ISSN: 2091-2889 (online)
2091-2412 (print)

Received: 27 Aug 2025
Accepted: 10 Oct 2025
Published: 31 Dec 2025

DOI: 10.54530/jcmc.1811

OPEN ACCESS

Peripheral neuropathy among patients with type II diabetes attending a teaching hospital Chitwan

Nirmala K.C.[1], Hem Kumari Subba[2], Saurav Khatiwada[3]

[1]Lecturer, Kathmandu Model Hospital, School of Nursing, Nepal
[2]Professor, School of Nursing, Chitwan Medical College, Nepal
[3]Departments of Endocrine Medicine, Chitwan Medical College Teaching Hospital, Nepal

Peer reviewed

Abstract

Introduction: Diabetes is a growing global health concern with significant morbidity and mortality. Diabetic peripheral nephropathy (DPN) is a common debilitating microvascular complication of diabetes mellitus. This study aimed to find peripheral neuropathy among patients with type II diabetes mellitus.

Method: A cross-sectional descriptive study was conducted among patients with type II diabetes mellitus attending endocrine medicine outpatient department of Chitwan Medical College Teaching Hospital, Nepal, during 24 Sep to 22 Oct 2023 Ethical approval was obtained. Data were collected from consecutive eligible patients using a structured interview schedule for socio-demographic and disease-related information, personal habits, and the Michigan Neuropathy Screening Instrument to assess DPN. Data were analysed using IBM SPSS v.23 with descriptive statistics and inferential statistics (chi-square test) to measure associations, and $p<0.05$ considered statistically significant.

Result: Out of 182 patients, females 95(52.2%), 21.4% of patients had mild peripheral neuropathy, none of the patients had moderate and severe peripheral neuropathy. There was significant association between peripheral neuropathy with education (p=0.037), intake of anti-diabetes medicine (p=0.027) and smoking habit (p=0.027) of patients.

Conclusion: Nearly one fourth of type II diabetes mellitus patients have peripheral neuropathy. Hence regular screening is necessary to all diabetes patient to prevent the progression of peripheral neuropathy.

How to cite

KC N, Subba HK, Khatiwada S. Peripheral Neuropathy among Patients with Type II Diabetes Mellitus attending in a Teaching Hospital Bhartapur, Chitwan. Journal of Chitwan Medical College. 2025;15(56):59-74.

Correspondence

Ms. Nirmala K.C., Lecturer, Kathmandu Model Hospital, School of Nursing, Kathmandu, Nepal.
Email: niskcthapa013@gmail.com, Telephone: +977 9840098135

Introduction

There are 589 million people with diabetes globally; 107 million in the South East Asia Region which will rise to 185 million by 2050. In Nepal, 7.7% of adult population suffer from diabetes.[1] Diabetic peripheral neuropathy (DPN) is one of the most common micro vascular complications of type II diabetes mellitus (DM). Neuropathic disorders in diabetes can impair functioning of the central, peripheral and autonomic nervous systems.[2]

The prevalence for DPN range from as low as 0.58% in Kenya to as high as 79.55% in Ukraine.[3] Different studies found that the prevalence of the DPN range from 42% in India[4] and 30.1% in Dubai[5], to 53.6% in Ethiopia.[6] In Nepal, different studies found that DPN were 38.1%, 45.45% to 58.7% respectively.[7-9] High prevalence of neuropathy correlating with older age and long duration disease to be the significant risk factors.[9,10] It is crucial to identify neuropathy early and to treat it accordingly for better outcome. Neuropathy can be prevented through glycaemic control, lifestyle modifications and foot care.[11]

Nepal is also high prevalence region for diabetes and thus prone to have many diabetic people with neuropathies and other chronic complications. This study aimed to investigate prevalence of diabetes peripheral neuropathy among diabetes patients to help in targeted interventions and preventive strategies to mitigate these health risks.

Method

Descriptive cross-sectional design was carried out among type II diabetes mellitus patient. The study setting was the Endocrine OPD of Chitwan Medical College Teaching Hospital. Patients who had been clinically diagnosed with Type II diabetes mellitus for at least 3 months, patients aged above >20 years, patients who were willing to participate were included in the study. Those patients who had known neurological problems (other than documented DPN), lower extremity amputations, known cases of autoimmune disease (other than Hashimoto's thyroiditis), severe osteoarthritis in lower extremity joints, had lower extremity amputation and were on long-term steroid therapy excluded from the study.

Sample size was calculated by using Cochran formula (1977), z^2pq/e^2, considering 38.8% prevalence (p)[7] with 95% confidence level (z=1.96) and a 5% allowable error (e=0.05), Calculated final sample size was 182. Consecutive sampling of patients who came during data collection period and met inclusion criteria were taken as study sample. Hospital data showed 360 diabetes patients attended endocrine OPD during 6 months before study.

