

“STUDY ON THE PREVALENCE OF RISK FACTORS FOR DIABETIC NEUROPATHY IN TYPE 2 DIABETES MELLITUS IN TERTIARY CARE HOSPITAL OF GUJARAT”

First Author: Dr Haresh J Panchal (Associate Professor of General Medicine, GMERS
Medical College, Gandhinagar)

Email: hareshpnchl@gmail.com

Second Author: Dr Harsh Patel (Assistant Professor of General Medicine, Ananya medical
college, Kalol)

Email ID: patel.harsh4695@gmail.com

Corresponding Author: Dr Sarita J Parmar (Professor of General medicine, Ananya Medical
College Kalol)

Email: drsaritaparmar@gmail.com

Received: 19-10-2024 Revised: 22-11-2024 Accepted: 09-12-2024
Published: 24-12-2024

ABSTRACT: INTRODUCTION: T2DM is the most common form of diabetes, accounting for about 90% of all cases. It is a significant risk factor for heart disease, stroke, kidney disease, blindness, and amputation. There is no cure for T2DM, but it can be managed with lifestyle changes, medication, and insulin therapy. **AIMS AND OBJECTIVES:** To estimate the Prevalence of Diabetic Peripheral Neuropathy in subjects with Type 2 diabetes mellitus, To study the distribution of risk factors for Diabetic Peripheral Neuropathy in Type 2 diabetes mellitus subjects. **METHODS:** The OPD/IPD patients attending GMERS Medical College and Hospital with Type 2 diabetes mellitus and having symptoms of diabetic neuropathy were inquired about eligibility. All patients with age above 30 and gave informed consent were included in study. 200 individuals (100 cases and 100 controls) were selected. A thorough history was obtained, and all necessary clinical exams and electrophysiological tests were performed. Investigations included the following tests: CBC, ESR, MCV, FBS, PP2bs, HbA1C, urine, serum creatinine, fundus for retinopathy, RFT, and lipid profile. **DISCUSSION AND CONCLUSION:** Diabetic Peripheral Neuropathy (DPN) is significantly associated with a longer duration of Type 2 diabetes mellitus, higher rates of hypertension, increased smoking habits, elevated blood pressure, and dysregulated lipid and glucose levels. Notably, there were no significant differences in age, gender, or basic anthropometric measures between those with and without DPN. Crucially, the study highlighted a higher prevalence of microvascular complications such as diabetic retinopathy and nephropathy, as well as ischemic heart disease among individuals with DPN.

KEYWORD: Neuropathy, Diabetes, Retinopathy

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by hyperglycemia (high blood sugar). A combination of insulin resistance and relative insulin deficiency causes it. In people with T2DM, the body either does not produce enough insulin or the cells do not respond to insulin as well as they should, leading to high blood glucose levels. T2DM is the most common form of diabetes, accounting for about 90% of all cases.

It is a significant risk factor for heart disease, stroke, kidney disease, blindness, and amputation. There is no cure for T2DM, but it can be managed with lifestyle changes, medication, and insulin therapy. The risk of developing T2DM increases with age, obesity, family history, and certain ethnic groups. Early diagnosis and treatment of T2DM can help prevent or delay the onset of complications. Diabetic neuropathy is a prevalent complication of Type 2 diabetes mellitus, affecting up to 50% of patients. It is a progressive disorder that affects the peripheral nerves and can cause various symptoms, such as pain, paralysis, and fatigue in the extremities, as well as issues with digestion, sexual function, and other physiological functions. The incidence of diabetic neuropathy increases with Type 2 diabetes mellitus duration and severity and inadequate glycemic control. It is prevalent among elderly adults, those with elevated blood pressure or cholesterol, and smokers. Diabetic neuropathy can significantly impact the quality of life of people with type 2 diabetes, resulting in decreased mobility, an increased risk of accidents and injuries, and a diminished capacity to carry out daily activities. In severe case it may cause blindness, amputation.

AIMS AND OBJECTIVES

1. To estimate the Prevalence of Diabetic Peripheral Neuropathy in subjects with Type 2 diabetes mellitus.
2. To study the distribution of risk factors for Diabetic Peripheral Neuropathy in Type 2 diabetes mellitus subjects
3. Early detection and prevention of diabetic foot ulcers and other microvascular complications like retinopathy and nephropathy

MATERIALS AND METHODS

Study setting: The study was conducted in the Department of General Medicine at GMERS Medical College, Gandhinagar

Study type: It was an observational (cross-sectional) study

Study duration: The study was conducted for a one-year duration.

