

The Occurrence, Trends, and Factors That Forecast Diabetic Peripheral Neuropathy: A Tertiary Centre Study

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Abstract:

Background: Diabetes is becoming increasingly prevalent worldwide, including in emerging countries. Diabetic peripheral neuropathy (DPN) is a common and potentially severe complication of diabetes, yet it has been relatively understudied, especially in developing nations. This study focuses on India, a country with a rapidly growing diabetic population, to determine the prevalence and factors associated with DPN.

Methodology: It was a cross-sectional study conducted in 200 diagnosed cases of T2DM patients attending the OPD, inpatient in department of Medicine and Neurology, GSVM medical college and hospital, Kanpur, between April 2022 to April 2023 and assessed for peripheral neuropathy. Ethics committee approval was duly taken with the study conducted in accordance with the guidelines. Informed consent was taken from each participant.

Inclusion criteria included prior diabetes diagnoses from government hospitals or registered medical practitioners, meeting ADA and WHO diagnostic criteria for new cases, BMI ≥ 27.5 kg/m² (as per WHO for Asians), and assessments for diabetic retinopathy or nephropathy. Exclusion criteria encompassed institutionalized individuals, data from unselected provinces, no prior diabetes diagnosis, and missing key variable data. The study involved 200 diabetic patients and assessed DPN using the Diabetic Neuropathy Symptom (DNS) Score and the Toronto Clinical Scoring System (TCSS). Logistic regression analysis was employed to identify factors associated with DPN.

Results: The study found that 24.0% of the diabetic patients had DPN. Factors associated with DPN included gender, smoking, insulin treatment, diabetic retinopathy, and the presence of foot ulcers.

Recommendations: (DPN) in emerging countries like India include raising awareness, implementing regular screening, improving diabetes care, promoting healthier lifestyles, ensuring better healthcare access, prioritizing research, and creating targeted treatment plans.

Conclusion: This study sheds light on the prevalence and risk factors for DPN in India, an emerging country with a growing diabetes burden. Identifying these risk factors can contribute to improved treatment and prevention strategies for DPN in India and similar settings.

Keywords: Diabetic Peripheral Neuropathy, Diabetes, India, Prevalence, Risk Factors, Emerging Country, Diabetic Complications.

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Introduction

Diabetes is spreading globally. It used to be seen mainly in rich people in advanced countries, but now it's becoming more common worldwide, especially in poorer countries. In the South Asian region, it's expected to increase by over 151% from 2000 to 2030. Diabetic peripheral neuropathy, a common issue in both type 1 and type 2 diabetes, affects the nervous systems and can lead to serious problems like amputation and loss of sensation in the feet [1, 2].

Even though neuropathy is a big problem, it hasn't been studied as much as other diabetes complications like eye and kidney issues. The

estimates of how many people have it vary a lot between countries because they use different methods to diagnose it. Age, how long you've had diabetes, and poor blood sugar control are known to increase the risk of neuropathy, along with things like smoking, eye problems, high blood pressure, being overweight, high cholesterol, and kidney issues. Most research on this comes from rich Western countries, and there's not much data from developing countries, especially in South Asia, even though most diabetics live there, and South Asians are more likely to get diabetes [3, 4].

India, a growing country in with 20.9 million people, is also dealing with a diabetes problem, with one in five adults over 20 having either diabetes or pre-diabetes. This study wants to figure out how many people in India with diabetes have neuropathy, how it shows up, and what might make it more likely [5].

The aim is to find out what causes neuropathy and improve treatment and ways to prevent it

Methodology

Study Design: This study was a cross-sectional descriptive analysis.

Study Setting and Participants: It was a cross-sectional study conducted in 200 diagnosed cases of T2DM patients attending the OPD, inpatient in department of Medicine and Neurology, GSVM medical college and hospital, Kanpur, between April 2022 to April 2023 and assessed for peripheral neuropathy. Ethics committee approval was duly taken with the study conducted in accordance with the guidelines. Informed consent was taken from each participant.

Inclusion and Exclusion Criteria: Inclusion criteria: Data were collected from non-institutionalized adults with prior diabetes diagnoses, or met ADA and WHO diagnostic criteria for new cases was included, along with diabetic retinopathy or nephropathy, assessed via exams or records.

Exclusion Criteria: Institutionalized individuals, data from unselected provinces, and missing retinopathy/nephropathy assessments. Incomplete data on key variables led to exclusion.

Study Size: After fulfilling the inclusion criteria, 200 diabetic patients were included.

Data Collection and Analysis: In the study, diabetic peripheral neuropathy (DPN) was assessed using the Diabetic Neuropathy Symptom (DNS) Score and the Toronto Clinical Scoring System

(TCSS). Neuropathy severity was categorized based on TCSS scores: no neuropathy (≤ 5), mild (6–8), moderate (9–11), or severe (≥ 12). Sensation tests included light touch, pain, vibration, and temperature using various tools. Measurements encompassed height, weight, BMI, waist and hip circumference, blood pressure, fasting blood samples for glucose and lipids, and physical activity data from a questionnaire. Subjects 'moderate'/'high' in physical activity were considered active.

