

Original Research Article


# Prevalence of peripheral neuropathy among diabetic patients in a tertiary care hospital

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## Abstract

**Introduction:** The burden of diabetes mellitus (DM) is on the rise especially in developing countries like India. Due to its chronic nature DM tends to cause many debilitating complications and diabetic peripheral neuropathy (DPN) is one of them. The aim of this study is to determine the prevalence of DPN among patients attending a tertiary care hospital and to identify the determinants associated with it.

**Materials and methods:** A cross-sectional study was conducted in diabetic patients attending a tertiary care hospital in Kancheepuram district of Tamil Nadu from May 2018 till September 2018. A total of 203 diabetic patients were asked to respond to the patient history version of Michigan neuropathy screening Instrument and examinations were conducted after obtaining consent from them. The data were analyzed in terms of descriptive statistics as well as bivariate analysis.

**Results:** The prevalence of DPN using the MNSI history version and MNSI examination were found to be 31% and 24% respectively. The major determinants were found to be age more than 50 years (OR: 0.24, CI: 0.123- 0.467),  $P < 0.00001$ , HbA1C > 6.5 (OR: 0.467, CI: 1.90 – 0.356,  $P = 0.05$ ).

**Conclusions:** This study showed that the prevalence of peripheral neuropathy among diabetic patients was 41.5% and the major determinants were age more than 50 years and poor HbA1C control. Early detection through routine screening and regular follow up examinations will reduce the burden of disability among diabetics and improve their quality of life significantly.

## Key words

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Diabetes Mellitus, HbA1C, Peripheral Neuropathy, Michigan neuropathy screening Instrument.

## Introduction

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Diabetes mellitus is one of the most common chronic diseases in nearly all countries and continues to increase in numbers and significance as economic development and urbanization lead to lifestyle changes characterized by reduced physical activity and increased obesity [1]. The global prevalence of diabetics among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014. Diabetes is the major cause of blindness, kidney failure, heart attacks and lower limb amputation [2]. India is one of the 6 countries of the IDF SEA region 425 million have DM in the world and 82 million people are in the SEA region. There were over 72 million DM patients in India in 2017 [3]. Diabetic Peripheral Neuropathy (DPN) is a well-known microvascular complication of Type 2 diabetes mellitus attributed to chronic hyperglycemia, and is defined as the presence of peripheral nerve dysfunction in diabetics after exclusion of other causes [4-7]. DPN leads to further infections, increasing the risk of foot ulcers and nontraumatic amputations. Estimates of foot infections in type 2 diabetes mellitus range from a lifetime risk of 4-7% annually [7, 8]. Available evidence suggests that the presence of DPN among patients with diabetes leads to reduced quality of life [9]. Screening for DPN in clinical practice using a simple objective tool is essential, as the detection of various soft and subtle signs of DPN at the earliest could minimize the damaging effects of this serious but manageable microvascular complication and in turn improve the quality of life of such patients [10]. This study was conducted to screen the diabetic patients for the presence of DPN and the determinates associated with them.

## Materials and methods

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A cross-sectional study was conducted in diabetic patients attending a tertiary care hospital in Kancheepuram district of Tamil Nadu from

May 2018 till September 2018. A total of 203 diabetic patients were asked to respond to the patient history version of Michigan neuropathy screening Instrument and examinations were conducted after obtaining consent from them. The data were analyzed in terms of descriptive statistics as well as bivariate analysis. The study included patients with type 2 DM. A sample size of 203 was calculated considering a power of 80% an absolute precision of 5% and a confidence level of 95% and a DPN prevalence rate of 19.1%. The study participants were selected based on convenient sampling among Indian diabetic patients [11].

**Study tool:** The screening for DPN was conducted using the Michigan Neuropathy Screening Instrument (MNSI). The MNSI is a validated tool for the screening of DPN in both community and hospital setups [12]. The MNSI includes two parts, the first part is related to patients' perception of symptoms in relation to DPN and the second part consists of a set of examinations done to detect the presence of DPN among the patients. The examinations include 1. Vibration perception test using a 128 HZ tuning fork, 2. Elicitation of muscle jerk at the ankle joint and 3. Monofilament testing. Scoring of Michigan Neuropathy Screening Instrument history version. The first part of the MNSI questionnaire asks the participants about the presence or absence of symptoms related to DPN. Responses are added to obtain the total score. Responses of yes to items 1-3, 5-6, 8-9, 11-12, 14-15 are each counted as one point. A no response on items 7 and 13 counts as 1 point. Item number 4 is a measure of impaired circulation and item number 10 is a measure of general asthenia and is not included in the scoring. A Score of  $\geq 7$  was taken as positive for DPN. Scoring of Michigan Neuropathy Screening Instrument examination version. After examining the patient's both extremities, each component is given a score of 0 if no finding is

present and a score of 1 if any abnormality was detected. After summing up all the components, if the overall score was found to be  $\geq 2.5$ , then it was considered to be positive for the presence of DPN. Apart from MNSI, socio-demographic aspects such as age, gender, BMI, marital status, literary, smoking and alcohol consumption were collected. The information regarding glycemic control was taken by recording recent HbA1C levels.

**Data analysis:** Statistical analysis was done using SPSS version 16. The data were analyzed in terms of descriptive statistics as well as bivariate analysis (Chi-square test). Independent sample students' t-test was used to comparing quantitative data. Chi-square was used to test for differences in proportions.  $P < 0.05$  was

considered evidence of a statistically significant difference, between predictive and outcome variables. Odds ratios (ORs) and corresponding 95% confidence intervals (Cis) are reported.

