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Original Research Article

Peripheral Neuropathy Prevalence among Type 2 Diabetes Patients Attending an Indian Diabetes Clinic

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Abstract

Background: In India, the burden of diabetes-related microvascular and macrovascular consequences is enormous. There are more persons developing DM problems as a result of the rising prevalence of diabetic mellitus (DM). In India, the prevalence of diabetic peripheral neuropathy (DPN), which can range from 18.8 to 61.9%, is the most prevalent complication among people with DM. Early detection of DPN can lessen its effects. Primary care screening services can aid in the early detection of problems and enhance patient health outcomes for people with diabetes. The purpose of this study was to evaluate the risk factors for DPN and its prevalence among type 2 DM patients who visited the diabetic clinic.

Methods: 300 individuals with type 2 diabetes who were enrolled in the Government Medical College and Hospital, Purnia from September 2021 to August 2022 underwent a cross-sectional study. A standardized questionnaire was used to gather data, which was then followed by a thorough visual and physical examination of the foot. Urine was obtained to check for albumin presence, while a blood sample was provided to determine HbA1c.

Results: One hundred and seventy (44%) of the 300 individuals had neuropathy, of which 85 (51%) were symptomatic. Higher HbA1c levels (OR = 2.86; $p < 0.017$), elementary schooling and less educational status (OR = 3.33; $p < 0.002$), length of DM (OR = 1.72; $p < 0.037$), the presence of urine albumin (OR = 2.56; $p < 0.032$), and peripheral vascular disease (OR = 2.84; $p < 0.002$) were predictors for DPN.

Conclusion: According to the current study, rural areas have a significant frequency of peripheral neuropathy. Frequent screening can aid in the early detection of DPN and help prevent complications like foot ulcers, which ultimately result in amputation.

Keywords: Diabetic peripheral neuropathy, Type 2 diabetes mellitus, Foot examination. HbA1c, Monofilament.

Introduction

Estimates from the World Diabetes Federation from 2017 indicate that 425 million individuals worldwide have diabetes mellitus (DM). The estimate is that there will be 629 million people on the planet by 2045. In 2017, India had the second-highest number

of diabetic patients at 72,946,400. In India right now, the prevalence is 8.8% [1]. According to the ICMR INDIA study, Tamil Nadu has a 13.7% prevalence of diabetes mellitus in urban areas and 7.8% in rural regions, with a higher percentage of undiagnosed diabetics living in rural areas than in urban ones [2,3].

In India, the burden of DM-related microvascular and macrovascular consequences is enormous [4,5; Figure 1]. An increasing number of persons are developing difficulties as DM prevalence rises [6,7]. The most frequent consequence in people with type 2 diabetes is diabetic peripheral neuropathy (DPN) [8].

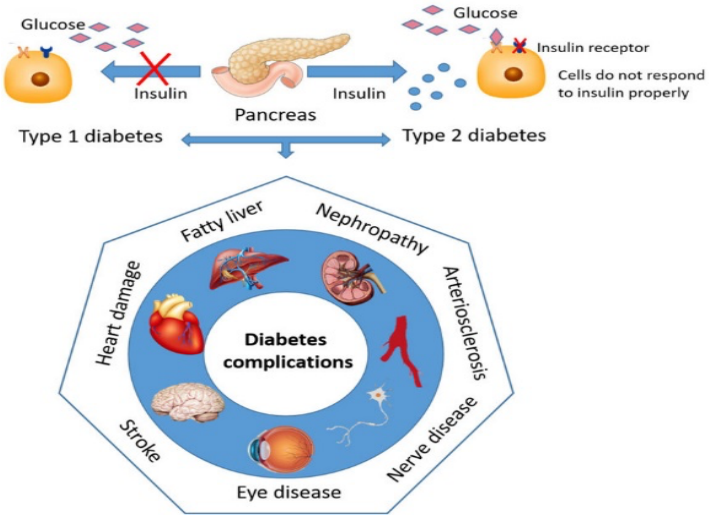

Figure 1: Important diabetes mellitus microvascular and macrovascular complications

In the literature, the prevalence of DPN varied from 18.8 to 61.9% [9–12]. DPN may or may not present with symptoms. When symptomatic, it most usually manifests as hyperaesthesia, tingling, and searing pain, all of which are uncomfortable to the patient. The majority of them will not experience any symptoms and are less likely to seek medical attention. Moreover, primary care doctors could fail to do a foot examination among them. Only an inspection or when a painless foot ulcer is evident can diagnose these asymptomatic DPN patients [13]. Patients with DPN frequently develop foot ulcers and repeated infections, which, if not appropriately treated, might eventually result in amputation. This worsens the quality of life, which is already compromised, and increases disability [14].