A structured interview schedule was used to gather socio-demographic information, disease related variables, along with personal habit-related factors of the respondents. Bio-physiological measurements were taken for height, weight, and blood pressure. Patient records were reviewed for medications, history of other illnesses, and findings of investigations. The physical activity of the respondents was measured using the physical activity questionnaire short form.[12]

The standard Michigan Neuropathy Screening Instrument (MNSI)[13] was used to diagnose DPN. The first part of the MNSI screening instrument consisted of 15 "yes or no" questions regarding foot sensation, encompassing pain, numbness, and temperature sensitivity. Responses of "yes" to items 1-3, 5-6, 8-9, 11-12, 14-15 were counted as one point. A "no" response on items 7 and 13 was counted as 1 point each. Item number 4 was a measure of impaired circulation, and item number 10, a measure of general asthenia, was not included in the scoring. A score of ≥3 was considered positive for DPN. The second part involved a brief physical examination which included: 1) inspecting the feet for deformities, dry skin, and hair or nail abnormalities, calluses, or infections, 2) semi-quantitative assessment of vibration sensation at the dorsum of the great toe, 3) grading ankle reflexes, and 4) monofilament testing.

After examining the patient's extremities, each item was assigned a score of 0 if no finding was

present and a score of 1 if any abnormality was detected. After summing up all the components, the total 22 score had 10 points, and a cut-off value of ≥2 was considered positive for the presence of DPN.[14]

The standard tool MNSI was reliable and valid tool for screening diabetic neuropathy and exhibited internal consistency (Cronbach's alpha) of >0.70.[14]Inter-rater reliability was measured with the assistance of a subject expert (endocrinologist) working in CMC-TH.

Ethical approval was obtained from Chitwan Medical College (CMC-IRC/080/081-129). Written informed consent for literate and verbal informed consent (thumb print) for illiterate patient was obtained prior to data collection. The purpose of the study was clearly explained. The data collection period lasted for 4 weeks, from 2080-6-7 to 2080-7-5 (21 Jun 2023 to 22 22 Oct 2023).

Information related to socio-demographics, diseases, and behavioural patterns were collected through face-to-face interview. Body weight was measured using a digital weighing scale, with patients wearing light clothing and no shoes, height was measured with a stadiometer (Cynor Company). Blood pressure was measured by digital sphygmanometer (OMRON Company) twice, 10 minutes apart, in a sitting position, and averaged.

History using the MNSI questionnaire, focusing on aspects like pain, numbness, and temperature sensitivity were collected. A physical examination was performed using the MNSI tool. During the examination, feet and lower limbs were carefully inspected for visible abnormalities such as calluses, ulcers, infections, or deformities.

Ankle reflexes were assessed using a reflex hammer and a specific reflex test procedure, checking for reflex responses with or without the Jendrassic manoeuvre. A reflex response observed during the test was graded as present, present with reinforcement and absent. Vibration perception at the great toe was assessed using a tuning fork of 128 Hz. The vibration detection test involved evaluating the patient's ability to accurately perceive the difference between a vibrating (128 Hz tuning fork) and a non-vibrating tuning fork when placed on the dorsum of the great toe's bony prominence at the distal interphalangeal (DIP) joint. Inability to detect vibration on one or both great toes was classified as severe neuropathy. Lastly, the monofilament test was performed to assess sensation using a 10 gram monofilament. If the patient correctly responded with "yes" to at least eight out of 10 monofilament applications on each great toe, their sensation was considered normal. If the patient correctly responded with "yes" to one to seven out of 10 monofilament applications on one or both great toes, it indicated reduced sensation. If the patient did not correctly respond with "yes" to any of the 10 monofilament applications on one or both great toes, it indicated absent sensation.

Data were reviewed and verified daily for completeness, consistency, and accuracy. They were then edited, coded, and entered into IBM SPSS version 23 for analysis. Descriptive statistics—including frequency, percentage, mean (SD), and median (IQR)—were used to summarize the data. The association between the status of peripheral neuropathy and selected variables was measured using inferential statistics (Pearson’s chi-square test). A p-value ≤0.05 was considered statistically significant.

Result

Out of 182 patients with diabetes, the mean age was 53.88±11.14 years, and 95(52.2%) were female. Most were Hindu 176(96.7%), married 176(96.7%), and literate 119(65.4%). Nearly half resided in municipalities 87(47.8%), were from nuclear families 102(56.0%), and were farmers 88(48.4%), Table 1.

Among disease characteristics, 80(44.0%) had diabetes for 1–5 years, 156(85.7%) were on oral medication, 83(45.6%) had comorbidities, and 75(41.2%) had a family history of diabetes, Table 2. Clinically, 119(65.4%) had normal BMI, 118(64.8%) had normal blood pressure, and 85(46.7%) had controlled HbA1c. However,

106(58.2%) had high fasting blood sugar and 84(46.2%) had elevated postprandial blood sugar, Table 3. Regarding lifestyle, 106(58.2%) were physically inactive, 6(3.3%) were current smokers, and 25(13.7%) were current alcohol drinkers, Table 4. Finally, 39(21.4%) had mild DPN; no moderate or severe cases were found, Figure 1.