## Results

Among the 203 patients who were selected for the study, 38.5% were male and 61.5% were females. 36.5% of the subjects were between the age group of 51-60 years. 69.5% of patients had less than 10 years of duration of diabetes. Almost 88% of the study population had HbA1C levels  $> 6.5\%$  and 51.5% of the study population had their BMI in the obese range (**Table – 1**). Among the 203 patients, 83 had peripheral neuropathy accounting for 41.5% (**Table – 2**).

**Table – 1:** Characteristic and diabetes pattern among sample population.

		N	%
<b>AGE GROUP</b>	31-40	17	8.5
	41-50	54	27
	51-60	73	36.5
	61-70	45	22.5
	>70	11	5.5
<b>SEX</b>	MALE	77	38.5
	FEMALE	123	61.5
<b>DURATION OF DIABETES</b>	<10 years	139	69.5
	>10 years	61	30.5
<b>HBA1C</b>	<6.5	24	12
	>6.5	176	88
<b>BODY MASS INDEX</b>	NORMAL	36	18
	OVERWEIGHT	49	24.5
	OBESE	103	51.5
	MORBIDLY OBESE	12	6

**Table – 2:** Prevalence of peripheral neuropathy.

PERIPHERAL NEUROPATHY	FREQUENCY	PERCENTAGE
PN PRESENT	83	41.5
PN ABSENT	117	58.5
TOTAL	200	100

Considering the association between various determinants and prevalence of DPN, it was found that, patients in the age group  $>50$  years

had a higher prevalence of DPN, as indicated by a p-value  $< 0.0001$ . In the same way patients

with HbA1C levels, more than 6.5% had a higher prevalence of DPN (P- 0.05) as per **Table – 3**.

that was 31% and 48 out of 203 had DPN as per the MNSI examination version, that was 24% as per **Table – 4**.

Taking MNSI questionnaire into account, 62 out of 203 had DPN as per MNSI history version,

**Table – 3:** Association of peripheral neuropathy with diabetes pattern.

CHARACTERISTICS OF PATIENT		PERIPHERAL NEUROPATHY		OR(CI)	Chi-square & P value
		PRESENT	ABSENT		
AGE GROUP	<50 YEARS	21.1	52.7	0.24 (0.123-0.467)	<b>X<sup>2</sup> =18.22</b> <b>P&lt;0.00001</b>
	>50 YEARS	78.9	47.3		
SEX	MALE	44.2	55.8	0.7055 (0.398-1.254)	X <sup>2</sup> =1.430 P=0.232
	FEMALE	52.8	47.2		
DURATION OF DIABETES	<10 YEARS	38.8	61.2	0.701 (0.381-1.286)	X <sup>2</sup> =1.319 P=0.251
	>10 YEARS	47.5	52.5		
HBA1C	HbA1C < 6.5	25	75	0.467 (0.190-0.356)	<b>X<sup>2</sup> =3.92</b> <b>P=0.05</b>
	HbA1C>6.5	45	55		
BMI	BMI <23	52.8	39	1.746 (0.845-3.60)	X <sup>2</sup> =2.31 P=0.129
	BMI >23	47.2	61		

**Table – 4:** Peripheral neuropathy as per history.

PERIPHERAL NEUROPATHY	FREQUENCY	PERCENTAGE
PN PRESENT	62	31
PN ABSENT	138	69
TOTAL	200	100

## Discussion

The present study was conducted to assess the prevalence of DPN among diabetic patients attending a tertiary care hospital. Majority of the participants in our study was aged more than 50 years. A proportionately higher number of older patients in our study can be explained by the fact that noncommunicable diseases, commonly occur in old age and usually the diagnosis is delayed due to lasting manifestations and detection of diseases [13]. Among the determinants used in this study, age more than 50 years had a significant association with the prevalence of DPN. In a study by Azidah A.K., et al., he concluded that the prevalence of peripheral neuropathy among elderly diabetics was high and associated with falls [14]. Many other studies have also concluded that the prevalence of DPN is more common among

elderly diabetics [15-17]. There was no significant association between DPN and other determinants like gender, duration of diabetes and BMI in this study. Dr. Athar Javed, et al. have concluded the same in his study conducted at King Edward University Hospital [18]. There was a statistically significant association between glycemic control and the prevalence of DPN in this study, which was also proved by many other studies [19, 20]. The prevalence of DPN as per MNSI history version is 24% in this study which is contradictory to a study conducted by Dr. Abishek Y Kadam [21]. The conclusions derived from this study have some limitations like the nerve conduction velocity tests were not done to confirm the presence of DPN. Etiology determinants like Vit B12 deficiency, Folic Acid deficiency was not ruled out in this study. But the studies valid in terms of use of a valid and

easy to use the scale on an adequate sample of the population with reasonably good response rate among them. A comprehensive, but by no means exhaustive, list of key players in the pathogenesis of DPN include hyperglycemia, folic adiposity, oxidative stress, mitochondrial dysfunction, activation of polyol pathway, accumulation of advanced glycation end products and elevation of inflammatory markers [22].

## Conclusion

The study concludes that the prevalence of DPN among diabetic patients is more than 40%. Age more than 50 and poor glycemic control was found to be the main determinants of DPN. MNSI is an easy and effective way to assess DPN in diabetics. Routine screening and regular follow up can surely reduce the long term disabilities in the diabetic population.

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