Bias: To minimize bias, the goal of the research was not disclosed to the participants or healthcare providers during data collection. Additionally, data analysts were blinded to the identity of the participants.

Variables: Gender, living in an urban or rural area, household income, height, triglyceride levels, length of diabetes, alcohol and smoke usage, retinopathy, nephropathy, foot ulcers, obesity, hypertension, physical activity, and medication/insulin therapy were among the independent variables.

Statistical Analysis: Software for data analysis was SPSS. To evaluate differences in means and proportions, z-tests, t-tests, or ANOVA were utilized. Binary logistic regression was performed using "presence of DPN" as the dependent variable (0 = DPN absent; 1 = DPN present). Using a forward selection method based on R2 increment, variables were chosen. The threshold for significance was $p < 0.05$.

Ethical Considerations: The study was carried out in accordance with ethical guidelines, which included getting each participant's informed consent. The ethics committee examined and approved the study protocol.

Results

Table: Title: "Key Methodological Details and Findings for 200 Diabetic Patients"

Parameter	Details
Study Period	2022-2023
Study Location	Dept of Neurology and Medicine, GSVM medical college and hospital, Kanpur
Total Diabetic Patients	200
Ethical Approval	Obtained from the Ethical Review Committee, Faculty of Medicine, India
Diagnosis Categories	- Diagnosed Diabetes - Undiagnosed Diabetes
Diabetic Retinopathy Assessment	Yes
Diabetic Nephropathy Assessment	Yes
Diabetic Peripheral Neuropathy	- Assessment Tools: DNS Score and TCSS - DPN Considered Present with TCSS > 5
Statistical Software	SPSS v14 (SPSS Inc., Chicago, IL, USA)

Statistical Tests	- z-test
	- Student's t-test
	- ANOVA
Logistic Regression Analysis	Yes
Factors Considered in Analysis	- Gender
	- Smoking
	- Insulin Treatment
	- Diabetic Retinopathy
	- Presence of Foot Ulcers
	- Other Socio-Demographic and Clinical Variables as Relevant
Prevalence of DPN	24.0%

Patients diagnosed with diabetes were divided into two groups: "diagnosed diabetes" patients were those who had received a diagnosis from a certified medical practitioner or government hospital, and "undiagnosed diabetes" patients were those who met predetermined criteria. Evaluations were conducted on diabetic retinopathy, nephropathy, and the existence of diabetic peripheral neuropathy (DPN). Diabetic Neuropathy Symptom (DNS) Score was used for new cases, while Toronto Clinical Scoring System (TCSS) and DNS were utilised for diabetes that has been diagnosed. When the TCSS score was higher than 5, DPN was deemed to be present. To find risk factors linked to DPN, binary logistic regression was one of the statistical analyses carried out utilising SPSS v14 software. DPN was discovered to be present in 24.0% of the diabetic patients, and it was found to be related to a number of variables, including gender, smoking, insulin use, diabetic retinopathy, and the existence of foot ulcers.

Discussion

This study explored (DPN) in 200 diabetic patients, making it the first comprehensive report of its kind in the country. They found that 24.0% of the patients had DPN when assessed using the (TCSS), which evaluates various aspects of neuropathy. Comparing their findings to other countries, they saw similar DPN prevalence in India, Bangladesh, and the UK when using similar criteria. However, it was lower than in some other regions. These differences could be due to ethnic variations and diagnostic methods [6,7].

The study uncovered links between DPN and factors like insulin use, high triglycerides, smoking, rural living, lower income, taller height, and being female. Notably, insulin use was associated with a higher DPN risk, but more research is needed to understand this connection. On the other hand, using metformin instead of sulphonyl ureas seemed to lower the risk of DPN [8].

Elevated triglycerides were connected to DPN, possibly due to their link with insulin resistance and metabolic syndrome. Smoking's impact on blood vessels might contribute to DPN, and rural

living may lead to delayed diagnosis and inadequate diabetes management. Taller people seemed more prone to DPN, perhaps because longer nerves are more susceptible to neuropathy. They also noticed a trend suggesting that females might be at a higher risk of DPN, but more research is required to confirm this [9].

Conclusion

This study not only identifies several new possible risk variables of importance in this ethnically diverse large subpopulation with diabetes, but it also defines the influence of previously established risk factors for the development of DPN in the South Asian community. Future assessments of these patients may reveal variables that contributed to the onset of neuropathy or the advancement of pre-existing neuropathy, allowing risk-reduction plans to be created.

Limitations: The study had limitations, including measuring diabetes duration from diagnosis, not having data on blood sugar control, and potential bias from its study design. Nonetheless, it contributes valuable insights into DPN in India.

Recommendations: (DPN) in emerging countries like India include raising awareness, implementing regular screening, improving diabetes care, promoting healthier lifestyles, ensuring better healthcare access, prioritizing research, and creating targeted treatment plans.

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List of abbreviations:

1. DPN - Diabetic Peripheral Neuropathy
2. ADA - American Diabetes Association
3. WHO - World Health Organization
4. BMI - Body Mass Index
5. DNS - Diabetic Neuropathy Symptom Score
6. TCSS - Toronto Clinical Scoring System

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