Table 1. Socio-demographics of type II diabetes patients with peripheral neuropathy, n=182

Variables	n(%)
Age group, years, mean±SD=53.88±11.14 (min=22, max=85)	
Young adults (20-39)	20(11.0)
Middle adults (40-59)	106(58.2)
Older adults (≥60)	56(30.8)
Sex	
Male	87(47.8)
Female	95(52.2)
Place of residence	
Rural municipality	10(5.5)
Sub municipality	18(9.9)
Municipality	87(47.8)
Metropolitan city	67(36.8)
Religion	
Hinduism	176(96.7)
Others	6(3.3)
Marital status	
Married	176(96.7)
others #	6(3.3)
Type of family	
Nuclear	102(56.0)
Joint	80(44.0)
Educational status	
Illiterate	63(34.6)
Literate	119(65.4)
Occupation	
Service	31(17.0)
Agriculture	88(48.4)
Business	33(18.1)
Unemployed	30(16.5)

= Buddhist, Christian, Islam, #=Widow/ widower, Divorcee/single

Table2.Type II diabetes patients' disease related information=182

Variables	n(%)
Duration of Diabetes, years, median =7, IQR (Q3-Q1)=11-3, (min=1, max=30)	
1-5.	80(44.0)
>5	102(56.0)
Type of medicine	
Oral hypoglycaemic agent	156(85.7)
Insulin	7(3.9)
Both	19(10.4)
Duration of medicine intake, years, median=6, IQR (Q3-Q1)=10-2, (min=1, max=30)	
1-5	88(48.3)
>5	94(51.7)
Presence of co-morbid condition	
Yes	83(45.6)
No	99(54.4)
Family history of diabetes mellitus	
Yes	75(41.2)
No	107(58.8)

Table 3. Type II diabetes patients' clinical information, n=182

Variables	n(%)
BMI, kg/m2	
Underweight (<18.5)	43(23.6)
Normal Weight (18.5-24.99)	119(65.4)
Overweight /Obesity (≥25)	20(11.0)
Blood pressure status, mm of hg	
Non hypertension (<140/90))	118(64.8)
Hypertension (≥140/90)	64(35.2)
HbA1c blood sugar level (within 3 mo), mmol, median=7.25, IQR (Q3-Q1)=8.80-6.50, (min=5, max=14)	
Controlled (< 7)	85(46.7)
Uncontrolled (≥7)	97(53.3)
Fasting blood sugar level (at the time of examination), mg/dl, median=131.50, IQR (Q3-Q1)=172.25-114.00 (min=70, max=396)	
Control fasting blood sugar (<126)	76(41.8)
Uncontrolled fasting blood sugar (≥126)	106(58.2)
Postprandial blood sugar (at the time of examination), mg/dl, median=194.50, IQR (Q3-Q1)=256-158, (min=78, max=522)	
Controlled (<200)	98(53.8)
Uncontrolled (≥200)	84(46.2)

Table 4. Type II diabetes patients' personal habit, n=182

Variables	n(%)
Physical activity, METs	
Inactive (<600)	106(58.2)
Minimal active (600-1499.99)	56(30.8)
HEPA Active (≥1500)	20(11.0)
Smoking habit	
Never smoke	146(80.2)
Current smoker	6(3.3)
Former smoker	30(16.5)
Alcohol habit	
Current drinker	25(13.7)
Ex- drinker	26(14.3)
Never drinker	131(72.0)

HEPA Active=Health-Enhancing Physical Activity, METs: -Metabolic equivalents

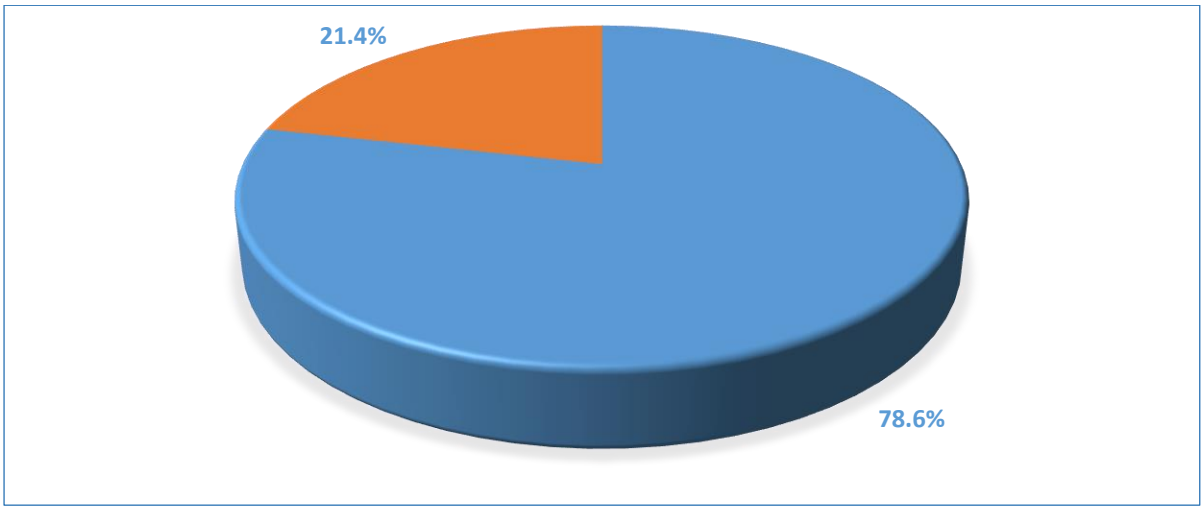

Figure 1. Status of peripheral neuropathy among type II diabetes patients, n=182

Table 5. Association between status of peripheral neuropathy with socio-demographic variable of respondents, n=182

