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## To study prevalence and risk factors for pre-diabetic peripheral neuropathy

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### Abstract

**Background:** The catastrophic effects of peripheral neuropathy on morbidity and mortality in patients with diabetes and at risk of acquiring diabetes make early screening for its existence and related risk factors advisable. As a result of the global development of diabetes, many people in India are feeling its effects. Among the many symptoms of diabetes, diabetic peripheral neuropathy stands out.

**Methods:** A cross-sectional approach was employed in this observational study. This study aims to investigate the incidence of distal sensory peripheral neuropathy by conducting a survey among patients attending the Outpatient clinic at the Department of General Medicine, Sree Lakshmi Narayan Institute of Medical Sciences, Puducherry, India between January 2019 to December 2019. This study employed a total of 150 patents.

**Results:** The average age of the participants in this study was 56 years and 3 months. Most of the patients fell between the age ranges of 50 to 59. Out of a total of 216 cases, 110 were identified as male and 106 as female. The ratio of males to females was 1.04. The prevalence of diabetic peripheral neuropathy in this sample was found to be 28.24%. Evidence demonstrated that 52.5% of individuals diagnosed with DPN also exhibited systemic hypertension. The prevalence of aberrant waist circumference among individuals with peripheral neuropathy was found to be 52.46 percent.

**Conclusion:** The pre-diabetic group with peripheral neuropathy exhibited significantly higher prevalence rates of age, hypertension, smoking, obesity, dyslipidemia, and raised HbA1c values. Peripheral neuropathy is frequently observed in individuals with a predisposition to diabetes.

**Keywords:** Peripheral neuropathy, incidence, pre-diabetes, risk factors

### Introduction

Over the past few decades, the prevalence of diabetes mellitus has experienced a rapid increase, impacting individuals not just in Western countries but also in Asian and Indian countries. Based on the latest statistical data, the prevalence of this condition in India exceeds 62 million individuals. In 2011, a study was undertaken by the Indian Council of Medical Research, which revealed that a total of 77.2 million individuals in India exhibited symptoms indicative of pre-diabetes <sup>[1-3]</sup>. It is estimated by researchers that the disease will affect around 80 million individuals in India by the year 2030.

There is a correlation between comorbidities such as cancer, infection, and psychological stress, as well as a significant increase in the mortality rate attributed to cardiovascular disease, which has more than doubled <sup>[3, 4]</sup>. Diabetic peripheral neuropathy is a frequently encountered condition associated with diabetes. The incidence of diabetic peripheral neuropathy exhibits significant variation across different research cohorts, with overall rates ranging from 15% to 40%. <sup>3</sup> As a consequence of this condition, there is an elevated susceptibility to the development of foot ulcers and gangrene <sup>[5]</sup>.

The greater prevalence of micro-vascular issues in newly diagnosed individuals with type 2 diabetes mellitus may be attributed to the disease's characteristic prolonged asymptomatic phase, which occurs between the onset of hyperglycemia and clinical diagnosis. It is very uncommon for individuals to delay seeking medical care for an extended duration as a result of limited comprehension and the absence of regular screening initiatives within their localities. Consequently, there is a potential for an elevated susceptibility to early-onset micro-vascular complications. Increasing data indicates that diabetic peripheral neuropathy becomes apparent during the initial phases of the disease. Hence, the primary aim of this research is to ascertain the frequency of peripheral neuropathy and identify the determinants

that lead to its onset in a demographic that exhibits a heightened susceptibility to diabetes<sup>[6-8]</sup>.

### Materials and Methods

A cross-sectional observational study a survey will be conducted on patients attending the Outpatient clinic at the Department of General Medicine, Sree Lakshmi Narayan Institute of Medical Sciences, Puducherry, India in order to investigate the prevalence of distal sensory peripheral neuropathy. This study employed a sample size of 150 patents.

### Inclusion criteria

- Individuals aged 30 and above who have pre-diabetes.

### Exclusion criteria

- The patient exhibits a refusal to grant consent.
- 2. Hypothyroidism.
- A deficiency of vitamin B12.
- Alcohol.

### Results

The study's participants exhibited an average age of 56.3 years. The age range of 50 to 59 years old encompassed the bulk of the patients. A total of 100 instances were attributed to males, while the remaining 50 cases were attributed to females.

