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Original Research

Assessment of assess prevalence and determinants of diabetic peripheral neuropathy in patients with type II diabetes mellitus

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ABSTRACT:

Aim: To assess prevalence and determinants of diabetic peripheral neuropathy in patients with type II diabetes mellitus. **Methodology:** One hundred ten type II diabetes mellitus patients of both genders were enrolled. Assessment of fasting blood sugar, random blood sugar and glycosylated hemoglobin was done. Body mass index (BMI) was calculated as kg/m^2 as normal, 23–24.9 as overweight, and ≥25 was considered as obesity. Physical signs such as numbness and ulcerations was done. Assessment of diabetic polyneuropathy was done. **Results:** Out of 110 patients, males were 60 (54.5%) and females were 50 (45.5%). Out of 60 male patients, 32 (53.3%) had diabetic peripheral neuropathy and out of 50 females, 28 (56%) had diabetic peripheral neuropathy. Out of 60 patients with DPN, 20 were in age group 30-50 years and 40 were >50 years. 45 had >23 BMI and 15 had <23. HBA1c >7 was seen among 42 and <7 in 18. Duration of diabetes was 5 seen in 12, 5-10 years in 18 and >10 years in 30. Numbness was seen in 40 and ulceration 45 patients with DPN. A significant difference was observed (P< 0.05). **Conclusion:** The severity of DN was significantly and positively associated with sex, duration of diabetes, HbA1c value and BMI.

Key words: Body mass index, diabetic peripheral neuropathy, Diabetes mellitus

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INTRODUCTION

Diabetes mellitus is a major public health issue. An estimated 451 million people were diagnosed with diabetes worldwide in 2017, and the number will increase to 693 million by 2045.[1] Compared with other chronic diseases, diabetes causes greater mortality, morbidity, disability and financial loss due to its complications.India has one of the highest prevalence of type-2 diabetes mellitus (T2DM) in the world.[2] The adverse effects of peripheral neuropathy (PN) are compounded by poor foot hygiene, improper footwear, and frequent barefoot walking, in such circumstances complications of foot infections and gangrene are a common cause of hospital admissions.[3] Diabetic PN (DPN) is a well-known micro-vascular complication of T2DM attributed to chronic hyperglycemia and is defined as the presence of peripheral nerve dysfunction in diabetics after exclusion of other causes. Clinically, diabetic neuropathy is a destructive disease of the peripheral nerve leading to symptoms of pain or paraesthesia or problems arising from neurological deficit.[4]

It is evident that oxidative stress inhibits insulin secretion in pancreatic β-cells by activation of uncoupling protein 2 (UCP-2), which, in turn, reduces the adenosine triphosphate (ATP)/adenosine diphosphate (ADP) ratio, and thus reduces the insulin secretory response. This approach explains the pancreatic dysfunction induced by glucose toxicity, as part of the pathophysiology of DM.[5] Increasing age, longer duration of diabetes and poor glycaemic control are well recognized risk factors for DPN, while cigarette smoking, retinopathy, hypertension, obesity, hyperlipidaemia and microalbuminuria have also been implicated as potential risk markers.[6] Considering this, we attempted present study to assess prevalence and determinants of diabetic peripheral neuropathy in patients with type II diabetes mellitus.

METHODOLOGY

We selected one hundred ten type II diabetes mellitus patients of both genders after considering the utility of the study and obtaining approval from ethical review committee of the institute. All patients were informed regarding the study and written consent was obtained. Demographic profile of each patient was recorded. All patients underwent a thorough clinical examination. Assessment of fasting blood sugar, random blood sugar and glycosylated hemoglobin was done. Modified Kuppuswamy's scale was used to assess the socioeconomic status. Body mass index (BMI) was calculated as kg/m^2 as normal, 23–24.9 as overweight, and ≥25 was considered as obesity.Physical signs such as numbness and ulcerations was recorded. Assessment of diabetic polyneuropathy was done. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

RESULTS

Table I Distribution of patients

Total - 110		
Gender	**Male**	**Female**
Number	60 (54.5%)	50 (45.5%)

Out of 110 patients, males were 60 (54.5%) and females were 50 (45.5%) (Table I).

Table II Prevalence of diabetic peripheral neuropathy

Total	Male	Female
110	32 (53.3%)	28 (56%)

Out of 60 male patients, 32 (53.3%) had diabetic peripheral neuropathy and out of 50 females, 28 (56%) had diabetic peripheral neuropathy (Table II).

