37 - 127.58]	
Neuropathy					0.023
No	268	289 (78.5)	79 (21.5)	1	
Yes	28	27 (96.4)	1 (3.6)	7,38 [0.99 - 55.16]	
Heart Disease					0.004
No	357	278 (77.9)	79 (22.1)	1	
Yes	39	38 (97.4)	1 (2.6)	10,80 [1.46 - 79.89]	
PAOD					0.001
No	29	253 (76.7)	77 (23.3)	1	
Yes	12	63 (95.5)	3 (4.5)	6,39 [1.95 - 20.92]	
Hypertension					< 0.001
No	213	149 (70.0)	64 (30.0)	1	
Yes	183	167 (91.3)	16 (8.7)	4,48 [2.48 - 8.09]	

	Erectile Dysfunction			OR [95% CI]	p
	Total	Yes n (%)	No n (%)		
Stroke					0.040
No	365	285 (78.1)	80 (21.9)	1	
Yes	31	31 (100)	0 (0.0)	-	

PAOD: Peripheral arterial occlusive disease

Stroke: Cerebrovascular accident.

Patients with macro-angiopathies had more mild ED (34.4%, n=31), whereas those with microangiopathy and mixed degenerative pathology had more moderate ED, in

34,5% (n=20) and 45,5% (n=61) of cases, respectively. There was a significant relationship between degenerative pathologies and IIEF-5 score (p=0.0001) (Table 4).

Table 4. Relationship between degenerative diseases and IIEF-5 score.

Degenerative Diseases	Absent (%)	Mild (%)	Moderate (%)	Severe (%)	Total (%)
None	54 (47.4)	35 (30.7)	24 (21)	1 (0.9)	114 (100)
Macro angiopathies	15 (16.7)	31 (34.4)	30 (33.3)	14 (15.6)	90 (100)
Micro angiopathies	8 (13.8)	19 (32.8)	20 (34.5)	11 (19)	58 (100)
Mixed	3 (2.2)	18 (13.4)	61 (45.5)	52 (38.8)	134 (100)
Total	80 (20.2)	103 (26)	135 (34.1)	78 (19.7)	396 (100)

Of the patients whose duration of diabetes was > 10 years, 85.1% had moderate-to-severe erectile dysfunction. There was a statistically significant link between the

duration of diabetes and the IIEF-5 score (p=0.0001). The longer the progression, the greater the severity (Table 5).

Table 5. Link between the length of diabetes and IIEF-5 score.

Duration of Diabetes	Absent (%)	Mild (%)	Moderate (%)	Severe (%)	Total (%)
< 5 years	68 (36.6)	67 (36)	36 (19.4)	15 (8)	186 (100)
5-10 years	10 (12.1)	19 (22.9)	41 (49.4)	13 (15.7)	83 (100)
>10 years	2 (1.6)	17 (13.4)	58 (45.7)	50 (39.4)	127 (100)
Total	80 (20.2)	103 (26)	135 (34.1)	78 (19.7)	396 (100)

Of all the factors associated with erectile dysfunction in diabetics, only advanced age, unbalanced diabetes, alcohol consumption, microangiopathy, mixed degenerative pathology, and duration of diabetes greater than 10 years remained statistically significant (Table 6).

Table 6. Multivariate logistic regression of factors affecting erectile function in people with diabetes at CHUL.

Variable	OR [95%]	p
Age (years)		
30 - 50	5.72 [1.33 - 24.52]	0.019
51 - 70	14.10 [3.03 - 65.70]	0.001
> 70	-	0.997
Diabetes Control	2.93 [1.33 - 6.47]	0.008
Alcohol Consumption	3.07 [1.55 - 6.10]	0.001
Degenerative Pathologies		
Macro-angiopathy	1.87 [0.87 - 4.03]	0.112
Micro-angiopathy	3.23 [1.25 - 8.35]	0.015
Mixed	8.85 [2.41 - 32.48]	0.001
Duration of diabetes (years)		
5-10	2.14 [0.94 - 4.89]	0.071
> 10	19.90 [4.49 - 88.30]	< 0.001

4. Discussion

Several risk factors or factors associated with ED were identified in our study. The first was age, after 50 years, 91.1% of people with diabetes had ED, and after 70 years, 100% of patients had ED. Among our patients, no cases of severe ED were reported before the age of 30 years, whereas 21.1% of

patients had severe ED after 50 years and 79.5% after 70 years of age. Advanced age was significantly associated with ED (p<0.001). Patients aged 51-70 years had a higher probability of having ED than patients younger than 30 years (OR [95% CI]=51.25 [13.40 - 196.06]). Similar data were described by Siu et al. in Hong Kong [8], who found an increase in the frequency of ED from 33.3% to 73.8% in patients aged 21 to 80 years.

Some authors have found ED to be more frequent in type 1 diabetes [9]. However, people with type 2 diabetes were clearly more numerous in our series, representing 83.8% (n=333) of the study population. Moreover, they had three times greater risk of developing ED than those of type 1 (OR [95% CI]=3.63 [2.03 - 6.48], p<0.001). However, other authors such as Monabeka et al. in Congo [10] and Baldé et al. in Guinea [11] did not find a significant difference in the occurrence of ED between type 1 and type 2 diabetes.

