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Frequency, Risk Factors and Clinical Forms of Neuropathies in Diabetics in Hospitals in Burkina Faso

Alfred Anselme Dabilgou[1*], Hervé Tieno[2], Joëlle Zabsonré Tiendrebeogo[3], Valentin N. Yameogo[4], Christian Manuel Zett[3], Athanase Millogo[5]

[1]Department of Neurology, Yalgado Ouedraogo University Teaching Hospital, Ouagadougou, Burkina Faso
[2]Department of Internal Medicine, Yalgado Ouedraogo University Teaching Hospital, Ouagadougou, Burkina Faso
[3]Department of Rheumatology, Yalgado Ouedraogo University Teaching Hospital, Ouagadougou, Burkina Faso
[4]Cardiology Department, Yalgado Ouedraogo University Teaching Hospital, Ouagadougou, Burkina Faso
[5]Department of Internal Medicine, Yalgado Ouedraogo University Teaching Hospital, Bobo-Dioulasso, Burkina Faso
Email: *dabilgouanselm@yahoo.fr

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Abstract

Introduction: Diabetic neuropathy is one of the most common chronic complications of diabetes. Most of the studies on the subject in the sub region, particularly in Burkina Faso, dealt it with the study of the complications of diabetes, or one of its components. Our study was designed to study in particular in all its aspects, by searching for its peculiarities in our context, for improvement of its support. **Methodology:** This is a cross-sectional descriptive study carried out in 150 diabetic patients aged at least 15 years followed in the Department of Internal Medicine at Yalgado Ouedraogo University Teaching Hospital. All patients included had agreed to participate in our survey after informed consent. We collected the data during the period from 2015 November to 2016 June. Each patient was evaluated by the DN4 questionnaire and clinically by a neurological examination. We determinated the frequency, the sociodemographic, clinical and therapeutic characteristics of diabetes neuropathy and its related factors. **Results:** The frequency of diabetic neuropathy was 80.7%. Peripheral neuropathies were seen in 81.8% of cases and autonomic neuropathies in 72.7% of cases. Autonomic neuropathy was dominated by the DAN (59.1%), and erectile dysfunction (44%). There was a high comorbidity with physical inactivity (66.9%), obesity (49.4%) and hypertension (38.8%). There were poorly controlled patients in 38.8%. A link was found between T2DM and neuropathy ($p = 0.014$). Painful diabetes was related to the quality of glycemic control ($p = 0.007$), and hypertension ($p = 0.021$). A link was also found between tobacco consumption ($p < 0.001$), male

($p < 0.001$), and urogenital autonomic neuropathy. **Conclusion:** Diabetic neuropathies are very common in our context and could be a haunting to the practitioner with the progression of diabetes and its corollary of degenerative complications. There was a significant association between Type 2 Diabetes mellitus and the presence of peripheral diabetic neuropathy.

Keywords

Prevalence, Risk Factor, Neuropathy, Diabetes Mellitus, Burkina Faso

1. Introduction

Diabetes mellitus is a truly global "epidemic" that is constantly growing. Overall, 422 million adults had diabetes in 2014 according to the 2016 report of the World Health Organization (WHO) [1]. Africa is experiencing the most dramatic increase with about 19.8 million adults [2] [3]. Diabetic neuropathy is the most common complication associated with diabetes mellitus and the main cause of neuropathy in the world [4]. Diabetic neuropathy is classically defined as "the presence of symptoms and/or signs of peripheral nerve dysfunction in people with diabetes after the exclusion of other causes" [5]. Diabetic neuropathy (DN) complicates type 1 and type 2 diabetes [6] [7]. The frequency of diabetes neuropathy varies according to the different studies from 7% to 80% [8]. The diabetic neuropathy syndromes include diabetes peripheral neuropathy (75%), diabetic autonomic neuropathy, cranial neuropathy, mononeuritis multiplex, mononeuropathy, radiculoplexus neuropathies, diabetic neuropathic cachexia, and treatment-induced neuropathy in diabetes [9] [10]. The prevalence of diabetes mellitus (DM) in Burkina Faso was 4.9% in 2013 [11]. There is little data published from Burkina Faso about the prevalence and risk factors of diabetic neuropathy. The aims of this study are to determine the prevalence of diabetic neuropathy and its risk factor among diabetics in hospital setting in Burkina Faso.