Study participants: The OPD/IPD patients attending GMERS Medical College and Hospital with Type 2 diabetes mellitus and having symptoms of diabetic neuropathy were inquired about eligibility.

Inclusion criteria:

Patients aged more than 30 years and gave informed consent

Clinical or NCV diagnosis of diabetic sensory-motor polyneuropathy

Exclusion criteria:

Age less than 30 years

Type 1 diabetes mellitus patients

Pregnant women

Patients with other causes of peripheral neuropathy, like Hypothyroidism, Vitamin B 12 deficiency, Alcoholics, Uraemia, Tuberculosis, HIV

Patients on drugs have peripheral neuropathy as established toxicity

Data collection procedure:

200 individuals (100 cases and 100 controls) were selected. A thorough history was obtained, and all necessary clinical exams and electrophysiological tests were performed. Investigations included the following tests: CBC, ESR, MCV, FBS, PP2bs, HbA1C, urine, serum creatinine, fundus for retinopathy, RFT, and lipid profile.

RESULTS

Table 1: Duration of diabetes among study participants

Duration of diabetes	With Diabetic peripheral neuropathy (n=100)	without Diabetic peripheral neuropathy (n=100)	p-value*
(in years)	11.13 ± 7.2	7.42 ± 3.2	<0.001

*p-value is calculated by independent sample t-test. P value <0.05 considered significant.

Table 2 : Known cases of hypertensives among study participants

Hypertension	With Diabetic peripheral neuropathy (n=100)	without Diabetic peripheral neuropathy (n=100)	p-value*
Yes	71 (71%)	16 (16%)	<0.001
No	29 (29%)	84 (84%)	

*p-value is calculated by chi-square test

Table 3 : Smokers among study participants

Smokers	With Diabetic peripheral neuropathy (n=100)	without Diabetic peripheral neuropathy (n=100)	p-value*
Yes	38 (38%)	18 (18%)	0.001
No	62 (62%)	82 (82%)	

Table 4: Blood pressure measurement among study participants

Blood pressure	With Diabetic peripheral neuropathy (n=100)	without Diabetic peripheral neuropathy (n=100)	p-value*
Systolic blood pressure (mm Hg)	145.5 ± 15.2	125.9 ± 13.8	<0.001
Diastolic blood pressure (mm Hg)	90.6 ± 4.8	80.7 ± 4.2	<0.001

Table 5: Blood sugar levels among study participants

Blood sugar level	With Diabetic peripheral neuropathy (n=100)	without Diabetic peripheral neuropathy (n=100)	p-value*
-------------------	---	--	----------

Fasting Blood sugar (mg/dl)	175.1 ± 68.6	171.8 ± 27.4	0.65
Post prandial blood sugar	250.0 ± 81.5	189.7 ± 36.0	<0.001

(mg/dl)			
Glycosylated haemoglobin (%)	7.6 ± 0.7	7.3 ± 0.6	0.03

Table 6: Lipid profiles among study participants

Lipid profile	With Diabetic peripheral neuropathy (n=100)	without Diabetic peripheral neuropathy (n=100)	p-value*
Cholesterol (mg/dl)	211.15 ± 47.1	147.3 ± 24.1	<0.001
Triglycerides (mg/dl)	160.67 ± 26.4	118.2 ± 17.0	<0.001

Table 7: Diabetic Retinopathy among study participants

Diabetic Retinopathy	With Diabetic peripheral neuropathy (n=100)	without Diabetic peripheral neuropathy (n=100)	p-value*
Present	55 (55%)	09 (9%)	<0.001
Absent	45 (45%)	91 (91%)	

Table 8: Diabetic nephropathy among study participants

Diabetic nephropathy	With Diabetic peripheral neuropathy (n=100)	without Diabetic peripheral neuropathy (n=100)	p-value*
Present	52 (52%)	06 (6%)	<0.001
Absent	48 (48%)	94 (94%)	

Table 9: Ischemic heart disease among study participants

Ischemic Heart Disease	With Diabetic peripheral neuropathy (n=100)	without Diabetic peripheral neuropathy (n=100)	p-value*
Present	38 (38%)	20 (20%)	0.005

