



## **Peripheral Neuropathy in Patients with Type 2 Diabetes: Prevalence and Risk Factors in a Tertiary Care Setting**

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### **Abstract**

**Background:** A large percentage of patients with "Type 2 diabetes mellitus (T2DM)" experience peripheral neuropathy. For the efficient treatment and prevention of this crippling illness, it is crucial to comprehend the prevalence and underlying causes of peripheral neuropathy in persons with T2DM.

**Methods:** The goal of this study, which was carried out in a tertiary care setting, was to identify the prevalence and root causes of peripheral neuropathy in T2DM patients. Clinical examination and nerve conduction investigations were used to evaluate peripheral neuropathy in a total of 500 T2DM patients.

**Results:** The study population had a 52.4% prevalence of peripheral neuropathy. "Distal symmetric sensorimotor neuropathy (DSSN)", which accounted for 75.6% of cases, was the most prevalent kind of neuropathy. Other forms of neuropathy, such as autonomic neuropathy and mononeuropathy, were not very common. Longer duration of diabetes, poor glycemic control, hypertension, and dyslipidemia were all significant risk variables linked to the emergence of peripheral neuropathy in T2DM patients.

**Conclusion:** In this tertiary care context, peripheral neuropathy affects more than half of the patients. It is a prevalent consequence of T2DM. The most typical form of neuropathy is DSSN. In T2DM patients, recognizing and treating risk factors such poor glycemic control, hypertension, and dyslipidemia can help postpone or avoid the onset of peripheral neuropathy. For patients with T2DM and peripheral neuropathy, early diagnosis and effective care are crucial for avoiding complications and enhancing quality of life.

**Keywords:** peripheral neuropathy, type 2 diabetes, prevalence, causes, tertiary care.

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## **Introduction**

Peripheral neuropathy is a common complication of diabetes that can cause significant morbidity and mortality. The prevalence of peripheral neuropathy in patients with type 2 diabetes varies widely, ranging from 10% to 50%, depending on the population studied and the diagnostic criteria used [1]. There are several types of peripheral neuropathy, including diabetic neuropathy, alcoholic neuropathy, and nutritional neuropathy, with diabetic neuropathy being the most prevalent form affecting both sensory and motor nerves [2].

Several risk factors have been identified for the development of peripheral neuropathy in patients with type 2 diabetes, including longer duration of illness, poor glycemic control, smoking, and hypertension [3]. The etiology of diabetic neuropathy is multifactorial and involves oxidative stress, inflammation, and advanced glycation end products [4]. Common clinical manifestations of peripheral neuropathy in patients with diabetes include numbness, tingling, pain, and weakness in the hands and feet, which can lead to ulceration, gangrene, and amputation [5].

It is essential to identify patients with peripheral neuropathy early to prevent further complications. Therefore, this study aimed to determine the prevalence and risk factors for peripheral neuropathy in patients with T2DM in a tertiary care setting.

To avoid complications and enhance quality of life, type 2 diabetics with peripheral neuropathy must be identified and treated early. The “Michigan Neuropathy Screening Instrument (MNSI)”, a validated test that assesses both sensory and motor nerve function, is one of many screening measures available to assess neuropathy [6]. Optimizing glycemic control, addressing risk factors including smoking and hypertension, and using drugs like tricyclic antidepressants, gabapentinoids, and duloxetine to treat symptoms are all part of managing peripheral neuropathy in patients with diabetes [7].

There is little information on the frequency and causes of peripheral neuropathy in tertiary care settings, despite the considerable effects it has on persons with type 2 diabetes. Therefore, the purpose of this study was to identify the prevalence and contributing factors of peripheral neuropathy in type 2 diabetics visiting a tertiary care facility.

## **Materials and Methods**

In India, a tertiary care facility hosted this trial from August 2021 to August 2022. The study included 500 people with T2DM in total. Age >18 years, a T2DM diagnosis based on “American Diabetes Association criteria (ADA)” [8], and the capacity to give informed consent were the inclusion criteria. A history of other neurologic conditions, was an exclusion criterion.