Variables	Status of diabetes peripheral neuropathy No neuropathy n(%)	Mild neuropathy n%)	χ2	p-value
Age group				
Young adults	18(90.0)	2(10.0)		
Middle age	80(75.5)	26(24.5)	1.743	0.254[f]
Old age	45(80.4)	11 (19.6)		
Sex				
Male	68 (78.2)	19 (21.8)	0.017	0.897
Female	75(78.9)	20(21.1)		
Educational status				
Illiterate	44(69.8)	19(30.2)	4.362	0.037
Literate	99(83.2)	20(16.8)		
Type of family				
Nuclear family	82(80.4)	20(19.6)	0.457	0.499
Joint family	61(76.3)	19(23.8)		

Level of Significant at α=0.05, f=fisher test

Table 6. Association between status of peripheral neuropathy with disease related factors and personal habit, n=182

Variables	No neuropathy n(%)	Mild neuropathy n(%)	X^2	p-value
Duration of diabetes mellitus, years				
1-5	64(80.0)	16(20.0)	0.173	0.677
>5	79(77.5)	23(22.5)		
Hba1c, mmol				
Controlled blood sugar level (<7)	74(87.1)	11(12.9)	6.824	0.09
Uncontrolled blood sugar level (≥7)	69(71.1)	28(28.9)		
BMI, kg/m2				
Underweight (<18.5)	35(81.4)	8(18.6)	1.089	0.580
Normal weight (18.5-24.99)	94(79)	25(21)		
Overweight /obesity (≥25)	14(70.0)	6(30.0)		
Family history of diabetes mellitus				
Yes	54(72.0)	21(28.0		0.070
No	89(83.2)	18(16.8)		
Type of medicine				
Oral	127(81.4)	29(18.6)	7.212	0.027
Insulin	3(42.9)	4(57.1)		
Both	13(68.4)	6(31.6)		
Presence of co-morbidity				
Yes	67(80.7)	16(19.3)	0.419	0.517
No	76(76.8%)	23(23.2)		
Blood pressure status				
Non hypertension	92(78.0)	26(22.0)	0.073	0.787
Hypertension	51(79.7)	13(20.3)		
Physical activities				
Inactive	85(80.2)	21(19.8)	3.413	0.181
Minimum active	40(71.4)	16(28.6)		
Hepa active	18(90.0)	2(10.0)		
Smoking habit				
Never-smoking	120(82.2)	26(17.8)		0.027[f]
Current- smoker	3(50.0)	3(50.0)		
Former-smoking	20(66.7)	10(33.3)		
Alcohol habit				
Never drinker	105(80.2)	26(19.8)	0.759	0.684
Current drinker	19(76.0)	6(24.0)		
Ex-drinker	19(73.1)	7(26.9)		

Level of significant at α=0.05, f= fisher exact test

Discussion

This study found nearly one fourth (21.4%) of patients had mild DPN and 78.6% had no neuropathy. This is similar to study conducted in Libya where 30.5% had suffered from peripheral neuropathy.[15] Similarly, a longitudinal study conducted in 14 different countries found that the prevalence of DPN was 26.71%, whereas country-specific prevalence showed considerable variation.[3] This study is slightly lower than the studies from Jordan and China reported that prevalence of peripheral neuropathy was 39.5% and 33.1% respectively.[16,17] Different studies have shown that higher prevalence of DPN compared to the finding of this study. A study conducted in China showed that the prevalence of DPN was 53.6%.[6]

Similarly in Ethiopia, the prevalence of DPN was found 52.2%.[18] Moreover, other different studies also reported high prevalence of DPN where 52% in Yemen, 45.7% in Iran, and 67.6%in China respectively.[19-21]

This study found that none of the patients had moderate or severe diabetic peripheral neuropathy, which contrasts with reports from global prevalence studies. This may be nearly half of the participants (46.7%) had controlled HbA1c levels, potentially reducing progression to advanced neuropathy. Additionally, the Michigan Neuropathy Screening Instrument (MNSI), while widely used and validated as a screening tool, is primarily sensitive for detecting early or mild neuropathic changes and may under-detect or misclassify moderate to severe neuropathy in the absence of confirmatory investigations such as nerve conduction studies. Finally, the findings may reflect a genuinely lower progression to severe neuropathy within this cohort, possibly due to effective early detection, timely intervention, and ongoing diabetes management at the study centre.

Education status had showed significant association with the development of DPN in the present study (p=0.037). Illiterates tend to have poor self-care in diabetes in China and in Ethopia.[22,23] This could be because people who lack literacy may disregard their physical well-being, which leads to poor medication compliance and ultimately poor glycaemic control. Type of medicine intake was significant with DPN (p=.027). The anti-hyperglycaemic medications may help to decrease the effect that glycaemic control on the development and progression of diabetic neuropathy.[24]Similar result explored by this study. But another study in Assam reported that there was no signification association between anti-diabetes medicines with DPN.[25]

In this study, smoking was significant association with DPN (p=0.027) which is consistent with the different studies conducted in Vietnam and in India.[26-28] The association between smoking and DPN can be explained by the fact that smoking induces neuropathy through neuronal ischaemia from endothelial damage, increased inflammation, oxidative stress, disturbance of glucose metabolism, and direct neurotoxic effects on the neurones.