Absent	62 (62%)	80 (80%)	
--------	----------	----------	--

DISCUSSION

Mathiyalagen P et al. found a median duration of 8.00 years in the neuropathy group, significantly longer than the 4.00 years in the non- neuropathy group (p-value <0.001). In this study, a contrast in hypertension prevalence was observed between diabetic patients with and without peripheral neuropathy (DPN), where 71% of those with DPN had hypertension, significantly higher than the 16% observed in those without DPN, with a p-value of <0.001. This finding aligns with **Alshammar NA et al.** which noted a hypertension prevalence of 37.4% among participants and is further corroborated by **Hode et al** who found that 42.73% of DPN patients also had hypertension. **Bashar MDA et al.** found a greater proportion of smokers in the neuropathy group (61.1%) compared to the non-neuropathy group (38.9%), with a p-value of 0.003. **Mathiyalagen P et al.** also reported that 29% of the DPN group were smokers versus 17.2% in the non- DPN group, with a significant p-value of 0.006 and an odds ratio of 1.96, suggesting a nearly two-fold increase in risk. In the present study, although fasting blood sugar (FBS) levels did not differ significantly between groups (175.1 mg/dl in the neuropathy group vs 171.8 mg/dl in the non-neuropathy group, p-value = 0.65), postprandial blood sugar and glycosylated haemoglobin (HbA1C) levels were significantly higher in the neuropathy group (p-values <0.001 and 0.03, respectively). Similarly, **Alshammari NA et al.** found higher FBS and HbA1C levels in the neuropathy group (p-values <0.001 for both), and **Bashar MDA et al.**⁵⁹ also reported significantly poorer glycemic control (HbA1c \geq 7%) in the neuropathy group (p-value = 0.007). In the present study, diabetic retinopathy was significantly more prevalent in the diabetic peripheral neuropathy (DPN) group, with 55% showing signs of retinopathy compared to only 9% in the non-neuropathy group, indicating a strong correlation between these microvascular complications (p-value < 0.001). This finding contrasts with **Baxi H et al.** who observed no significant difference in retinopathy prevalence between their groups. However, other research supports a considerable association: **Hafeez et al** also found a higher prevalence of retinopathy among those with DPN. Diabetic nephropathy is significantly more prevalent among those with diabetic peripheral neuropathy (DPN), as demonstrated in a study where 52% of individuals with neuropathy also had nephropathy, compared to only 6% in the non-neuropathy group (p-value <0.001). This association is supported by **Baxi H et al** who also noted a higher incidence of nephropathy among neuropathy patients.

CONCLUSION

The present study concluded that Diabetic Peripheral Neuropathy (DPN) is significantly associated with a longer duration of Type 2 diabetes mellitus, higher rates of hypertension, increased smoking habits, elevated blood pressure, and dysregulated lipid and glucose levels. Notably, there were no significant differences in age, gender, or basic anthropometric measures between those with and without DPN. Crucially, the study highlighted a higher prevalence of microvascular complications such as diabetic retinopathy and nephropathy, as well as ischemic heart disease among individuals with DPN. These findings underscore the importance of early screening and targeted interventions for Type 2 diabetes mellitus management to mitigate the risk and progression of DPN and its associated complications.