2. Methodology

2.1. Study Design

This is a descriptive, prospective, cross-sectional hospital based study. It was carried out in diabetics patients followed in the Department of Internal Medicine at Yalgado Ouedraogo University Teaching Hospital of Ouagadougou, the main hospital of Burkina Faso. Ouagadougou is the capital of Burkina Faso located in West Africa which occupies an area of 274,300 K msq for a population of 16,248,558 according to the 2006 Burkina population census. The data were collected during a period of eight months from 2015 November to 2016 June.

2.2. Study Population

Patients with current diagnosis of diabetes mellitus aged at least 15 years were

included in the study. No current psychiatric (or any other) disorder that might affect the reliability of their response to the study questionnaire. Sampling was non-random with systematic patient recruitment. Initially, each diabetic patient was confirmed by the neurologist to have diabetic neuropathy if diagnosed with one or more abnormal finding in neurogical examination. The tools used consisted of a 128 Hertz diapason, a brush, monofilament test for the evaluation of tactile, algebra and vibratory proprioceptive sensitivities, and a monofilament for the evaluation of the risk of lesion of the foot; a reflex hammer for evaluating osteotendinous reflexes; a blood pressure monitor and stethoscope for searching for a NAC; scales and tape measure for BMI and nutritional status assessment; a DN4 questionnaire for the search for neuropathic pain; the EVA for assessing the intensity of the pain. Variables related to diabetic disease, neuropathies.

2.3. Assessments

Patients having fasting blood sugar levels > 7 mmol/L or random blood sugar levels > 11.1 mmol/L, along with other clinical symptoms such as weight loss, polydipsia and polyuria, were diagnosed as diabetics. The diagnosis of Diabetic neuropathy (DN) was based on clinical criteria (interview and neurogical examination). The diagnosis of peripheral neuropathy (PDN) was made in the presence of subjective signs (burning, tingling, painful cold, tingling, electric shocks, itching, cramps, numbness, muscle weakness), hypoesthesia in tact, pain, a decrease in motive power, amyotrophy, decrease or abolition of osteotendinous reflexes, and or cranial nerve involvement. PDN is defined as the diabetic patients having dysfunction of peripheral nerves in the absence of other causes of dysfunction. Patients who presented a DN4 score ≥ 4 were considered positive for painful diabetic neuropathy (PFDN). Cardiovascular autonomic neuropathy (CAN) was posed in the presence of orthostatic hypotension. We defined orthostatic hypotension (OH) as a reduction of systolic blood pressure of at least 20 mm Hg or diastolic blood pressure of at least 10 mm Hg within 3 minutes of standing. Hypertension was considered to be present if systolic blood pressure was over 140 mm Hg or a diastolic blood pressure over 90 mm Hg and if there was a history of treatment for high blood pressure. Digestive autonomic neuropathy (DAN) was defined as the presence of gastroparesis (feeling of early satiety, feeling of dilation or bloating of the stomach, postprandial nausea or vomiting) and enteropathy (chronic constipation, chronic imperious diarrhea often nocturnal, anal incontinence). Urogenital autonomic neuropathy (UGAN): disturbance of perception of need to urinate, dysuria, chronic urinary retention, urge urgency with leakage, erectile dysfunction, retrograde ejaculation in men and anorgasmia in women. Sweaty manifestations: anhydrosis of the lower limbs and or hyperhidrosis of the face and trunk. Quality control of diabetes was judged on the basis of three modalities: glycated hemoglobin (HbA1C), fructosamin and mean fasting glucose levels. Table 1 assesses the quality of diabetes balance. Renal failure was selected in a patient treated for renal failure or with a glomerular filtration rate < 90 ml/min. Dyslipidemia was retained in patients on

Table 1. Assessment of the quality of diabetes balance.

	Glycemic control (value)		
Biochemical test	**Good**	**Fair**	**Poor**
HbA1C (%)	<7	[7; 8[	≥8
Fructosamin (µmol)	<317	[317; 375[	≥375
Fasting blood glucose (mmol / l)	<6.5	[6.5; 7.5[	≥7.5

lipid-lowering therapy. Levels of low-density lipoprotein (LDL) > 1.8 mmol/L in any patient with cardiovascular disease (CVD) or chronic kidney disease (CKD), or any patient no CVD over 40 years of age with one or more cardiovascular risk factors, or clear evidence of target organ damage; LDL-c > 2.5 mmol/L in any other diabetic patient.

Physical inactivity has been defined by physical inactivity: people performing less than 30 minutes a day of moderate to intense physical activity.

