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Lower Limb Arteriopathy in Diabetics at the Oueme-Plateau Provincial Hospital in Porto-Novo: Frequency and Associated Factors

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Abstract

Introduction: The distribution of arteriopathy of the lower limbs (ALL) is not familiar in the city of Porto-Novo. The aim of this study was to determine the prevalence and associated factors of ALL in diabetic patients in treatment at the Oueme-Plateau Provincial Teaching Hospital. **Methods:** This was a cross-sectional, descriptive, and analytical study from July 12 to October 10, 2021, at the Oueme-Plateau Provincial Teaching Hospital in Porto-Novo. ALL was screened by performing systolic pressure index (SPI) in all diabetic patients aged at least 18 years, seen in consultation or hospitalization during the study period and who had given their consent. **Results:** The study registered 165 diabetics and 98.2% of them were type 2. Subjects aged between 55 and 65 years were the most represented (33.9%), with an average age of 59.4 years. Women were in the majority (61.2%), with a sex ratio of 0.6. High blood pressure was associated with diabetes in 61.2% of patients. The prevalence of ALL was 48.5% (80 patients). Obliterative arteriopathy of the lower limbs (OALL) was observed in 70 patients (42.4%), mediocalcosis in 8 patients (4.8%), and mixed arteriopathy in 2 patients (1.2%). In 88.5% of patients, the pathology was symptomless. Factors significantly associated with ALL included advanced age ($p = 0.01$), the age of the glycemic imbalance ($p = 0.03$), lack of regular physical activity ($p = 0.001$) and dyslipidemia ($p = 0.008$). **Conclusion:** Pelvic limb arteriopathy is usual among diabetics at Oueme-Plateau Provincial Teaching Hospital. The use of SPI, which enables diagnosis, requires simple, low-cost means, and should be encouraged.

Keywords

ALL, Diabetes, OALL, Porto-Novo, Systolic Pressure Index

1. Introduction

Worldwide, in 2021, nearly 537 million people aged 20 to 79 will be living with diabetes. This number will increase to 643 million in 2030 and 783 million in 2045 if nothing is done [1]. In Africa, this number was 23.6 million in 2021 and will rise to 54.9 million in 2045 if no action is taken again [1]. In Benin, the prevalence of diabetes was 1.1% in 2001 [2] and 2.6% in 2008 [3]. Diabetes is accountable for both macrovascular and microvascular degenerative complications. Arteriopathies of the lower limbs (ALL) represent macrovascular complications. They are dominated by obliterative arteriopathy of the lower limbs, the ever-increasing prevalence of which varies according to the diagnostic method used and the target population [4]. It is estimated that over 200 million people in the world are affected by ALL [4]. In Benin, a study carried out in 2003 in Cotonou in a population of diabetics monitored using the systolic pressure index as a diagnostic method, revealed a prevalence of 33.3% for arteriopathy obliterating the lower limbs (OALL) [5]. Another study carried out in 2013 in Parakou in a population of diabetics not under surveillance found a prevalence of 41.9% for OALL [6]. During a hospital study conducted in 2015 in Benin, the overall prevalence of diabetic feet was 21.5%, and arteriopathy was found in 70.4% of cases [7]. But no data or body of knowledge on this subject is available in Porto-Novo, even though Porto-Novo is a city in southern Benin with a high prevalence of diabetes (6.7% in 2017) [8]. The main goal of the current study was to determine the prevalence and factors associated with ALL in diabetic patients at the Oueme-Plateau Provincial Teaching Hospital.

2. Methods

This was a cross-sectional, descriptive, and analytical study from July 12 to October 10, 2021, at the Oueme-Plateau Provincial Teaching Hospital in Porto-Novo. ALL was detected by performing the systolic pressure index (SPI) in all diabetic patients at least 18 years old, seen in consultation or hospitalization during the study period and who had given their consent.

- Inclusion criteria: diabetic patients aged at least 18 years and seen in consultation or hospitalization.
- Non-inclusion criteria:
 - All patients who did not give consent.
 - Patients with amputations or lower-limb lesions making it impossible to perform the SPI.

We used non-random sampling. All patients seen in consultation or hospitalized during the study period and who were eligible were included in the study.