The “Michigan Neuropathy Screening Instrument (MNSI)”, a validated instrument that assesses both sensory and motor nerve function, was used to examine peripheral neuropathy. The self-administered questionnaire and the physical examination make up the two components of the MNSI. While the physical examination analyzes vibration perception

threshold, ankle reflexes, and foot appearance, the questionnaire assesses neuropathy symptoms like numbness, tingling, and pain.

Blood tests were done to evaluate diabetic management and look for possible neuropathy triggers such thyroid problems and vitamin B12 deficiency. High-performance liquid chromatography was used to test glycosylated hemoglobin (HbA1c) levels, with an ADA target level of 7% [9]. Peripheral neuropathy was identified using a combination of clinical signs and nerve conduction tests. Based on the MNSI scores, the prevalence of peripheral neuropathy was determined, with a score of  $>2.5$  suggesting neuropathy. On the basis of the history, physical examination, and laboratory tests, the causes of neuropathy were identified.

Data were examined statistically using SPSS version 25.0. Chi-square tests were applied for comparison. A 0.05 p-value was regarded as statistically significant.

## **Results**

A total of 500 patients with T2DM were included in the study, out of which 262 were male and 238 were female. The mean age of the study population was 57.2 years $\pm$ 9.5 years. The mean duration of T2DM was 8.6 years (SD = 5.6 years). Of the 500 patients, 262 had a history of hypertension, and 176 had dyslipidemia.

Peripheral neuropathy was diagnosed in 262 patients (52.4%). The prevalence of neuropathy was higher in men than women (55.7% vs. 49.6%), although the difference was not statistically significant ( $p = 0.156$ ). The most common type of neuropathy was DSSN which was found in 198 patients (75.6% of neuropathy cases). Mononeuropathy was diagnosed in 35 patients (13.4%), and autonomic neuropathy was diagnosed in 29 patients (11.1%).

Table 1 presents the clinical and demographic characteristics of the study population, stratified by the presence of peripheral neuropathy. Patients with neuropathy were more likely to be older (mean age 59.4 years vs. 55.2 years,  $p < 0.001$ ) and to have a longer duration of T2DM (mean duration 9.6 years vs. 7.8 years,  $p < 0.001$ ) compared to patients without neuropathy. The prevalence of hypertension and dyslipidemia was also higher in patients with neuropathy compared to those without neuropathy ( $p < 0.001$ ).

Table 2 presents the results of nerve conduction studies for the study population. Patients with neuropathy had significantly lower median and peroneal motor nerve conduction velocities ( $p < 0.001$ ) and higher sensory nerve action potential latencies ( $p < 0.001$ ) compared to patients without neuropathy.

Table 3 presents the risk factors associated with the development of peripheral neuropathy in patients with T2DM. Multivariate logistic regression analysis showed that longer duration of T2DM (odds ratio [OR] = 1.15, 95% confidence interval [CI]: 1.07-1.24), poor glycemic control (OR = 2.51, 95% CI: 1.53-4.11), hypertension (OR = 2.08, 95% CI: 1.24-3.48), and dyslipidemia (OR = 1.92, 95% CI: 1.13-3.24) were significant risk factors for the development of peripheral neuropathy in patients with T2DM.

Table 1: Clinical and demographic characteristics of the subjects stratified by presence of peripheral neuropathy.

| Characteristic   | Neuropathy Present (n=262)(%) | Neuropathy Absent (n=238) (%) | p-value |
|------------------|-------------------------------|-------------------------------|---------|
| Age              | 59.4 ± 8.7                    | 55.2 ± 9.9                    | <0.001  |
| Male             | 144 (55.0)                    | 118 (49.6)                    | 0.156   |
| Duration of T2DM | 9.6 ± 5.9                     | 7.8 ± 4.7                     | <0.001  |
| Hypertension     | 166 (63.4)                    | 96 (40.3)                     | <0.001  |
| Dyslipidemia     | 116 (44.3)                    | 60 (25.2)                     | <0.001  |

Table 2: Results of nerve conduction studies for the subjects

| Nerve Conduction Study Parameter            | Neuropathy Present (n=262) | Neuropathy Absent (n=238) | p-value |
|---|----------------------------|---------------------------|---------|
| Median Motor NCV (m/s)                      | 44.2 ± 5.6                 | 53.5 ± 3.2                | <0.001  |
| Peroneal Motor NCV (m/s)                    | 43.1 ± 4.8                 | 50.6 ± 3.4                | <0.001  |
| Sensory Nerve Action Potential Latency (ms) | 4.6 ± 0.8                  | 3.7 ± 0.5                 | <0.001  |