2.4. Data Analysis

Detail information of the socio-demographic variables (age, sex, marital status, profession, hypertension, smoking, alcoholic status), clinical variables about diabetes (history of family diabetes, diabetes duration, treatment) and neuropathy (types, treatment) were recorded in each patient. Data collected by the authors was introduced into the computer software program using Epidata version 3.1 and analysed using SPSS version. The data was analysed in terms of descriptive statistics using Pearson chi2 test as well as bivariate analysis using Chi-square test or Fisher's exact test when application conditions were not meet. Pearson Chi square test was applied at 5% level of significance, p value was < 0.05.

2.5. Ethical Considerations

The research had the approval from the institutional review board and ethics committee of Yalgado Ouedraogo University Teaching Hospital. All of the patients had given their verbal consent to participate in the study. The anonymity of the patients was preserved in the treatment of the data.

3. Results

3.1. Sociodemographic Characteristics

A total of 150 patients with diabetes including 50 (49.3%) male patients and 100 (50.7%) female patients were recruited into the study. The mean age of the study participants was 54.6 ± 11.7 years (range 33 - 82 years). Type 2 DM was common in 141 patients (94%). Among the study cohort, 121 (80.6%) patients had diabetic neuropathy. There were 80 (66.9%) female patients and 40 (31.1%) male patients. The prevalence of DN among males and females was 80%. The mean age of patients with DN was 55.23 ± 11.12 years (range 22 - 76). The mean age at the diagnosis of diabetes was 48.61 years. The prevalence of Diabetic neuropathy

was 10.8% in patient under 40 years, 49.5% between 40 and 60 years, 39.6% after 60 years. Table 2 gives the prevalence of diabetic neuropathy according to age groups. Of the total number of patients, 35.5% were housewives, 25.6% had office work, 15.7% were retired, 10.7 trader, 10% manual work and 2.5% were unemployed and. Patients had urban residence in 109 (90.1%).

3.2. Characteristics of Diabetes Mellitus

In study population, type 2 diabetes mellitus was common in 141 patients (94%). Among patients with DN, 118 (95.9%) patients had type 2 DM, 2 (1.6%) type 1 DM and 3 (2.5%) others types of diabetes (secondary, gestational, Mody). First degree family diabetes was reported in 43 (35.5%). Mean duration of diabetes was 6.62 ± 4.47 years. The duration of diabetes was under 5 years in 58 (47.9%) patients, between 5 and 10 years in 31 (25.6%) and after 10 years in 32 (26.5%) patients. Oral antidiabetic drug were used in 90 (74.3%) patients and insulin in 32 (26.4%). The glycemic control was assessed by HbA1C (67.8%), mean fasting glucose (19.8%) and fructosamin (12.4%). The mean value of HbA1C was 7.25%, fasting blood glucose 11.74 mmol/l and fructosamin 363.5 µmol. Glycemic control was good at 38.8% of patients and inadequate in 61.2% of patients. Table 3 gives the risks factors and diabetes mellitus complications among patients with DN.

3.3. Types of Diabetic Neuropathy

Peripheral diabetic neuropathy (PDN) was found in 99 (66%) patients. The main complaints were tingling (71.4%), tingling (55.1%) and burns (48%). The most clinical findings were hypoesthesia in 70.4% and loss of vibratory in 13.3%. The prevalence of Painful neuropathy in total study population was 20.7% (31/150) patients according to the DN4 questionnaire items.

A total of 31.6% (31/88) patients with peripheral diabetic neuropathy had painful neuropathy. Brushing and tingling were the most frequently reported symptoms on the DN4 questionnaire, followed by burning. Table 4 gives the proportions of patients who have positive responses on individual Douleur Neuropathique-4 (DN4) questionnaire items. For the total sample, 23 patients (19%) had a score of 0 on the DN4, 67 patients (55.3%) had a score of 1 - 3, 15 (12.4%) had a score of 4, and 16 patients (13.2%) had a score of 5 - 10. Focal neuropathy was found in 7.4% of patients. The mains symptoms were carpal tunnel syndrome (one case), lomboradiculalgia in 4 cases, facial palsy in 2 cases and common eye motor damage in one case. There were 21 (17.3%) patients who had treatment of their neuropathy. The most common treatment were antidepressants in 8 (38%) patients, antiantiepileptic drugs in 8 (38%) patients and B vitamin in 10 (47.6%) patients. Autonomic Diabetic neuropathy (DAN) was found in 88 patients (58.6%). The most affected system by DAN was the gastrointestinal system in 52 (34.6%) followed by genitourinary system in 29 (19.3%), and sweat manifestations in 27 (18%). Cardiovascular system represents

Table 2. Prevalence of diabetic neuropathy according to age groups.