The increased proportion of diabetic foot might be decreased by an early identification of DPN. Ulcers are the most common starting point for amputations in DM patients. With the right foot hygiene habits and routine screening to determine the risk of foot issues, this can be avoided. As a result, all DM patients should undergo routine DPN screenings starting at the time of diagnosis. In addition, numerous studies have demonstrated that neuropathic symptoms can be reduced with improved blood sugar management and the avoidance of excessive blood glucose fluctuations [8].

The aim of this research was to determine the risk factors for DPN and to determine its prevalence among type 2 DM patients attending Government Medical College and Hospital, Purnia.

Methods

Between September 2021 and August 2022, the study involved type 2 diabetes mellitus patients who were seen at Government Medical College and Hospital, Purnia.

Every patient with DM who receives a diagnosis is registered at the facility, and a treatment card is given to each registered patient to keep track of all their appointments, including the results of their clinical exams, their blood sugar readings, and the recommended treatments. The medical officer does a thorough physical examination on each patient who visits the center once every 3 weeks. An average of 40 minutes were spent interviewing each patient to g*et al*l the details. Demographic data was gathered and DPN symptoms were elicited using a pre-tested structured questionnaire. An examination of the body then ensued.

The feet were then carefully examined in a well-lit space. The evaluation was done in accordance with the following categories: (a) musculoskeletal, (b) neurological, (c), and (d) vascular. began with a physical examination of the foot, which included a musculoskeletal and dermatological assessment.

The feet were examined for missing hair, misshapen nails, dry skin, fissures, ulceration, areas of erythema, previously healed scars, and gangrene for dermatological examination. The prevalence of wasting and abnormalities including claw toes, Charcot joints, and large metatarsal heads were noted for the musculoskeletal examination [19]. Three straightforward clinical tests were used to evaluate the nervous system: ankle reflexes, 128 Hz VibraTip, and 10-g monofilament.

Blood tests: The most recent results for postprandial blood sugar (PPBS) and fasting blood sugar (FBS) were noted from the treatment card. Each patient had their glycosylated haemoglobin (HbA1c) levels checked utilising the smartphone-based Aina HbA1c Monitoring System. This point-of-care testing tool uses capillary fingersticks to determine the levels of glycosylated haemoglobin (HbA1c). It has received validation at numerous clinical facilities around the world with outcomes that are comparable to those of the gold standard analyzers.

Software from the Statistical Package for Social Sciences, version 16, was used for data entry and analysis. The background variables were analyzed using descriptive statistics. Quantitative variables have a reported median and range. For qualitative variables, frequency and percentage are given. The connections of risk factors were examined using chi-square. They computed the odds ratios (ORs) and their 95% confidence intervals (CIs). Statistical significance was defined as a p-value less than 0.04. In order to identify the predictors for the occurrence of DPN, binary logistic regression was carried out using the Backward-Wald approach. Inputs for the logistic regression model included variables and the primary outcome.

A p-value < 0.04 was deemed statistically significant. Adjusted odds ratio (AOR) was used to determine the strength of the link between DPN and the risk factors.

Results

300 type 2 DM patients in total—109 men and 191 women—were included in the study. The study's participants were 55 years old on average (IQR 51–63). Participants in the study had a median BMI of 25.87 kg/m2 (IQR 21.26–28.03). There was a positive family history of DM in 175 (45.7%) of the individuals. One year had passed since the DM diagnosis on average (IQR 1–11). Just 4.4% of the participants were taking insulin in addition to another OHA, while the majority of participants were taking

metformin, either alone or in combination with another OHA.

