

# Prevalence and Risk Factors of Diabetic Peripheral Neuropathy in T2DM Patient Presenting to Community Hospital in Nepal

Shrestha HK, Katwal PC

Department of Medicine  
Dhulikhel Hospital, Kathmandu University Hospital  
Dhulikhel, Kavre, Nepal.

## Corresponding Author

Hari Kumar Shrestha  
Department of Medicine  
Dhulikhel Hospital, Kathmandu University Hospital  
Dhulikhel, Kavre, Nepal.  
E-mail: drhariks676@gmail.com

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## ABSTRACT

### Background

Diabetic peripheral neuropathy (DPN) is a well-known microvascular complication of type 2 diabetes mellitus (T2DM) attributed to chronic hyperglycemia, and is defined as the presence of peripheral nerve dysfunction in patients with diabetes after exclusion of other causes.

### Objective

To determine the prevalence and risk factors of Diabetic Peripheral Neuropathy among type 2 diabetes mellitus patients.

### Method

A cross sectional study was carried out in a University Teaching Hospital. Type 2 diabetes mellitus patients with diabetes duration of more than 6 months were recruited. Michigan Neuropathy Screening Instrument Scoring was used to diagnose Diabetic Peripheral Neuropathy.

### Result

Among a total of 160 patients who were enrolled, 61 (38.1%) had diabetic peripheral neuropathy and 26 (16%) had diabetic peripheral neuropathy within 1 year of being diagnosed with diabetes. Mean Diabetes duration was 5.56 years and mean age was 57.32 years, with 90 (56%) of the participants being female. The mean HbA1c was 8.33%. Among them 25% of the participants were alcoholics and 30% were smoker. No statistically significant risk factors are evident on multivariate analysis.

### Conclusion

Diabetic peripheral neuropathy was found to be highly prevalent in patients with type 2 diabetes including the patients with relatively shorter diabetes duration. This finding warrants the need of improving the preventive measures and quality of care related to foot complication among patients with type 2 diabetes.

## KEY WORDS

*Diabetic peripheral neuropathy, michigan neuropathy screening instrument, prevalence, type 2 diabetes mellitus*

## INTRODUCTION

Diabetes mellitus (DM) has reached epidemic proportions worldwide.<sup>1</sup> Neuropathy is considered the most common micro-vascular complications of diabetes mellitus.<sup>2,3</sup> Neuropathic disorders in diabetes can impair functioning of the central, peripheral and/or autonomic nervous systems.<sup>4</sup> Diabetic peripheral neuropathy (DPN), affects the peripheral nervous system and is by far the most commonest type of neuropathy seen in DM.<sup>5</sup>

It is estimated that between 12 and 50% of people with diabetes have some degree of DPN. Approximately 15% of people with diabetes develop at least one foot ulcer during their lifetime and 60-70% of them are primarily neuropathic in origin.<sup>6-8</sup>

In the U.S., the annual total direct medical and treatment cost of diabetes was estimated to be \$44 billion in 1997, representing 5.8% of total personal health care expenditure in the U.S. during that year.<sup>9</sup> The management of DPN and its complications is likely to form a large proportion of this total expenditure, because treatment is often resource intensive and long term.

The early recognition and appropriate management of neuropathy in the patient with diabetes is important for a number of reasons: (1) A number of treatment options exist for symptomatic diabetic neuropathy; (2) Up to 50% of DPN may be asymptomatic, and patients are often at risk of insensate injury to their feet; (3) As >80% of amputations follow a foot ulcer or injury, early recognition of at-risk individuals, provision of education, and appropriate foot care may result in a reduced incidence of ulceration and associated diabetic complications.<sup>10,11</sup>

## METHODS

This is a cross sectional study of diagnosed Type 2 diabetes mellitus (T2DM) patients attending the Medicine OPD of Dhulikhel Hospital, Kathmandu University Hospital between January 2015 to December 2015. T2DM patients aged 30 years or above with diabetes duration of more than 6 months were included in the study. Participation was voluntary and subjects were enlisted after informed consent. Patient with lower extremities amputation, known case of autoimmune disease, severe osteoarthritis in lower extremities joint, congenital neuropathies and underlying conditions such as uremia, along with those on anticoagulant therapy or any tricyclic antidepressant and other neuropathic treatment for more than a month were excluded from the study. Demographic data such as age, gender, marital status were acquired through conversation with patient. All patients' weight was recorded including their height, vital signs, liver function test, renal function test, lipid profile, fasting plasma glucose, HbA1c. Examination of foot was carried out in order to detect any abnormalities such as any deformities, ulcers and any neurological conditions. The

questionnaire consisted of questions regarding the type, severity and location of complaints or symptoms as well as the neuropathies signs gathered through history taking. The Michigan Neuropathy Screening Instrument (MNSI) examines factors such as: appearance of foot (inspecting any signs of dry skins, callous formation, fissures and deformities), ulcer formation, Achilles tendon reflex and vibration sensation tested using a 128 Hz tuning fork placed over great toes. Scores  $\geq 2.5$  on MNSI was considered as presence of DPN.