Several authors have shown a direct correlation between ED and glycated hemoglobin (HbA1c) levels [12, 13]. Like these authors, we found a significant association in multivariate analysis between diabetes regulation and ED. Patients with poor diabetes regulation had a higher risk of developing ED (OR [95%]=2.93 [1.33 - 6.47]), p=0.008.

ED occurs earlier in patients with diabetes [4]. We found ED in 63.4% (n=118) of patients who had a history of diabetes for a period under 5 years. Many authors have reported the same trends, such as El Achhab et al. in Morocco [14] and Siu et al. in Hong Kong [8], who found

ED in 73% and 56% of cases, respectively. The frequency and severity of ED increased with the duration of diabetes. Thus, after 10 years of diabetes progression, 98.4% of patients had ED. These patients had a 36-fold higher risk than those who had a duration of the evolution of under 5 years (OR [95% CI]=36.02 [8.63 - 150.28], $p<0.001$). Other authors have also identified the duration of diabetes as a risk factor for the development of ED [13]. For example, Siu et al. in Hong Kong [8] described 72% ED in patients with diabetes > 20 years ($p=0.038$), and 72.2% complete ED for these patients ($p<0.001$).

The risk of ED in diabetic patients increases with the number of cigarettes smoked per day and the accumulation of intoxication [15]. Diabetic smokers or former smokers have a greater risk of developing ED [15]. The possibility of regression of erectile dysfunction increases with time when the patient stops smoking [14]. However, smoking was not a risk factor for ED in our study (OR [95% CI]=1.20 [0.70 - 2.05], $p=0.302$).

Chronic alcoholism is a factor associated with ED described by several authors [8, 16, 17]. In our series, 84.7% of patients who consumed alcohol had ED with a significantly higher risk than non-users (OR [95% CI]=2.77 [1.66 - 4.63], $p<0.001$). Our results differ from those of Monabeka et al. in Congo [10], who did not find an association between alcohol consumption and the occurrence of ED.

ED was reported in greater frequency in 91.3% of cases in patients with hypertension. Hypertensive patients were at greater risk of developing ED than normotensive patients (OR [95% CI]=4.48 [2.48 - 8.09], $p<0.001$). Arterial narrowing and loss of elasticity secondary to hypertension significantly interfere with blood flow to the corpora cavernosa and may result in partial or complete loss of erection [18].

The frequency of ED increases with the complications of diabetes [19]. Thus, in our series, patients with mixed degenerative pathology had a significantly higher risk than patients without this pathology (OR [95% CI]=38.66 [11.62 - 128.55], $p<0.001$). Among the macroangiopathies, heart disease was the one with the greatest significant risk (OR [95% CI]=10.80 [1.46 - 79.89], $p=0.004$), whereas diabetic nephropathy was the microangiopathy with the greatest significant risk (OR [95% CI]=17.39 [2.37 - 127.58], $p=0.004$). Other authors have found a statistically significant association between macroangiopathy, microangiopathy, and ED [11] [20].

In multivariate analysis, only advanced age (OR [95% CI]=14.10 [3.03 - 65.70]), $p=0.001$), diabetes control (OR [95% CI]=2.93 [1.33 - 6.47], $p=0.008$), alcohol consumption (OR [95% CI]=3.07 [1.55 - 6.10], $p=0.001$), microangiopathy (OR [95% CI]=3.23 [1.25 - 8.35], $p=0.015$), mixed degenerative pathology (OR [95% CI]=8.85 [2.41 - 32.48], $p=0.001$), macroangiopathy (OR [95% CI]=1.87 [0.87 - 4.03], $p=0.112$), as well as duration of diabetes greater than 10 years (OR [95% CI]=19.90 [4.49 - 88.30], $p<0.001$) remained significantly related to ED.

Other series around the world have found similar data: Siu

et al. in Hong Kong [8] found that the duration of diabetes was associated with the occurrence of ED, while Seid et al. [21] in Ethiopia found advanced age and duration of diabetes of more than 10 years to be predictive factors for the occurrence of erectile dysfunction. In addition, Mutagaywa et al. [22] in Tanzania found age and microangiopathy (diabetic neuropathy) as predictive factors, Kemp et al. in South Africa [23] found age as a predictive factor, and Sasaki et al. in Japan [24] found age and microangiopathy as predictive factors for ED.

The majority of the patients (74.3%, $n=294$) had not consulted a doctor for ED. Similar results were reported by Monabeka et al. in Congo [10], for whom 69.6% of the patients had not spoken to their doctors. Sexuality is still a taboo subject, difficult to discuss even within the health sphere. Despite the desire to be treated, most of our patients are embarrassed to talk about it to their doctors. This reluctance possibly explains the figures found.

5. Recommendations

The study's limitations stem from the fact that the patients were recruited only in hospitals and in urban areas. General population studies and rural population studies are essential to understand better the extent of the problem in our country and its impact on the quality of life of those concerned.

6. Conclusion

The prevalence of erectile dysfunction is significant in people with diabetes. Several factors associated with ED are clearly identified. They should be sought at the time of diagnosis of diabetes to make patients aware of the risk of ED associated with it. This would allow the physician to talk to the patient about ED, thus short-circuiting any difficulty the patients may have in discussing it voluntarily even when they are suffering from it.

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