The dependent variable was the presence of ALL. It is a binary qualitative variable coded as follows: 1 = Yes and 2 = No. The independent variables were sociodemographic factors, history, behavioral risk factors, and metabolic risk factors. A structured individual interview was conducted with each patient to gather socio-demographic and behavioral information. It was followed by the measurement of anthropometric parameters (weight, height, blood pressure) for those who did not have them in their records. A survey form was completed for each patient, followed by the performance of SPI for all patients. OALL is defined by an $SPI \leq 0.90$ and mediocalcosis by an $SPI > 1.30$. SPI is said to be normal when it is between 0.91 and 1.30 [9] [10]. The lowest index in both lower limbs is the one considered to define OALL [11]. Data were entered in Excel. Categorical variables were expressed as percentages. Continuous variables were expressed as mean and standard deviation. Univariate analysis by simple logistic regression identified factors associated with ALL at a significant threshold of 0.05. The multivariate analysis strategy consisted of including in the model all variables with a p-value of less than 0.20. The manual top-down procedure was used to obtain the final model, which enabled us to obtain the associated factors. Statistical analysis was performed in the SAS studio. Confidentiality was paramount, and patients' first and last names did not appear on the datasheet. Authorizations were obtained.

3. Results

A total of 173 patients were seen in consultation and hospitalization. Among them, 165 met the criteria and constituted our sample, *i.e.*, an inclusion rate of 95.4%.

3.1. Socio-Demographic Characteristics

3.1.1. Age

Subjects aged between 55 and 65 were the most represented, accounting for 33.9% (Figure 1).

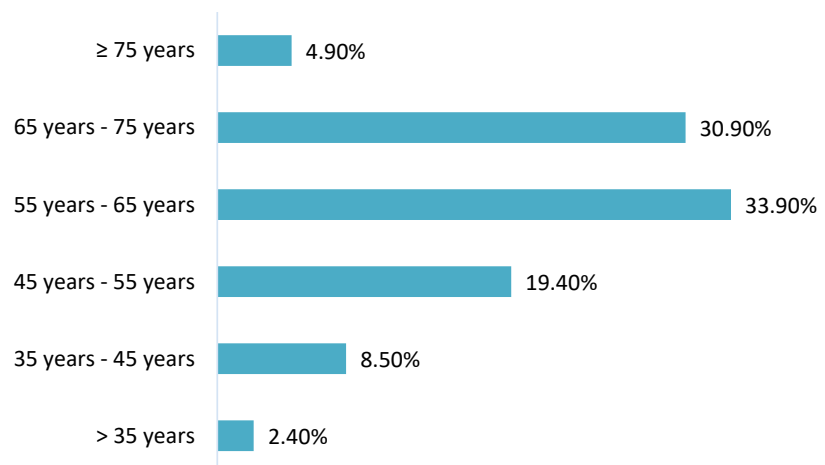


Figure 1. Sample distribution by age group.

3.1.2. Gender

In our study, women predominated (101 out of 165 patients), *i.e.*, 61.2%. The sex ratio was therefore 0.63.

3.2. Clinical Characteristics

3.2.1. Type, Duration, and Control of Diabetes

Type 2 diabetics were the most represented in our study (**Table 1**).

The mean age of diabetes was 7.80 years, with a standard deviation of 7.48 years.

Diabetes was balanced in 34.1% of patients (HbA1C < 7%).

3.2.2. Distribution of Patients According to Other Cardiovascular Risk Factors

61.2% of our patients had high blood pressure; 50 patients (30.3%) had dyslipidemia. Only 4 of our patients were smokers and 15 Consumed alcohols, *i.e.*, 2.4% and 9.1% respectively (**Table 2**).

3.3. Prevalence of Peripheral Arterial Disease in Diabetic Patients at Oueme-Plateau Provincial Teaching Hospital

Lower limb arteriopathy (ALL) was found in 80 patients, representing a hospital prevalence of 48.5% (**Table 3**).

OALL is the most common arterial disease, with a hospital prevalence of 42.4%. Mediacalcosis accounted for 4.9% of arteriopathies (**Table 4**).

Table 1. Distribution of patients by type of diabetes.