The data was analyzed using SPSS 20.  $\chi^2$  significant test was used and the criteria for statistical significance was p value  $<0.05$ . This study was approved by KUSMS-IRC.

## RESULTS

This study was carried out in 160 T2DM patients to see the prevalence of peripheral neuropathy, the following result was obtained:

The mean age of the patient was 57.32 yrs (SD: 12.53) ranging from 32 to 90 yrs. 56% percent of the patients were female. The mean Diabetes duration was found to be 5.56 yrs (SD: 4.33) with range from 6 month to 20 yrs. The mean FBS level was 143.13 $\pm$ 50.06). Variables are tabulated on Table 1.

**Table 1. Characteristics of study population**

Variables	Mean $\pm$ SD/Number(%)
Age (Years)	57.32 $\pm$ 12.53
Female	90 (56%)
Diabetes mellitus Duration (Years)	5.56 $\pm$ 4.33
Body mass index (Kg/m <sup>2</sup> )	23.97 $\pm$ 4.72
Smoking	48 (30%)
Alcohol History	40 (25%)
BP systolic (mmHg)	127.21 $\pm$ 15.92
BP diastolic (mmHg)	80.37 $\pm$ 9.79
Fasting Blood Sugar (mg/dL)	143.13 $\pm$ 50.06
HbA1C (%)	8.33 $\pm$ 2.01
Low Density Lipoprotein (mg/dL)	104.66 $\pm$ 37.07
High Density Lipoprotein (mg/dL)	41.69 $\pm$ 11.24
Triglycerides (mg/dL)	173.84 $\pm$ 105.64
Total Cholesterol (mg/dL)	178.50 $\pm$ 86.11
Known case of Dyslipidemia	47 (29.4%)
Known case of Hypertensive	67 (41.9%)
Peripheral Diabetic Neuropathy	61 (38.1%)

The overall prevalence of diabetic peripheral neuropathy was found to be 38.1% in our study participant.

For analysis of predictors of diabetic peripheral neuropathy, no risk factor was found to be statistically significant though those people with DPN have higher HbA1c level, poor glycemic control as shown in figure 1 and figure 2 respectively. Similarly those people have higher diabetes