Age group (years)	Number (n = 121)	Percentage
<30	3	2.5
31 - 40	10	8.3
41 - 50	19	15.7
51 - 60	51	42.1
61 - 70	31	25.6
>70	7	5.8

Table 3. Risk factors and diabetes complications among patients with DN.

Features	Number (121)	Percentage
Risk factor		
Hypertension	47	38.8
Dyslipidemia	40	33.1
Obesity	38	31.6
Alcohol	07	5.8
Smoking	07	5.8
Complications		
Retinopathy	10	8.3
Neuropathic foot ulceration	10	8.2
Myocardial infarctus	03	2.4
Nephropathy	03	2.4
Stroke	01	0.8
Peripheral vascular diseases	01	0.8

Table 4. Proportions of patients who have positive responses on individual Douleur Neuropathique-4 (DN4) questionnaire items.

Variable	Frequency (n = 31)
Pins and needles	0
Painful cold	2
Electric shocks	5.1
Itching	10.2
Numbness	24.4
Hypoesthesia to prick	28.5
Hypoesthesia to touch	41.8
Burning	47.9
Tingling	55.1
Brushing	71.4

the least affected system (2.6%). Constipation and diarrhea were the commonest gastrointestinal symptoms of DAN (45.4%), followed by early satiety (13.6%). Regarding the cardiovascular symptoms of DAN, most patients complained of orthostatic hypotension (3.3%). On urogenital system, there were dysuria in 3 cases, urine incontinence in 2 cases and erectile dysfunction was found in 22 patients (14.6%). The prevalence of erectile dysfunction in men was 44%. The most common complaints of sweat manifestations were anhydrosis in 14 (51.8%) cases and hyperhidrosis in 25 (92.5%) cases.

3.4. Risk Factors of Diabetic Neuropathy

There was a significant correlation between type 2 diabetes and the presence of neuropathy (p-value = 0.014). We had found a significant correlation between hypertension and the presence of painful neuropathy (p = 0.021). **Table 5** presents the risk factor of diabetic neuropathy among 150 diabetics with and without neuropathy. There was a significant link between painful neuropathy and quality of diabetes balance (p = 0.007). **Table 6** describes the risk factors of painful neuropathy (PN). Urogenital neuropathy was more common in smokers than non-smokers (p < 0.001). Similarly, it was more common in men than in women (p < 0.001). In men, urogenital neuropathy was related to duration of diabetes (p = 0.042), smoking (p = 0.045) and type of diabetes (p = 0.05). **Table 7** is risk factors of urogenital neuropathy. There was an association between sweat manifestations and plantar perforating diseases (p = 0.003).

4. Discussion

4.1. Prevalence of Neuropathy

In our study, there is a high prevalence of diabetic neuropathy (80.6%). This frequency is comparable to studies done by Palumbo *et al.* (84.8%) in USA [12] and Soyupek *et al.* (80.4%) in Iran [13]. In Sub-Saharan Africa, the prevalence rate of DN varies from 27% to 66% according to different studies [14] [15]. The same prevalence was observed in a study from Saudi Arabia (56%) [16] and Malaysia (60.7%) [17]. A lower prevalence (22%) has been reported in a study from Brazil [18]. The differences between this studies could be attributed to different types of diabetes (e.g. type 1 and type 2 diabetes), existing healthcare facilities, sample selection, different diagnostic criteria used (pin-prick perception, clinical signs and symptoms, and quantitative sensory tests or electrodiagnostic tests).

In nerves conduction studies, the prevalence has risen to 100% [8]. In a recent study, the authors showed that detection of neuropathy is earlier and significant with NCS compared to clinical [19].

4.2. Sociodemographic Characteristics

The mean age of patients with neuropathy was 55.23 ± 11.12 years, similar that found in Senegal (56.8 years) [20] but lower than observed in Singapour (62 ± 10.37 years) [17]. According to diabetes duration, the mean age at the diagnosis

Table 5. Risk factor of diabetic neuropathy among 150 diabetics with and without neuropathy.