This study found that there was no association between DPN with age and sex. But different studies conducted in India and Ethiopia reported that age was association with DPN respectively.[6,18,20,28] Female diabetic patients were more likely to develop DPN than male patients. Similarly, sex-specific predisposition to DPN has been observed with female preponderance.[29,30] These discrepancies might due to differences in demographic characteristics. This study found that there was no significant association with duration of disease and DPN. Contrary to this finding, various study findings reported that duration of diabetes is independent risk factors of DPN which leads to micro vascular complication.[6,29-33] Discrepancies might be due to different demography of the study population, cultural settings, and management of healthcare.

This study finding revealed that HbA1c was not significantly association with DPN. This is similar finding to study conducted in Jordan.[16]But a study conducted in Tiwan and Yaman which explored that significant linear trend in DPN incidence with increasing HbA1c.[34,35] This discrepancy variations due to differences in geographical regions, and environmental factors.

There was no significant association between BMI and DPN in this study. This finding concurred with other studies[29,31,36]wherein anthropometric variables were not identified as risk factors. Both lower BMI and higher BMI were risk factors for DPN. Lower and Higher BMI might imply a nutritional imbalance that could contribute to the neuropathy. Our study found there was no significant association with the blood pressure status and DPN. But a longitudinal study conducted in 14 countries which explored hypertension is strong independent risk factors of DPN in United Kingdom.[3,26] These differences might be due to differences in population selection.

This study found that there was no significant association with physical activities and DPN. This is similar to study which reported physical inactivity was not a significant predictor of DPN in patients with DM in Sri Lanka and Jordan.[37] Contrary to this study, physical activities independently predict DPN in South Ethiopia[6] and in North Ethiopia.[18] Good glycaemic control and appropriate physical activity are linked to a lower risk of neuropathy.[38,39]

This study was not association between alcohol and DPN. This finding is similar to study conducted in Assam.[25] Contrary to this finding which reported that alcohol is risk factor for developing DPN in India.[40] The direct poisoning of the nerve by alcohol and the effect of poor nutrition associated with alcohol.

This study adds to the information regarding peripheral neuropathy among individuals with type II diabetes mellitus in our context and this finding might be helpful for DPN screening program and support services regarding peripheral neuropathy for early identification, appropriate treatment and management to ensure the prevention of peripheral neuropathy for patients and family members. This finding might be helpful for conducting awareness program regarding diabetes and its micro vascular complications such as peripheral neuropathy among diabetes patients. Still this study has certain limitations: (i) This study is conducted in a single setting among OPD attendant patients with DM II so the results may not be generalized to other settings (ii) non-probability purposive sampling technique was used for data collection which do not gave the randomization (iii) This is cross-sectional study so it cannot prove the causal relationship between variables.

Conclusion

In conclusion, this study showed that nearly one fourth of the type II diabetes patient had peripheral neuropathy. Education, smoking habits, and type of diabetic medicine tent to influence the peripheral neuropathy. Thus it is important to timely screening for early detection of DPN that can help to take necessary actions to prevent the progression of peripheral neuropathy among individuals with type II diabetes mellitus.

Author contribution

Conception, design: All; Data acquisition: NKC; Data analysis, interpretation: All; Drafting: All; Revision: All; Final approval of the version to be published: All; Agreement to be accountable for all aspects of the work: All.

Acknowledgment

None

Conflict of interest

None

Funding

None

Supplementary material

Data and supplementary material that support the findings of this study are available from the corresponding author upon reasonable request.

References

1. International Diabetes Federation. IDF Diabetes Atlas Nepal. The Fact Sheet. 2024. Link
2. Katulanda P, Ranasinghe P, Jayawardena R, Constantine GR, Sheriff MH, Matthews DR. The prevalence, patterns and predictors of DPNin a developing country. DiabetolMetabSyndr. 2012 May 29;4(1):21. DOI PubMed Google Scholar Full Text
3. Lu Y, Xing P, Cai X, Luo D, Li R, Lloyd C, Sartorius N, Li M. Prevalence and Risk Factors for DPNin Type 2 Diabetic Patients From 14 Countries: Estimates of the INTERPRET-DD Study. Front Public Health. 2020 Oct 20;8:534372. DOI PubMed Google Scholar Full Text
4. Bashar MD, Verma M. Prevalence and determinants of diabetic peripheral neuropathy/foot ayndrome in the rural population of North India. Iberoam J Med. 2021;3(1):18-25. DOI Google Scholar Full Text
5. Sendi RA, Mahrus AM, Saeed RM, Mohammed MA, Al-Dubai SAR. DPNamong Saudi diabetic