DPN was present in 44.8% of people, with prevalence rates for males (46.1%) and females (44.3%) nearly equal. Pressure sensation was diminished or absent in 110 (31%) research participants, the ankle reflex was absent in 80 (23%) participants, and vibration perception was diminished or absent in 65 (16.8%) patients.

165 (43.2%) of the study's participants reported having symptoms that might point to DPN. 85 (51.4%) of individuals who had DPN diagnosed had symptoms. Burning, pricking, and discomfort were the symptoms that were most commonly reported in this study. Table 1 provides information on the musculoskeletal, neurological, vascular, and dermatological assessments.

Table 1: Symptoms of DPN

Symptoms	**Number**	**Percentage**
Any 2 or more symptoms	165	43.2%
Burning	85	22.5%
Pricking	80	21.4%
Pain	70	18.4%
Numbness	65	17.1%
Tingling	30	8.8%
Physical examination	**Right foot (%)**	**Left foot (%)**
Absent hair	22.7%	22.7%
Deformed nails	21.7%	24.0%
Fissured skin	21%	20.7%
Ulceration	2.5%	3.2%
Old healed scar	2.5%	2.7%
Gangrene	0.4%	0.7%
Deformities	6.1%	6.1%
Neurological assessment (%)		
Monofilament test—pressure sensation absent/ reduced	28.1%	27.3%
Vibration test—vibration perception absent/ reduced	14.0%	16.3%
Ankle reflex—absent	20.7%	21.7%
Vascular assessment (%)		
Dorsalis pedisartery—pulsations absent	5.0%	4.8%
Posterior tibial artery—pulsations absent	7.3%	8.4%

There was no discernible sex difference in prevalence, with males and females each reporting nearly identical rates of 46.1 and 44.3 percent. Those older than 60 years had a higher likelihood of having DPN (OR = 3.16), and there was a statistically significant rise in the prevalence of DPN with advancing age (p = 0.008). Moreover, the prevalence of DPN increased with the length of DM, and this proportional difference was statistically significant (p = 0.008). The glycemic indices fasting blood sugar > 125 mg/dl (OR = 1.94, p = 0.002), postprandial blood sugar > 100 mg/dl (OR = 2.04, p=0.002), and glycosylated hemoglobin > 9.4 (OR = 2.231, p = 0.042) were significantly associated with DPN. Age, time since diagnosis, education level, HbA1c, systolic blood pressure, the presence of urine albumin, and PVD were used as predictors in a binary logistic

regression analysis to determine the prevalence of DPN. It was verified that having only completed primary school (p=0.002), having a disease duration of at least four years (p = 0.037), having higher HbA1C levels (p = 0.018), having urine albumin (p = 0.013), and having PVD (p = 0.002) showed a significant association with DPN.

Discussion

44.8% of participants in this study had DPN. George *et al*. reported similar outcomes. In order to diagnose DPN, they carried out a study at a secondary rural hospital using the Michigan Neuropathy Screening Instrument (MNSI) instrument. 99 (47%) of the 212 participants had a DPN diagnosis [15]. Another study that used MNSI and was carried out in a tertiary medical facility in rural Pondicherry revealed a prevalence of 52.9%, which was marginally higher than the results of the present study [14]. A prevalence of 39.3% was found in a study in rural Andhra Pradesh utilising SW 10-g monofilament, VPT test by 128-Hz tuning fork, and ankle reflex tests [16].

This was a little less common than in the current study. A prevalence of 29.2% was observed in a Lucknow study utilising the Neuropathy Symptom Score (NSS) and Neuropathy Disability Score (NDS), which was less than in the present study. This can be as a result of the study only including patients who had their diagnosis during the previous six months. However, the same study found that 43.3% of those who underwent aberrant VPT using a VibraTip had a strong connection with NDS, which is comparable to our incidence of DPN [17]. Male prevalence in the current study was somewhat greater (46.1%) than female prevalence (44.3%), although this difference was not statistically significant. This was consistent with the results published by Bansal *et al*., J Cazebas-Cerrato, and Javed *et al*. [18-20], while some research indicate that men are more likely than women to develop DPN [21–22]. This study indicated primary schooling or less as a risk factor for the development of DPN. Low-educated DM patients had worse results in terms of complications, according to research by Van der Meer and colleagues [23].