Characteristic	Total sample (N = 150)	DN present (n = 121)	DN absent (n = 29)	p-value
Residence				
Rural, n (%)	15	12 (80%)	3 (20%)	1*
Urbane, n (%)	135	109 (80.7%)	26 (19.3%)	
Gender				
Male	100	81 (81%)	19 (19%)	0.884*
Female	50	40 (80%)	10 (20%)	
Age (years)				
<50	42	32 (76.2%)	10 (23.8%)	0.387*
≥50	108	89 (82.4%)	19 (17.6%)	
Cigarette Smoking				
Yes	7	7 (100%)	0 (0%)	0.347**
No	143	114 (79.7%)	29 (20.3%)	
Alcohol consumption				
Yes	9	7 (77.8%)	2 (22.2%)	0.685**
No	141	114 (80.9%)	27 (19.1%)	
Physical inactivity				
Yes	97	81 (83.5%)	16 (16.5%)	0.234*
No	53	40 (75.5%)	13 (24.5%)	
Diabetes types				
Type 1	6	2 (33.3%)	4 (66.7%)	0.014 **
Type 2	141	116 (82.3%)	25 (17.7%)	
Non Type 1, 2	3	3 (100%)	0 (0%)	
Glycemic control				
Good	63	47 (74.6%)	16(25.4%)	0.261*
Average	31	27 (87.1%)	4 (12.9%)	
Bad	56	47 (83.9%)	9(16.1%)	
Diabetic duration (years)		121	29	
0 - 5	58	57 (82.6%)	12 (17.3%)	0.887*
6 - 10	31	31 (83.7%)	6 (16.2%)	
11 - 15	30	30 (83.3%)	6 (16.6%)	
15 - 20	2	3 (37.5%)	5 (62.5%)	
History of family diabetes				
Yes	52	44 (84.6%)	8 (15.3%)	
No	88	77 (78.4%)	21 (21.4%)	0.540*
Diabetic Nephropathy				
Yes	7	7 (100%)	0%	0.347*
No	143	114 (79.7%)	29 (20.3%)	

* Chi 2 test of Pearson; **Bilateral Fisher test.

Table 6. Risk factors of painful neuropathy (PN).

		Painful neuropathy		
	Number (31)	Yes	No	**p-value****
Alcohol consumption				
Yes	3	1 (30%)	2 (70%)	0.432**
No	28	6 (20%)	22 (80%)	
Hypertension				
Yes	7	11.5%	88.5%	0.021*
No	24	27%	73%	
Cigarette Smoking				
Yes	1	14.3%	85.7%	0.669**
No	30	21%	79%	
Physical inactivity				
Yes	19	19.6%	80.4%	0.659*
No	12	**22.6%**	77.4%	
Glycemic control				
Good	9	14.3%	85.7%	
Fair	3	9.7%	90.3%	0.007*
Bad	19	33.9%	66.1%	
Diabetes duration (years)				
≤5	12	16.7%	83,3%	
]5; 10]	9	23.7%	76,3%	0,360**
]10; 15]	10	27%	73%	
]15; 20]	0	0%	100%	
History of family diabetes				
Yes	11	21.2%	78.8%	0,921*
No	18	20.5%	79.5%	

*Chi 2 test of Pearson; **Bilateral Fisher test.

of neuropathy was 48.61 years, similar than in the study of Bansal (51.47 years) [21]. Diabetes neuropathy increases after the age of 40 years [22] [23]. Female gender was most common affected in our study (66.7%), such in previous studies from Sub-Saharan Africa [22] [24] [25].

4.3. Characters of DM

Type 2 DM was the most common in patients with neuropathy (95.9%). This finding were observed in many studies from developing countries [26] but it differed to a study from Sudan where the majority of patients had Type 1 DM (61%) [27]. Mean duration of diabetes was 8.7 years. The mean duration in our study (6.62 ± 4.47 years) was lower that found by Katulanda (7.8 ± 7.1 years)

Table 7. Risk factors of urogenital neuropathy.

		Urogenital neuropathy		
	Number (n = 29)	Yes	No	**p-value**
Cigarette smoking				
Oui	6	85.7%	14.3%	<0.001**
Non	23	16.1%	83.9%	
Gender				
Female	5	5%	95%	<0.001*
Male	24	48%	52%	

* Chi 2 test of Pearson; **Bilateral Fisher test.

[26] and Touré [20]. In concordance with literature, the risk of neuropathic dysfunction increases over time, so that > 50% of diabetics are affected after 10 years [28]. A majority of patients with DN in our study had inadequate glycemic control (61.2%). These findings were present in the study from Sudan [27] with a high frequency (73%). Hypertension was the most vascular risk factor associated to diabetes neuropathy (38.8%) and this is similar to study conducted in Turkey (86.6%) [29].