**Table 1:** Age and gender-based distributions

Sr. No.	Age	Male	Female	Total
1.	<40	10	6	16
2.	40 to 49	30	11	31
3.	50 to 59	40	20	60
4.	60 to 69	10	08	18
5.	≥70	10	5	15
Total		100	50	150

A total of twenty-one individuals in the study were below the age of 40. The total number of individuals was 15 males and 6 females. A total of 35 individuals fell between the age ranges of 40 to 49. The total number of individuals was 25 males and 10 females. A total of sixty-two patients were classified within the age range of 50 to 59 years. The total number of individuals was 41 males and 21 females. A cohort of 18 individuals fell between the age ranges of 60 to 69 years. The sample consisted of 18 individuals, comprising 9 males and 9 females. The study included a total of 14 male patients and 4 female individuals. The patients had an average age of 50.9 years.

**Table 2:** A study on the prevalence of DPN in the sample population

	DPN		Total
	Present	Absent	
Male	20	61	81
Female	21	48	69
Total	41	109	150

A total of 150 individuals in our research study exhibited good results for peripheral neuropathy as determined by the MNSI. There were twenty male patients and sixty female patients. The study consisted of a total of 69 individuals

who were pre-diabetic, with 21 being men and 49 being women.

The prevalence of diabetic peripheral neuropathy in this sample was found to be 28.24%.

**Table 3:** Distribution of DPN and Age

Age	DPN		Total
	Present	Absent	
<40	16	5	21
40-49	24	10	34
50-59	40	22	62
60-69	10	08	18
≥70	10	5	15
Total	100	50	150

Among the sample of individuals with DPN, it was observed that 35 were in their forties, 50 were in their fifties, 60 were in their sixties, and the remaining 18 participants were aged 70 and above. Most of the patients fell between the age ranges of 50 to 59. However, it was demonstrated that those aged 70 and above exhibited a notably elevated incidence of peripheral neuropathy. The prevalence of DPN among individuals aged 70 and above experienced a statistically significant rise.

**Table 4:** The prevalence of hypertension among participants

Sr. No.		SHT	Normal BP
1.	Male	32	90
2.	Female	10	18
	Total	42	108

Systemic hypertension was identified in 42 people out of a total of 150. Whether or not systemic hypertension was common among participants. The average systolic blood pressure was 128 mm Hg across the people in the research. The average diastolic blood pressure of the people in the study was 81 mm Hg.

**Table 5:** Handouts for DPN and SHT

	DPN		Total
	Present	Absent	
Systemic HT	21	59	80
Normal BP	20	50	70
Total	41	109	150

41% of the 150 individuals with diabetic peripheral neuropathy exhibited systemic hypertension. Among a group of 109 individuals without DPN, 41 were diagnosed with systemic hypertension. The incidence of systemic hypertension in individuals with DPN. Out of the total of 41 cases, 20 were male and 21 were female. The incidence of systemic hypertension in individuals lacking diabetic peripheral nephropathy (DPN).

**Table 6:** The study examined the prevalence of obesity among the participants

Sr. No.	BMI	Male	Female	Total
1.	<18	14	29	16
2.	18-22.9	56	24	81
3.	23-24.9	21	16	32
4.	≥25	9	04	18

The individuals had an average body mass index of 24.2. Out of the 150 patients included in the study, 90 individuals

exhibited a healthy body mass index. A total of seven patients were classified as underweight. A total of 45 individuals were identified as overweight, while 60 individuals were classified as obese.

## Discussion

In all, 100 men and 50 females took part in the research. The participants' average age was fifty. In the study group, 61 individuals exhibited DPN. Of those who participated in the poll, 28.24% had DPN. Out of the 61 people that took part, 30 were men and 31 were women. A trend toward a higher prevalence of DPN in female respondents compared to male ones was seen, albeit it did not reach statistical significance. Thus, there appears to be no discernible gender disparity in the prevalence of DPN among those at risk for developing diabetes, according to our findings<sup>[9, 10]</sup>.