	Frequency	%
Type 1	2	1.2
Type 2	162	98.2
Secondary	1	0.6

Table 2. Distribution of patients according to other risk factors.

	Frequency	%
Hypertension (n = 165)	101	61.2
Dyslipidemia (n = 165)	50	30.3
Alcohol		
Yes	15	9.1
No	149	90.3
Stopped	1	0.6
Smoking		
Yes	4	2.4
No	160	97
Stopped	1	0.6

Distribution of Patients by Severity of ALL

Mild arteriopathy is most common in over 2/3 of patients, with a prevalence ranging from 79% to 86%. Arteriopathy is severe in 4 to 5% of cases, and bilateral in 47.5% (Table 5).

Only 19 of 165 patients (11.5%) had lower-limb claudication on walking.

Pain in the lower limbs at rest was found in 4.8% and trophic disorders in 2.4% of patients.

3.4. Factors Associated with ALL in Diabetic Patients at Oueme-Plateau Provincial Teaching Hospital

We sought the association between arteriopathy of the lower limbs and certain sociodemographic, clinical and paraclinical factors. The factors significantly associated with ALL were advanced age ($p = 0.01$), glycemic imbalance ($p = 0.03$), lack of regular physical activity ($p = 0.001$) and dyslipidemia ($p = 0.008$) (Table 6).

Table 3. Distribution of patients according to the presence or absence of ALL.

	Frequency	%
Yes	80	48.5
No	85	51.5
Total	165	100

Table 4. Distribution of patients by type of ALL.

	Frequency	%
OALL (n = 165)	70	42.4
Mediocalcosis (n = 165)	8	4.9
Mixed (n = 165)	2	1.2
Total	165	100

Table 5. Classification and severity of arteriopathy by artery.

	Posterior right tibial artery		Left posterior tibial artery		Right pedal artery		Left pedal artery	
	N	%	n	%	n	%	N	%
OALL (≤ 0.90)	49	29.7	50	30.3	41	24.8	39	23.6
Severe (≤ 0.40)	3	6.1	2	4	2	4.9	2	5.1
Moderate (0.41 - 0.70)	7	14.3	5	10	6	14.6	4	10.3
Mild (0.71 - 0.90)	39	79.6	43	86	33	80.5	33	84.6
Normal artery (0.91 - 1.30)	109	66.1	110	66.7	117	70.9	123	74.5
Mediocalcosis (> 1.30)	7	4.2	5	3	7	4.2	3	1.8

Table 6. Relationship between certain factors and arteriopathy in diabetics at Oueme-Plateau Provincial Teaching Hospital.

	ALL (%)		OR	CI 95% [OR]	p-value
	Yes	No			
Age					
<60 years	28 (37.8)	46 (62.2)	1		
≥60 years	52 (57.1)	39 (42.9)	2.2	1.2 - 4.1	0.01
Gender					
Male	28 (43.8)	36 (56.2)	1		
Female	52 (51.5)	49 (48.5)	1.4	0.4 - 1.3	0.3
Obesity					
No	59 (46.5)	68 (53.5)	1		
Yes	21 (55.3)	17 (44.7)	1.42	0.7 - 2.9	0.3
Age of diabetes					
<10 years	51 (44.3)	64 (55)	1		
≥10 years	29 (58)	21 (42)	1.7	0.9 - 3.4	0.1
HbA1c					
<7%	11 (36.7)	19 (63.3)	1		
≥7%	35 (60.3)	23 (39.7)	2.6	1.1 - 6.5	0.03
HTA					
No	27 (42.2)	37 (57.8)	1		
Yes	53 (52.5)	48 (47.5)	1.5	0.8 - 2.8	0.2
Regular physical activity					
Yes	14 (17.5)	02 (2.3)	1		
No	66 (82.5)	83 (97.7)	8.8	1.9 - 40.1	0.001
Dyslipidemia					
No	16 (32)	34 (68)	1		
Yes	29 (58)	21 (42)	2.9	1.3 - 6.6	0.008