Table III Distribution of peripheral neuropathy according to different variables

Parameters	Variables	Present	Absent	OR	P value
Age (years)	30-50	20	28	3.18	0.01
	>50	40	22		
BMI	>23	45	24	3.01	0.02
	<23	15	26		
HBA1c	>7	42	23	0.67	0.04
	<7	18	27		
Duration of diabetes (Years)	5	12	27	4.15	0.03
	5-10	18	11		
	>10	30	12		
Numbness		40	20	2.13	0.05
Ulcerations		45	15	2.98	0.04

Out of 60 patients with DPN, 20 were in age group 30-50 years and 40 were >50 years. 45 had >23 BMI and 15 had <23. HBA1c >7 was seen among 42 and <7 in 18. Duration of diabetes was 5 seen in 12, 5-10 years in 18 and>10 years in 30. Numbness was seen in 40 and ulceration 45 patients with DPN. A significant difference was observed (P< 0.05) (Table III).

DISCUSSION

Diabetes mellitus (DM) is a devastating metabolic disorder that places an economic burden for every country around the world with the global increasing trend.[7]Type 2 DM is characterized by insulin resistance, with or without insulin deficiency that induces organ dysfunction. Persistent hyperglycemia in DM generates reactive oxygen species (ROS) and nitrosative species (RNS); both are considered an essential factor for DM macro- and microvessels complications.8 Along with overproduction of ROS and RNS, a reduction of the activity of antioxidant enzymes is known to cause endothelial dysfunction, insulin resistance, and DM complications.[9,10] We attempted present study to assess prevalence and determinants of diabetic peripheral neuropathy in patients with type II diabetes mellitus.

Our results showed that out of 110 patients, males were 60 (54.5%) and females were 50 (45.5%). Darivemula et al[11] observed that among 336, 202 (60.1%) were male and 134 (39.9%) were female. The prevalence of the DPN was 39.3% among them 28.9% in males and 10.4% in females, respectively. The other determinants of the participants, 264 (78.6%) had the Glycated hemoglobin (HbA1c) >7, 205 (61%) had a burning foot sensation, 124 (36.9%) of them were had numbness of the foot, almost 50% of them had pricking sensation in the foot and more than one-third (130) of them had callosity over foot.

We observed that out of 60 male patients, 32 (53.3%) had diabetic peripheral neuropathy and out of 50 females, 28 (56%) had diabetic peripheral neuropathy. Bansal et al[12] found that among 150 patients, 102

(68%) developed DPN. Age of the patient is not found to be significant risk factor for DPN. Patients presented with sensation of burn (25.33%) followed by numbness (18%), tingling (11.33%), pricking (2%), diabetic foot (2.6%). 54.5% patients already had neuropathy at the time of diagnosis. In our study, HbA1c is found to be a significant risk factor for DPN with prevalence of neuropathy to be as high as 90%. The prevalence of DPN was high as 68%. Most common symptom was found to be burning sensation while around 20% were asymptomatic at the time of presentation. Significant correlation of DPN is found with duration of DM and HbA1c. Thus, better glycemic control and early diagnosis of T2DM will reduce DPN related complications like foot ulcerations and amputations, gait disturbances.

We found that out of 60 patients with DPN, 20 were in age group 30-50 years and 40 were >50 years. 45 had >23 BMI and 15 had <23. HBA1c >7 was seen among 42 and <7 in 18. Duration of diabetes was 5 seen in 12, 5-10 years in 18 and >10 years in 30. Numbness was seen in 40 and ulceration 45 patients with DPN. Lu et al[13] found that the overall prevalence of DPN across different countries was 26.71%, whereas country-specific prevalences showed considerable variation. Multivariate analysis revealed that duration of diabetes, poor glycemic control, and history of hypertension, cardiovascular disease and depressive symptoms were independently and positively associated with the risk of DPN. Sensitivity analyses including or excluding patients from countries with extreme low or high prevalence of DPN yielded similar estimates in terms of trend and magnitude.

Katulanda et al14 included 528 diabetic patients with a mean age of 55.0 ± 12.4 years and 37.3% were males, while 18% were from urban areas. Prevalence of DPN according to DNS score among all patients, patients with already established diabetes and newly diagnosed patients were 48.1%, 59.1% and 28.8% respectively. Prevalence of DPN in those with established DM as assessed by TCSS was 24% and the majority had mild DPN (16.6%). The remainder of the abstract is based on subjects with established DM. The prevalence of DPN in males and female was 20.0% and 26.4% respectively. The mean age of those with and without DPN was 62.1 ± 10.8 and 55.1 ± 10.8 years respectively ($p < 0.001$). The presence of foot ulcers, female gender and smoking were the strongest predictors followed by insulin treatment, diabetic retinopathy, treatment with sulphonylureas, increasing height, rural residence, higher levels of triglycerides and longer duration of DM.

CONCLUSION

The severity of DN was significantly and positively associated with sex, duration of diabetes, HbA1c value and BMI.

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