patients: A multicenter cross-sectional study at primary health care setting. J Family Med Prim Care. 2020 Jan 28;9(1):197-201. DOI PubMed Google Scholar Full Text
6. 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 Jun 29;2020:9562920. DOI PubMed Google Scholar FullText
7. Shrestha HK ,Katwal PC . Prevalence and Risk Factors of DPNin T2DM Patient Presenting to Community Hospital in Nepal. Kathmandu Univ Med J (KUMJ). 2017 Apr-Jun;17(58):146-9. PubMed Google Scholar Full Text
8. Karki D, Nagila A, Dhakal N, Chhetri S. Prevalence of peripheral neuropathy in diabetes mellitus and its association with therapy, ethnicity and duration of diabetes mellitus. Asian J of Med Sc. 2019;10(1):72-6. DOI Google Scholar Full Text
9. Karki DB, Yadava SK, Pant S, Thusa N, Dangol E, Ghimire S. Prevalence of Sensory Neuropathy in Type 2 Diabetes Mellitus and Its Correlation with Duration of Disease. Kathmandu Univ Med J (KUMJ). 2016 Apr-Jun;14(54):120-24. PubMed Google Scholar
10. Safitri VA, Rosdiana D, Astari RV. GambaranHasilPemeriksaanMonofilamenpada Pasien Diabetes Melitus (DM) yang BerkunjungkePoliklinikPenyakitDalam RSUD ArifinAchmadProvinsi Riau. JurnalIlmuKedokteran. 2018;11(2):34–9. Google Scholar
11. Smith S, Normahani P, Lane T, Hohenschurz-Schmidt D, Oliver N, Davies AH. Prevention and Management Strategies for Diabetic Neuropathy. Life (Basel). 2022 Aug 3;12(8):1185. DOI PubMed Google Scholar Full Text
12. Craig C, Marshall A, Sjostrom M, Bauman A, Lee P, Macfarlane D, Lam T, Stewart S. International physical activity questionnaire-short form. J Am Coll Health. 2017;65(7):492-501. Google Scholar FullText
13. Feldman EL, Stevens MJ, Thomas PK, Brown MB, Canal N, Greene DA. Michigan Neuropathy Screening Instrument. Diabetes Care.1994. APA PsycTests. DOI Google Scholar
14. Barbosa M, Saavedra A, Severo M, Maier C, Carvalho D. Validation and Reliability of the Portuguese Version of the Michigan Neuropathy Screening Instrument. Pain Pract. 2017 Apr;17(4):514-21. DOI Google Scholar
15. Elbarsha A, Hamedh M, Elsaeiti M. Prevalence and risk factors of DPNin patients with type 2 diabetes mellitus. Ibnosina J of Med and Bio Sci. 2019 Mar;11(01):25-8. DOI Google Scholar FullText
16. Khawaja N, Abu-Shennar J, Saleh M, Dahbour SS, Khader YS, Ajlouni KM. The prevalence and risk factors of peripheral neuropathy among patients with type 2 diabetes mellitus; the case of Jordan. DiabetolMetabSyndr. 2018 Feb 21;10:8. DOI PubMed Google Scholar FullText
17. Li L, Chen J, Wang J, Cai D. Prevalence and risk factors of DPNin Type 2 diabetes mellitus patients with overweight/obese in Guangdong province, China. Prim Care Diabetes. 2015 Jun;9(3):191-5. DOI PubMed Google Scholar
18. Jember G, Melsew YA, Fisseha B, Sany K, Gelaw AY, Janakiraman B. Peripheral Sensory Neuropathy and associated factors among adult diabetes mellitus patients in Bahr Dar, Ethiopia. J Diabetes MetabDisord. 2017 Apr 4;16:16. DOI PubMed GoogleScholar FullText
19. Basebaa AS, Musiaan NS, Mahross AH. Prevalence and Risk Factors of Diabetic Peripheral Neuropathy: A cross-sectional study from Yemen. Ain Shams Med J. 2024 Mar 1;75(1):201-13. DOI Google Scholar FullText
20. Kiani J, Moghimbeigi A, Azizkhani H, Kosarifard S. The prevalence and associated risk factors of peripheral diabetic neuropathy in Hamedan, Iran. Arch Iran Med. 2013; 16(1): 17 – 19. PubMed Google Scholar FullText
21. Wang W, Ji Q, Ran X, Li C, Kuang H, Yu X, Fang H, Yang J, Liu J, Xue Y, Feng B, Lei M, Zhu D. Prevalence and risk factors of diabetic peripheral neuropathy: A population-based cross-sectional study in China. Diabetes Metab Res Rev. 2023 Nov;39(8):e3702. DOI PubMed Google Scholar
22. Bai A, Tao J, Tao L, Liu J. Prevalence and risk factors of diabetes among adults aged 45 years or older in China: A national cross-sectional study. Endocrinol Diabetes Metab. 2021 May 24;4(3):e00265.DOI Google Scholar FullText
23. Tefera YG, Gebresillassie BM, Emiru YK, Yilma R, Hafiz F, Akalu H, Ayele AA. Diabetic health literacy and its association with glycemic control among adult patients with type 2 diabetes mellitus attending the outpatient clinic of a university hospital in Ethiopia. PLoS One. 2020 Apr 8;15(4):e0231291. DOI PubMed Google Scholar FullText
24. Ang L, Jaiswal M, Martin C, Pop-Busui R. Glucose control and diabetic neuropathy: lessons from recent large clinical trials. CurrDiab Rep. 2014;14(9):528. DOI PubMed Google Schloar FullText