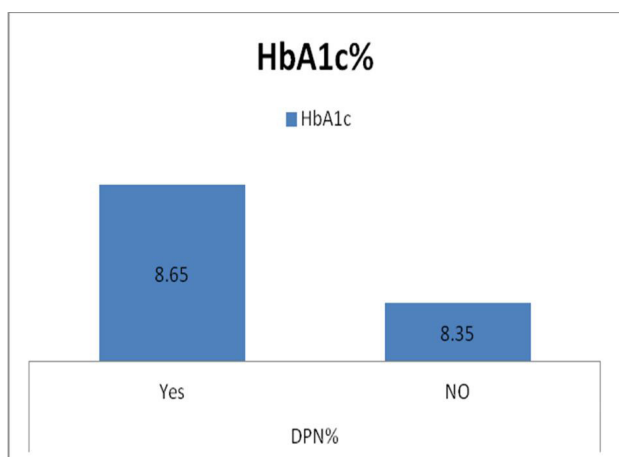


Figure 1. Level of HbA1c with Diabetic Peripheral Neuropathy

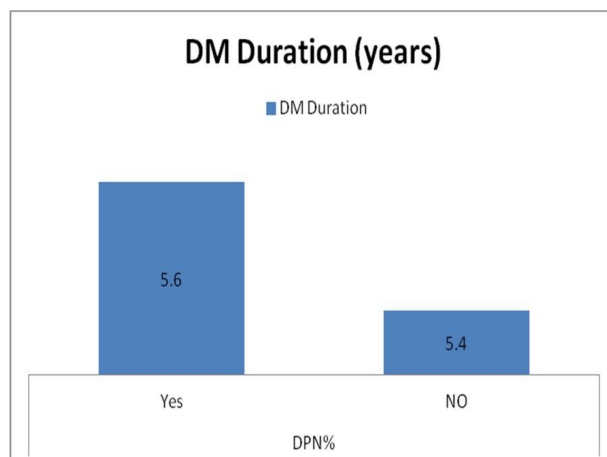


Figure 3. DPN with DM duration

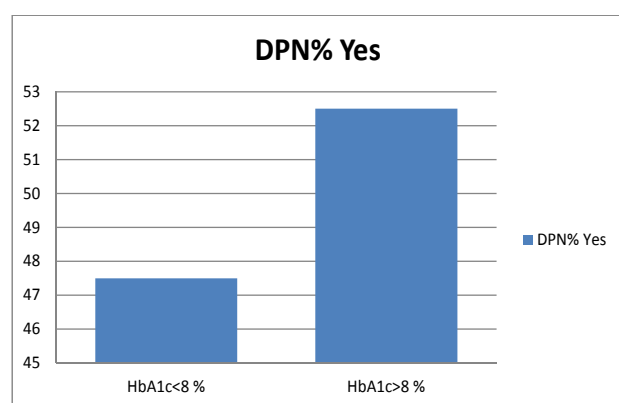


Figure 2. DPN in relation to HbA1c

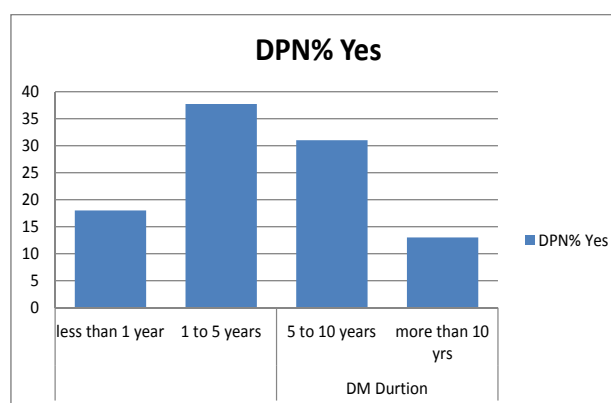


Figure 4. DPN with Duration of Diabetes

duration as shown on figure 3. As shown on figure 4, among people whose diabetic duration is less than 1 year, 15.6 % have DPN.

## DISCUSSION

The estimates of DPN prevalence vary widely from 9.6 to 78% in different populations.<sup>12-18</sup> This could be attributed to different types of diabetes (e.g. type 1 and type 2 diabetes), genetic predisposition, age of onset of diabetes, existing healthcare facilities, sample selection, different diagnostic criteria used such as pin-prick perception, clinical signs and symptoms, and quantitative sensory tests or electro-diagnostic tests.

The western studies have shown prevalence of DPN 32%, 35% and 60% respectively while Asian studies showing relatively lower prevalence of DPN.<sup>19-21</sup> Many studies from India reporting the prevalence of DPN from 14-19%, with variation on diabetes duration.<sup>12-14</sup> A recent study was done in Northern India enrolling a total of 2,006 patients with diabetes including 989 (49.3%) male and 1,017 (50.7%) female patients.<sup>18</sup> Among the study cohort, 369 (18.4%) patients were NDDM with duration of diabetes <6 months and the remaining 1,637 (81.6%) patients were KDM. Overall, 586 patients were found to have DPN accounting

for 29.2% (27.2–31.2). The prevalence of neuropathy among 1637 known diabetes patients was 33.7% which is similar to our finding.

Increasing age, gender, longer duration of diabetes, dyslipidemia and the presence of other microvascular complications were found to be significantly associated with DPN in previous studies. Many studies have shown age as a risk factor.<sup>12-14,16,21</sup> Whereas similar to our study, a study done on Mauritius by Shaw et al. found no such association.<sup>22</sup> The mean age (57 years ) of our study population is similar with study done by Bansal et al.<sup>18</sup> Though mean HbA1c level is similar to their study, in contrast to their finding, we could not establish significant correlation between DPN and glycemic control. In our study, diabetes duration is longer among DPN patients compare to those who do not have it, but no statistically significant. One alarming feature is that almost 16% of our study population has DPN within 1 year of diabetes diagnosis which may signifies our diabetes population got late diagnosis. Sex specific predisposition to DPN has been observed with female preponderance in a study by Katulanda et al. and males being at higher risk in Diabetes Control and Complication Trial(DCCT).<sup>23,24</sup> However our study in accordance with other studies, did not show any gender predisposition for DPN development.<sup>18,21</sup>

Our study has come up with few limitations. The sample size is relatively small. This study was carried out in one centre and may not be representative of whole Nepal. So in near future, there should be larger studies involving multiple centres for representation of Nepalese population is required.

## CONCLUSION

The significance of present study is that it estimates the prevalence of DPN among patients with type 2 diabetes in our study population. Our study found DPN to be highly

prevalent even at the earlier diabetes duration among our study population which warrant improving the preventive measures and quality of care related to foot complication among type 2 diabetic patients.

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