REFERENCES

1. Zheng Y, Ley SH, Hu FB. Global aetiology and epidemiology of type 2 diabetes mellitus and its complications. *Nat Rev Endocrinol*. 2018;14(2):88-98.
2. Goyal R, Singhal M, Jialal I. Type 2 Diabetes. [Updated 2023 Jun 23]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK513253/>
3. Deshpande AD, Harris-Hayes M, Schootman M. Epidemiology of diabetes and diabetes-related complications. *Phys Ther*. 2008 Nov;88(11):1254-64.
4. Andrei Cristian B, Amarin Remus P. Diabetic Neuropathy Prevalence and Its Associated Risk Factors in Two Representative Groups of Type 1 and Type 2 Diabetes Mellitus Patients from Bihor County. *Maedica (Bucur)*. 2018;13(3):229-234.
5. Bodman MA, Varacallo M. Peripheral Diabetic Neuropathy. [Updated 2023 Sep 4]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK442009/>
6. Feldman EL, Callaghan BC, Pop-Busui R, Zochodne DW, Wright DE, Bennett DL, Bril V, Russell JW, Viswanathan V. Diabetic neuropathy. *Nat Rev Dis Primers*. 2019;5(1):42.
7. American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes Care*. 2009 Jan;32 Suppl 1(Suppl 1):S62-7.
8. Tabish SA. Is Diabetes Becoming the Biggest Epidemic of the Twenty-first Century? *Int J Health Sci (Qassim)*. 2007 Jul;1(2):V-VIII.
9. World Health Organization. Diabetes [Internet]. Geneva: World Health Organization; [cited 2023 Nov 22]. Available from: <https://www.who.int/news-room/fact-sheets/detail/diabetes>
10. Yagihashi S, Mizukami H, Sugimoto K. Mechanism of diabetic neuropathy: Where are we now and where to go? *J Diabetes Investig*. 2011 Jan 24;2(1):18-32.
11. Bansal V, Kalita J, Misra UK. Diabetic neuropathy. *Postgraduate medical journal*. 2006;82(964):95-100.
12. Thomas PK. Classification, differential diagnosis, and staging of diabetic peripheral neuropathy. *Diabetes*. 1997;46(Supplement_2):S54-7.
13. Jasmine A, GV A, Durai V, Shriraam V, V S, Mahadevan S. Prevalence of peripheral neuropathy among type 2 diabetes mellitus patients in a rural health centre in South India. *International Journal of Diabetes in Developing Countries*. 2021;41:293-300.
14. Pfannkuche A, Alhajjar A, Ming A, Walter I, Piehler C, Mertens PR. Prevalence and risk factors of diabetic peripheral neuropathy in a diabetics cohort: Register initiative “diabetes and nerves”. *Endocrine and Metabolic Science*. 2020;1(1-2):100053.
15. Abdissa D, Hamba N, Kene K, Bedane DA, Etana G, Muleta D, Gerbi A. Prevalence and Determinants of Peripheral Neuropathy among Type 2 Adult Diabetes Patients Attending Jimma University Medical Center, Southwest Ethiopia, 2019, an Institutional-Based Cross-Sectional Study. *J Diabetes Res*. 2020;2020:9562920.
16. Aleidan FAS, Ahmad BA, Alotaibi FA, Aleesa DH, Alhefdhi NA, Badri M, Abdel Gader AG. Prevalence and Risk Factors for Diabetic Peripheral Neuropathy Among Saudi Hospitalized Diabetic Patients: A Nested Case-Control Study. *Int J Gen Med*. 2020;13:881-889.

17. Bashar MD, Verma M. Prevalence and determinants of diabetic peripheral neuropathy/foot ayndrome in the rural population of North India. *Iberoamerican Journal of Medicine*. 2021;3(1):18-25.
18. Alshammari NA, Alodhayani AA, Joy SS, Isnani A, Mujammami M, Alfadda AA, Siddiqui K. Evaluation of Risk Factors for Diabetic Peripheral Neuropathy Among Saudi Type 2 Diabetic Patients with Longer Duration of Diabetes. *Diabetes Metab Syndr Obes*. 2022;15:3007-3014.
19. Schreiber AK, Nones CF, Reis RC, Chichorro JG, Cunha JM. Diabetic neuropathic pain: Physiopathology and treatment. *World J Diabetes*. 2015;6(3):432-44.
20. Baxi H, Habib A, Hussain MS, Hussain S, Dubey K. Prevalence of peripheral neuropathy and associated pain in patients with diabetes mellitus: Evidence from a cross-sectional study. *Journal of Diabetes & Metabolic Disorders*. 2020 Dec;19:1011- 7.
21. Chobe M, Chobe S, Dayama S, Singh A, Metri K, Basa JR, Raghuram N. Prevalence of Non-Communicable Diseases and Its Associated Factors Among Urban Elderly of Six Indian States. *Cureus*. 2022;14(10):e30123.
22. Joshi D, Khan M, & Singh A. A clinical study of the association and risk factors for lower limb neuropathy in patients with diabetic retinopathy. *Journal of Family Medicine and Primary Care* 2020;9(4):1891.
23. Kärvestedt L, Mårtensson E, Grill V, Elofsson S, Wendt G, Hamsten A. et al.. Peripheral sensory neuropathy associates with micro- or macroangiopathy. *Diabetes Care* 2009;32(2):317-322.
24. Hashemi-Soteh M, Amiri A, Rezaee M, Amiri A, Ahrari R, Amiri A. et al.. Evaluationof glutathione s-transferase polymorphism in iranian patients with type 2 diabetic microangiopathy. *Egyptian Journal of Medical Human Genetics* 2020;21(1).
25. Azeez, T. A., Eguzozie, E. C., & Olalusi, O. V. (2021). Diabetic peripheral neuropathy:a systematic review of nigerian patients. *Libyan International Medical University Journal*, 06(01), 12-18.
26. Kim B, Jung C, Mok J, Kang S, & Kim C. Prevalences of diabetic retinopathy and nephropathy are lower in korean type 2 diabetic patients with non-alcoholic fatty liverdisease. *Journal of Diabetes Investigation* 2013;5(2):170-175.