25. Dutta SJ, Dutta PK, Dutta A, Ahmed SJ, Sonowal S, Boruah A. Prevalence and risk factors of peripheral neuropathy among young type 2 diabetes mellitus patients attending a tertiary care hospital in upper Assam: A cross-sectional study. J of Diabetology. 2023 Jul 1;14(3):149-56. DOI Google Scholar FullText
26. Dinh Le T, Phi Thi Nguyen N, ThanhThi Tran H, Luong Cong T, Ho Thi Nguyen L, Do Nhu B, Tien Nguyen S, Van Ngo M, TrungDinh H, Thi Nguyen H, Trung Nguyen K, Le DC. DPNAssociated with Cardiovascular Risk Factors and Glucagon-Like Peptide-1 Concentrations Among Newly Diagnosed Patients with Type 2 Diabetes Mellitus. Diabetes MetabSyndrObes. 2022 Jan 6;15:35-44. DOI PubMed Google Scholar FullText
27. Yeboah K, Puplampu P, Boima V, Antwi DA, Gyan B, Amoah AGB. Peripheral sensory neuropathy in type 2 diabetes patients: A case control study in Accra, Ghana. J ClinTranslEndocrinol. 2016 Jul 20;5:26-31. DOI PubMed Google Scholar FullText
28. D'Souza M, Kulkarni V, Bhaskaran U, Ahmed H, Naimish H, Prakash A, S T, Dahiya B, Thapar R, Mithra P, Kumar N, Holla R, Bb D, Kumar A. DPNand its Determinants among Patients Attending a Tertiary Health Care Centre in Mangalore, India. J Public Health Res. 2015 Jul 30;4(2):450. DOI PubMed GoogleScholar FullText
29. Jatooi NA, Alsulaiman ASA, Alromaih NJ, Abdullah Albahrani B, Alkhattaf IM, Alyami F, Alabdrabalrasol KA. Prevalence of DPNamong type2 diabetic patients in King Fahd University Hospital, Khobar, Kingdom of Saudi Arabia. HospPract (1995). 2021 Apr;49(2):63-70. DOI PubMed Google Scholar
30. Lian X, Qi J, Yuan M, Li X, Wang M, Li G, Yang T, Zhong J. Study on risk factors of DPNand establishment of a prediction model by machine learning. BMC Med Inform DecisMak. 2023 Aug 2;23(1):146. DOI PubMed Google Scholar FullText
31. 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 J EndocrinolMetab. 2017 Sep-Oct;21(5):665-669. DOI PubMed Google Scholar FullText
32. Liu X, Xu Y, An M, Zeng Q. The risk factors for diabetic peripheral neuropathy: A meta-analysis. PLoS One. 2019 Feb 20;14(2):e0212574. DOI PubMed Google Scholar FullText
33. Chali SW, Salih MH, Abate AT. Self-care practice and associated factors among Diabetes Mellitus patients on follow up in BenishangulGumuz Regional State Public Hospitals, Western Ethiopia: a cross-sectional study. BMC Res Notes. 2018 Nov 26;11(1):833. DOI PubMed Google Scholar FullText
34. Yang CP, Lin CC, Li CI, Liu CS, Lin WY, Hwang KL, Yang SY, Chen HJ, Li TC. Cardiovascular Risk Factors Increase the Risks of DPNin Patients With Type 2 Diabetes Mellitus: The Taiwan Diabetes Study. Medicine (Baltimore). 2015 Oct;94(42):e1783. DOI PubMed Google Scholar FullText
35. ali AY, Azuhairi AA, Hejar AR, Amani YW. Prevalence and associated risk factors of DPNamong diabetic patients in national center of diabetes in Yemen. International Journal of Public Health and Clinical Sciences. 2014 Sep 6;1(1):141-50. Google Scholar FullText
36. 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. J Diabetes Investig. 2014 Nov;5(6):714-21. DOI PubMed Google Scholar FullText
37. Ashok P, Kharche JS, Raju R, Godbole G. Metabolic equivalent task assessment for physical activity in medical students. National J of Physi, Pharm and Pharmacology. 2017;7(3):236. DOI Google Scholar FullText
38. Kluding PM, Bareiss SK, Hastings M, Marcus RL, Sinacore DR, Mueller MJ. Physical Training and Activity in People With Diabetic Peripheral Neuropathy: Paradigm Shift. PhysTher. 2017 Jan 1;97(1):31-43. DOI PubMed Google Scholar FullText
39. Loprinzi PD, Hager KK, Ramulu PY. Physical activity, glycemic control, and diabetic peripheral neuropathy: a national sample. J Diabetes Complications. 2014 Jan-Feb;28(1):17-21. DOI PubMed Google Scholar
40. Bethiun S, Premaraja R, Kabilan D, Kiran KP. Study of prevalence and determinants of peripheral neuropathy in patients with type 2 diabetes mellitus. MedPulseInt J of Physiology. June 2021;18(3):10-14.DOI FullText

Questionnaire/tools

Research Instrument

"Structure Interview Schedule to finding the peripheral neuropathy among patients with type 2 diabetes mellitus ''

Code no: …….. **Date of Interview: ……**

Place: Medical Out Patient Department, CMC-TH

Direction: Researcher ticks (√) in the box for the appropriate answer provided to the closed ended question according to respondent view point and researcher fill the answer within space provided to the open- ended questions.