4. Discussion

The occurrence of ALL was 48.5%. OALL was found in 42.4% of cases, Media-calciosis in 4.9% and mixed arteriopathy in 1.2%. Our prevalence of OALL is similar to that of Codjo H *et al.* [6] at CHUD Borgou in 2013 (41.9%). Alassani *et al.* [12] found a higher prevalence than ours (80.8%). This difference can be explained by the fact that their research was carried out on patients with a diabetic foot. Desormais *et al.* [13] found that the prevalence of ALL changes with age, which is coherent with the results of our current work. Older age (≥60 years) was associated with arteriopathy in our study (p = 0.01). Patients in this age group have 2.2 times (OR) the risk of developing the disease than others. The most represented age group was that of patients between 55 and 65 years of

age, accounting for 33.9%. This result is like that of Alassani [12] and Azebaze [14], who found an age range of 50 to 62, 50 to 60 and 50 to 69 respectively. On the other hand, our result differs from those of Bougrini [15] and Hanan [16], who found the age ranges from 65 to 74 and 70 to 80, respectively. We noted a female predominance in our study. This result is in line with those of Desormais *et al.* [13], who also found a female predominance. Alassani *et al.* [12] found a male predominance in their study. In our study, the prevalence of ALL was higher in female subjects, with no significant statistical relationship ($p = 0.3$). The prevalence of arteriopathy was higher in obese than in non-obese patients, but the difference was not statistically significant ($p = 0.3$). Most of our patients had a normal BMI. Our results concurred with those reported in another study in Cotonou, in 2016 [17]. Other authors such as Amidou *et al.* [18] had found a significant association. In the chronic complications stage of diabetes, most diabetics experience varying degrees of weight loss because of chronic hyperglycemia. This probably explains why most of our patients had a normal BMI, and why obesity was not associated with arteriopathy in our study. Patients diagnosed with diabetes mellitus at least 10 years ago have more arteriopathy than those diagnosed less than 10 years ago. But this difference was not statistically significant ($p = 0.1$). On the other hand, Codjo H *et al.* [6] found a statistically significant association between the length of diabetes and ALL. Our results could be the consequence of a low representation of subjects whose diabetes had been evolving for more than 10 years. Patients with glycemic imbalance ($HbA1C \geq 7\%$) had a higher prevalence of arteriopathy (60.3%), with a statistically significant association ($p = 0.03$). The risk of arterial disease is multiplied by 2.6 for patients with glycemic imbalance. This result also tallies with that of Selvin *et al.* [19], who demonstrated that any 1% increase in HbA1c was associated with a 28% increase in the risk of HAI. But Alassani *et al.* [12] found no association. The literature shows that chronic hyperglycemia plays an important role in the development of atherosclerosis [20]. In our study, the prevalence of arteriopathy was higher in patients with dyslipidemia (58%) than in those without (32%), with a statistically significant difference ($p = 0.008$). Codjo H *et al.* [6] and Alassani *et al.* [12] found no association between dyslipidemia and arteriopathy. Our result seems logical to us, since the first stage of atherogenesis is a high level of Low-density lipoprotein (LDL) formation in the blood due to hypercholesterolemia, and atherogenesis is responsible for lipid plaque formation [21]. The prevalence of arteriopathy is higher in those who do not engage in regular physical activity (82.5%). This suggests that regular physical activity reduces the risk of arterial disease. There was a statistically significant link between lack of regular physical activity and the occurrence of ALL ($p = 0.001$). The risk of arterial disease is multiplied by 8.8 (OR) for those who do not engage in regular physical activity. Codjo H *et al.* [6] found that a sedentary lifestyle was significantly associated with arterial disease. Our results are in line with the literature, which suggests that regular physical activity significantly reduces the risk of arterial disease [1].

The limited size of our sample during the study period is linked to the COVID-19 pandemic with a significant drop in attendance at health centers. In addition, the obligation of a vaccination health pass in health centers during our study period greatly affected the size of the sample.

5. Conclusion

Arteriopathy of the lower limbs is common among diabetics at Oueme-Plateau Provincial Teaching Hospital, with a hospital prevalence of 48.5%. They are asymptomatic in 87.3% of cases. This explains the need for systematic screening, without waiting for a clinical manifestation. Performing an SPI, which enables the diagnosis to be made, requires simple, inexpensive means, and should be encouraged. All diabetics should be screened at least once a year.

Conflicts of Interest

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

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