These findings are consistent with our research and are explained by the fact that people with higher levels of education are more knowledgeable about the illness and its complications. They are more likely to follow and maintain dietary guidelines, pharmaceutical regimens, and lifestyle changes [24]. High HbA1c levels were also found to be a risk factor in the current study for the occurrence of DPN. Liu *et al*. conducted a meta-analysis to examine the risk variables for DPN, which included research from China, India, Bangladesh, and Kuwait. According to this study, DPN risk factors include Hba1c [25].

In newly diagnosed type 2 DM patients, strict glycemic management has been shown to delay the development of microvascular problems, such as neuropathy and nephropathy [26]. This shows that glycemic state affects the onset and development of problems connected to diabetes. The current study indicated that having PVD was a risk factor for developing DPN. According to a study on DPN risk factors conducted in Germany, having diabetes-related comorbidities such peripheral vascular disease, nephropathy, and retinopathy was linked to a higher risk of developing DPN [27]. This is similar to what it was found in this study.

Conclusion

The histomorphology of soft tissue tumors can be pretty well correlated using the safe and affordable diagnostic technique known as FNAC. Consequently, even if a particular diagnosis may not always be achievable,

FNAC can be utilized as a trustworthy diagnostic technique for preoperative workup with fair sensitivity, specificity, and accuracy.

References

1. Desai JR, Vazquez-Benitez G, Taylor G, Johnson S, Anderson J, Garrett JE, Gilmer T, Vue-Her H, Rinn S, Engel K, Schiff J. The effects of financial incentives on diabetes prevention program attendance and weight loss among low-income patients: the We Can Prevent Diabetes cluster-randomized controlled trial. BMC Public Health. 2020 Dec;20(1):1-1.
2. Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R. Prevalence of diabetes and prediabetes in urban and rural India: Phase I results of the ICMR-INDIAB study. Diabetologia. 2011; 54:3022-7.
3. Shashank RJ. Diabetes care in India. Ann Glob Health. 2015;81(6):830-.
4. Pradeepa R, Rema M, Vignesh J, Deepa M, Deepa R, Mohan V. Prevalence and risk factors for diabetic neuropathy in an urban south Indian population: the Chennai Urban Rural Epidemiology Study (CURES-55). Diabetic medicine. 2008 Apr;25(4):407-12.
5. Mohan V, Deepa R, Shanthirani S, Rema M. Prevalence of microalbuminuria in a selected South Indian population-the Chennai Urban Population Study (CUPS). Diabetes Research and Clinical Practice. 2000(50):261.
6. Ramachandran A, Snehalatha C, Viswanathan V. Burden of type 2 diabetes and its complications–The Indian scenario. Current science. 2002 Dec 25:1471-6.
7. Mohan V, Shah S, Saboo B. Current glycemic status and diabetes related complications among type 2 diabetes patients in India: data from the A1chieve study. The Journal of the Association of Physicians of India. 2013;61(1 Suppl):12-5.
8. Tesfaye S, Boulton AJ, Dyck PJ, Freeman R, Horowitz M, Kempler P, Lauria G, Malik RA, Spallone V, Vinik A, Bernardi L. Diabetic neuropathies: update on definitions, diagnostic criteria, estimation of severity, and treatments. Diabetes care. 2010 Oct;33(10):2285.
9. Young MJ, Boulton AJ, MacLeod AF, Williams DR, Sonksen PH. A multicentre study of the prevalence of diabetic peripheral neuropathy in the United Kingdom hospital clinic population. Diabetologia. 1993 Feb; 36:150-4.
10. Rani P, Raman R, Rachapalli S, Pal S, Kulothungan V, Sharma T. Prevalence and risk factors for severity of diabetic neuropathy in type 2 diabetes mellitus. Indian journal of medical sciences. 2010 Feb 1;64(2):51.
11. Ashok S, Ramu M, Deepa R, Mohan V. Prevalence of neuropathy in type 2 diabetic patients attending a diabetes centre in South India. Japi. 2002 Apr 1; 50:546-0.
12. Agrawal R, Ola V, Bishnoi P, Gothwal S, Sirohi P, Agrawal R. Prevalence of micro and macrovascular complications and their risk factors in type-2 diabetes mellitus. JAPI. 2014 Jun; 62:505.
13. Boulton AJM, Vinik AI, Arezzo JC, Bril V, Feldman EL, Freeman R, *et al*. Diabetic Neuropathies. Diabetes Care. 2005;28(4):956–62.
14. Begum S, Venkatesan M, Ganapathy K. Foot care practices, its barriers and risk for peripheral neuropathy among diabetic patients attending medical college in rural Puducherry.
15. George H, Rakesh PS, Krishna M, Alex R, Abraham VJ, George K, Prasad JH. Foot care knowledge and practices and the prevalence of peripheral neuropathy among people with diabetes attending a