Part: I **Question related to socio-demographic information**

SN	Questions	Response
1	What is your age? (completed in years)	……
2	Sex a) Male ( ) b) Female ( )	
3	What is your educational status? a) Illiterate b) Literate	
4	If literate, what is your educational level? a) Primary level b) Secondary level c) Bachelor d) Master e) Masters above	
5	Marital status a) Married b) Unmarried c) Widow /Widower d) Divorcee/ Single	
6	What is your occupation? a) Homemaker b) Agriculture c) Service d) Business e) Labor daily wages f) Others	
7	What is your ethnicity? a) Brahmin b) Chhetri c) Dalit d) Janajati e) Others	
8	What is your place of residence? a) Rural municipality b) Sub Municipality c) Municipality d) Metropolitan city	
9	What Is your status of family income?	

	a) Enough for 3 month b) Enough for 6month c) Enough for 1 year d) Enough for > 1 year	
10	What is your family type? a) Nuclear b) Joint	
11	What is your religion? a) Hinduism b) Buddhist c) Christianity d) Islam e) Others	

12 .Anthropometric Measurements

Content		
Weight (kg)		
Height (cm)		
Blood Pressure	Systolic :-	Diastolic:-

13. Lab Investigation

Name of Investigation	Findings	Normal Range
HbA1c		
Fasting Blood sugar		
Postprandial Blood Sugar		
Cholesterol		

Part II: Questions related to disease related information

SN	Question	Response
14	Since how long you have been suffered from diabetes mellitus? (in completed month)	……
15	Do you have a Family History of Diabetes Mellitus? a) Yes b) No	
16	If yes, what is the relationship?	……
17	What type of medication are you taking? a) Oral hypoglycemic agents b) Insulin c) Both	
18	Do you take regular anti diabetic medicine? a) Yes b) No	

19	Do you have any other co-morbid condition? a) Yes b) No If yes, please specify……..	

Part IV: Questions related to lifestyle risk factors

SN	Question	Response
	Question related exercise	
20.1	Do you perform exercise regularly? a) Yes b) No	
20.2	During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling a) _____ days per week No vigorous physical activities • Skip to question 20.3 question	
20.3	How much time did you usually spend doing vigorous physical activities on one of those days a)_____ hours per day b)_____ minutes per day Don't know/Not sure	
20.4	During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking. a) _____ days per week b) ------- No moderate physical activities Skip to question 20.5	
20.5	How much time did you usually spend doing moderate physical activities on one of those days? a) _____ hours per day b) _____ minutes per day Don't know/Not sure	
20.6	During the last 7 days, on how many days did you walk for at least 10 minutes at a time? a) _____ days per week b) No walking Skip to next question 20.7	
20.7	How much time did you usually spend walking on one of those days? a) _____ hours per day b) _____ minutes per day Don't know/Not sure	
20.8	During the last 7 days, how much time did you spend sitting on a week day? a) _____ hours per day b) _____ minutes per day Don't know/Not sure	
	Question related smoking	
21.1	Do you have smoking? a) Non smoker b) Current smoker c) Ex-smoker	
21.2	If current smoker, What is your smoking status? a) Light Smoker (≤10cigarettes daily) b) Moderator smoker (≤ 20cigarettes daily) c) Heavy smoker (≥20 cigarettes daily)	

	Question related alcohol	
22	Have you ever consume alcohol? a) Never b) Social drinker: festival c) Occasional drinker d) Daily consumption e) Ex-alcoholic	

MICHIGAN NEUROPATHY SCREENING INSTRUMENT

A. History

SN	Statements	Yes	No
1	Are your legs and/or feet numb?		
2	Do you ever have any burning pain in your legs and/or feet?		
3	Are your feet too sensitive to touch?		
4	Do you get muscle cramps in your legs and/or feet?		
5	Do you ever have any prickling feelings in your legs or feet?		
6	Does it hurt when the bed covers touch your skin?		
7	When you get into the tub or shower, are you able to tell thehot water from the cold water?		
8	Have you ever had an open sore on your foot?		
9	Has your doctor ever told you that you have diabetic neuropathy?		
10	Do you feel weak all over most of the time?		
11	Are your symptoms worse at night?		
12	Do your legs hurt when you walk?		
13	Are you able to sense your feet when you walk?		
14	Is the skin on your feet so dry that it cracks open?		
15	Have you ever had an amputation?		
	Total		

B. Physical Assessment

1.	.**Appearance of Feet**	Right Foot		Left Food	
A	Normal	Yes	No	Yes	No
B	If no, check all that apply				
	Deformities				
	Dry skin, Callus				
	Infection				
	Fissure				
	Other Specify				
2.	**Ulceration**				

3. Ankle Reflexes

Right Foot	Left Foot

Present	Present/Reinforcement	Absent	Present	Present/Reinforcement	Absent

4.Vibration perception at great toe

Right Foot			Left Foot		
Present	Reduced	Absent	Present	Reduced	Absent

5.10 gm filament (number of applications detected out of 10 applications):

Right Foot			Left Foot		
Present (≥8)	Reduced(1-7)	Absent(0)	Present(≥8)	Reduced(1-7)	Absent(0)