4.4. Prevalence of Peripheral Diabetic Neuropathy

The prevalence of PDN was 66% in our study. Higher prevalence was observed in Sudan (71%) [27], in Pakistan (74.8%) [30] and Iran (75.1%) [31].

The most prevalent form of diabetic neuropathy is sensory polyneuropathy (PNP) [32]. The majority of clinical signs are mainly sensory was also found by Barbosa [33]. Neuropathic pain was diagnosed in 20.7% of our patients. Our results are comparable to that of Sani *et al.* which found 24% [34]. In this setting, 53.7% of diabetic patients met the criteria for painful DPN (DN4 score ≥ 4) [35]. In Saudi Arabia, the overall prevalence of diabetic painful neuropathy, determined using the Douleur Neuropathique 4 (DN4) pain questionnaire, was 65.3% [36]. The highest prevalence of PFN was observed in Egypt (61.3%), followed by Jordan (57.5%), Lebanon (53.9%) and the Gulf States (37.1%) [35]. In South Africa, the prevalence of painful neuropathy (DN4 score _4) was 30.3% [37]. The most frequently reported symptoms on DN4 questionnaire was burning (32%) which are considered to be classic symptoms, like than a study from South Africa with 36.5% [38] and in Middle East region with 59.3% [35]. The majority of study population (55.3%) had a DN4 score of 1 - 3. In Middle East region, 41.2% of total sample had a score of 5 - 10 [35].

4.5. Autonomic Diabetic Neuropathy

The prevalence of Autonomic Diabetic neuropathy in our study (58.6%) was lower than the study from Pakistan (66%) [30] and Sudan (71%) [27] but higher than the study from South Africa (5%) [38]. Our study showed that gastrointes-

tinal system was the most affected by DAN (34.6%). A higher prevalence was showed in Pakistan (46.5%) [30] and Sudan (70%) [27]. This difference is due to clinical criteria or tests of autonomic nervous system function. In the absence of paraclinical arguments, it is difficult to exclude all other causes of digestive functional disorders. The most symptoms were gastroparesis and enteropathy (43%). Nausea and vomiting was the complaint in 87 (43.5%) patients in Pakistan [30]. Cardiovascular symptoms were the least system affected in autonomic neuropathy (3.3%).

This rate was significantly lower than in the previous study from Pakistan (43%) probably related to diagnostic criteria [30]. The increase incidence of cardiovascular DAN may be due to co-existence of other diseases like hypertension, ischemic heart disease and cardiomyopathy. Genitourinary system was affected in 29 (18%) higher than found in a study in Paskistan (7.5%) [30]. The prevalence of erectile dysfunction in men was 44%, similar that found in Guadeloupe by Zantour *et al.* [37]. Higher results were found by Kambou and Sagna in Burkina Faso with respectively 57% and 74% [39] [40]. A lower prevalence was found in Senegal (16%) by Gueye S. *et al.* [41]. This variability could be related to the characteristics of the studied populations (size, male predominance) and diagnostic criteria (use of the "International Index of Erectile Function", more sensitive). In our study, sweat manifestations were present in 23.3% of patients, lower than observed in Sudan (67%) [27].

4.6. Factors Related to Neuropathy

In our study, there was a statistically significant association between Type 2 Diabetes mellitus and the presence of peripheral diabetic neuropathy ($p = 0.014$). Type 2 diabetes is usually associated with the presence of neuropathy, consistent with literature data [1] [34]. Painful neuropathy was related to the quality of glycemic control ($p = 0.007$) and the presence of arterial hypertension ($p = 0.021$). The association between the quality of glycemic control and the presence of neuropathic pain is very controversial in the literature [1] [34]. On the other hand, Hartemann showed that the improvement of the glycemic balance or intensive insulin therapy did not reduce the occurrence of painful neuropathy [1]. Smokers and men gender had significantly more urogenital neuropathies than non-smokers and women ($p < 0.001$). Results confirm the data of the literature on the subject [42]. There was a significant relationship ($p = 0.003$) between sweat manifestations and plantar perforating diseases. This can be explained by the link between cutaneous dryness and vasomotor disorders and the development of foot lesions in diabetics.

5. Conclusions

Diabetic neuropathy is a very common problem among our studied group. Poor glycemic control plays a central role in the development of DAN. Neuropathies are very common in type 2 diabetics and are dominated by predominantly sen-

sory polyneuropathy. Autonomic neuropathy was very present in all its forms. Thus, it's important to develop the laboratory investigations capacities for earlier detection of neuropathies in our context.

Conflicts of Interest

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

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