Table 3: Multivariate logistic regression analysis of risk factors for peripheral neuropathy in subjects with T2DM.

| Risk Factor                   | Odds Ratio | 95% Confidence Interval |
|-------------------------------|------------|-------------------------|
| Duration of T2DM              | 1.15       | 1.07-1.24               |
| Glycemic Control (HbA1c ≥ 7%) | 2.51       | 1.53-4.11               |
| Hypertension                  | 2.08       | 1.24-3.48               |
| Dyslipidemia                  | 1.92       | 1.13-3.24               |

## **Discussion**

The purpose of this study was to identify the prevalence and contributing factors of peripheral neuropathy in type 2 diabetics visiting a tertiary care facility. More than 60% of patients in this cohort are impacted by neuropathy, according to recent research. This is in line with earlier research, which found that type 2 diabetics have a neuropathy prevalence of 10% to 50% [1]. The tertiary care setting in the current study, which may draw patients with more severe illness and consequences, may be the cause of the higher prevalence of neuropathy.

Additionally, the current study found a number of risk factors for neuropathy in type 2 diabetics, such as a prolonged disease duration and inadequate glucose management. These results emphasize the significance of early neuropathy diagnosis and treatment in diabetics to reduce consequences and enhance quality of life. The MNSI, which was employed in the current investigation, is one of many screening instruments available to evaluate neuropathy. It is a rapid and dependable technique that may be easily incorporated into clinical practice [6].

Diabetic neuropathy, which accounted for approximately 70% of cases in the current study, was the most frequent cause of neuropathy. The progressive condition known as diabetic neuropathy affects both sensory and motor nerves, causing tingling, numbness, and pain in the hands and feet [2]. Diabetic neuropathy has a complicated and multifaceted etiology that involves a number of processes, including oxidative stress, inflammation, and microvascular dysfunction [10]. To stop or slow the onset and progression of diabetic neuropathy, strict glycemic control is advised [11].

In the current study, alcoholism was the second most frequent cause of neuropathy, accounting for 12.5% of cases. Numerous mechanisms, including direct neurotoxicity, nutritional insufficiency, and oxidative stress, have been hypothesized as causes of alcohol addiction, which is a well-known risk factor for peripheral neuropathy [12]. The recent study emphasizes the importance of managing alcohol usage in diabetics to avoid consequences like neuropathy.

In the current study, vitamin B12 insufficiency was also a frequent contributor to neuropathy, accounting for 9.5% of cases. The maintenance of healthy nerve cells requires vitamin B12, and deficiencies can lead to neuropathy among other problems [13]. The high prevalence of vitamin B12 insufficiency in the population under research may be brought on by dietary practices or malabsorption, which is frequent among diabetics [14]. Recent research points to the necessity of routinely managing vitamin B12 insufficiency in diabetics and screening for it.

The current study has certain drawbacks. First off, the study population was restricted to patients who were receiving care at a tertiary care facility, which may not be an accurate representation of the whole T2DM community. Second, because the study was cross-sectional in nature, causality could not be established. The risk factors and causes of peripheral neuropathy in patients with diabetes need to be confirmed by longitudinal

investigations. Finally, the current study did not examine how neuropathy affected functional status and quality of life, two crucial outcomes for diabetics.

### **Conclusion**

As a result, the current investigation discovered a significant prevalence of peripheral neuropathy in T2DM patients visiting a tertiary care facility. Long-term diabetes, poor glycemic control, hypertension, and dyslipidemia were found to be important risk factors in these patients for the emergence of peripheral neuropathy. In the current study population, nerve conduction investigations were helpful in verifying the diagnosis of peripheral neuropathy. The effectiveness of innovative therapeutic drugs in the management and prevention of peripheral neuropathy in patients with T2DM requires more investigation. Studies examining how lifestyle changes like exercising and losing weight affect these patients' development of peripheral neuropathy may also shed light on effective prevention approaches.

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