Peripheral neuropathy was observed in 28.0% of diabetics, 13% of IGT patients, and 11.3% of IFG patients, according to research by Dan Ziegler *et al.*, colleagues. Neuropathy was present in 11-25% of people who were at risk for developing diabetes, according to a related study by Papanas *et al.* Our results are lower than the prevalence of DPN in pre-diabetics, which was 49% in a research by Lee CC *et al.* In a study of Indians, Meena *et al.* discovered that 32.8% of the population had impaired glucose tolerance<sup>[11-13]</sup>.

In this investigation, dyslipidemia was shown to be 23.26 percent prevalent. It was higher in the DPN group compared to the control group. A total blood cholesterol level of 214.75 mg/dl was observed in patients with DPN, compared to 169.61 mg/dl in subjects without DPN. Hypercholesterolemia was far more common in people with DPN than in subjects without the condition. The prevalence of TGL was determined to be 14.4% in the study population. The mean TGL in the DPN group was 146.95 mg/dl, compared to 130.45 mg/dl in the control group. People with DPN were found to have a higher prevalence of hypertriglyceridemia<sup>[14-16]</sup>.

The average total cholesterol levels of individuals with DPN and those without DPN were 217.4 mg/dl, and Katulanda *et al.* also discovered no statistically significant difference between the two groups. The mean TGL levels of those with DPN were 162.1 versus 138.2, which is a statistically significant difference. Among all participants, 30.1% exhibited signs of systemic hypertension<sup>[17]</sup>. A systolic reading of 128 and a diastolic reading of 81 were the averages. People with DPN had a much higher prevalence of systemic hypertension than those without the illness. Our results are in line with those of Fargol Booya *et al.*, who discovered that 41.8% of DPN patients had systemic hypertension. Our sample population consists of 181 people who do not smoke and 35 people who smoke<sup>[18]</sup>. Smoking was more common among subjects with DPN compared to those without the illness. It was at this stage that the probability level was 0.004<sup>[19-21]</sup>.

In their investigation on the prevalence of DPN in a cohort of diabetic volunteers, Dipika Bansal *et al.* could not find a statistically significant difference in smoking prevalence between individuals with and without DPN. The average HbA1c level among the study's participants was 5.8%. On average, people with DPN had HbA1c values of 6.10 percent<sup>[22]</sup>.

The prevalence of HbA1c levels above 6.0 was higher in subjects with DPN compared to those without DPN.

It was less likely than 0.005 that an error of this magnitude would occur. Those without diabetic peripheral neuropathy had superior glucose control compared to those with the illness, according to the researchers. The results indicated that the average participant's body mass index was 24.2. The mean BMI for people with DPN was 26.8. Overweight individuals made up 33% of the research population. Obesity was defined as a risk factor for DPN in 38 patients (BMI 25). Obesity was more common among subjects with DPN compared to those without the illness<sup>[23-25]</sup>. Christine Lee *et al.* found that in the PROMISE cohort, individuals without DPN had a body mass index (BMI) of 30.4, but those with DPN had an average BMI of 30.7. In their investigation of the prevalence and association of peripheral neuropathy in Indian diabetic patients, researchers H.K. Gill *et al.* could not find a statistically significant link between obesity and the illness. Waist measurements averaged 82.58 cm among research participants. In general, men tend to have a bigger waist circumference than women. The waist circumference of individuals with DPN was found to be higher than that of patients without DPN<sup>[26, 27]</sup>.

## Conclusion

Peripheral neuropathy is common in people with diabetes and those who are at risk for getting the disease. An increased risk of getting the illness is observed in pre-diabetic older persons who are 70 years of age and older. The incidence of peripheral neuropathy is similar in men and women. Those affected are disproportionately more numerous among hypertensive individuals. People who are overweight are more likely to have peripheral neuropathy and are therefore at increased risk for acquiring diabetes. The prevalence of dyslipidemia was greater in individuals with peripheral neuropathy and pre-diabetes compared to the general population. Those who are at risk for developing diabetes and have peripheral neuropathy also tend to have higher HbA1c values. People who smoke and are prone to getting diabetes are more likely to experience peripheral neuropathy. Lastly, my research emphasizes the importance of identifying high-risk individuals for developing diabetes early and screening for risk factors associated with peripheral neuropathy.

## Conflict of Interest

None.

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