secondary care rural hospital in southern India. Journal of family medicine and primary care. 2013 Jan;2(1):27.
16. Darivemula S, Nagoor K, Patan SK, Reddy NB, Deepthi CS, Chittooru CS. Prevalence and its associated determinants of Diabetic Peripheral Neuropathy (DPN) in individuals having type-2 diabetes mellitus in Rural South India. Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine. 2019 Apr;44(2):88.
17. Panicker JN, Nagaraja D, Kovoor JM, Subbakrishna DK. Descriptive study of acute disseminated encephalomyelitis and evaluation of functional outcome predictors. Journal of postgraduate medicine. 2010 Jan 1;56(1):12.
18. Bansal D, Gudala K, Muthyala H, Esam HP, Nayakallu R, Bhansali A. Prevalence and risk factors of development of peripheral diabetic neuropathy in type 2 diabetes mellitus in a tertiary care setting. Journal of diabetes investigation. 2014 Nov;5(6):714-21.
19. Cabezas-Cerrato J. Neuropathy Spanish Study Group of the Spanish Diabetes Society (SDS) The prevalence of clinical diabetic polyneuropathy in Spain: a study in primary care and hospital clinic groups. Diabetologia. 1998 Oct 1;41(11):1263-9.
20. Javed A, Furqan A, Zaheer M, Kasuri N. Gender based differences in diabetic peripheral neuropathy. Pakistan Journal of Neurological Sciences (PJNS). 2014;9(4):20-4.
21. Gogia S, Rao CR. Prevalence and risk factors for peripheral neuropathy among type 2 diabetes mellitus patients at a tertiary care hospital in coastal Karnataka. Indian journal of endocrinology and metabolism. 2017 Sep 1;21(5):665-9.
22. Al-Maskari F, El-Sadig M. Prevalence of risk factors for diabetic foot complications. BMC family practice. 2007 Dec;8(1):1-9.
23. D'Souza M, Kulkarni V, Bhaskaran U, Ahmed H, Naimish H, Prakash A, Tabreez S, Dahiya B, Thapar R, Mithra P, Kumar N. Diabetic peripheral neuropathy and its determinants among patients attending a tertiary health care centre in Mangalore, India. Journal of public health research. 2015 Jul 30;4(2):jphr-2015.
24. van der Meer JB, Mackenbach JP. The care and course of diabetes: differences according to level of education. Health policy. 1999 Jan 1;46(2):127-41.
25. Liu X, Xu Y, An M, Zeng Q. The risk factors for diabetic peripheral neuropathy: a meta-analysis. PLoS One. 2019;14(2):e0212574.
26. Kasper DL, Braunwald E, Fauci AS, Hauser SL, Longo DL, Jameson JL, *et al*., editors. 16th ed. Vol II. New York: McGraw Hill, Medical Publishing Division; Harrison's principles of internal medicine, 1998; 2161–63
27. Sharma N, Sharma SK, Maheshwari VD, Sharma KK, Gupta R. Association of low educational status with microvascular complications in type 2 diabetes: Jaipur diabetes registry. Indian journal of endocrinology and metabolism. 2015 Nov;19(6):775.