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Evaluation of Diabetic Peripheral Neuropathy by Neuropathy Symptom Score and Neuropathy Disability Score: A Cross-Sectional Study

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ABSTRACT

Background: Diabetic peripheral neuropathy (DPN) is a common and progressive complication of diabetes mellitus, contributing significantly to morbidity and reduced quality of life. Early identification through simple clinical tools such as the Neuropathy Symptom Score (NSS) and Neuropathy Disability Score (NDS) is essential for timely intervention. The present study aims to assess the prevalence and severity of DPN among diabetic patients using NSS and NDS, and to determine gender-related differences in neuropathic patterns and sensory deficits.
Methods: A cross-sectional study was conducted among 100 diabetic patients. NSS was used to evaluate subjective neuropathic symptoms, and NDS to assess objective sensory deficits including vibration, pain, temperature perception, and ankle reflex. Data were analyzed using SPSS version 20.0 with $p < 0.05$ considered statistically significant.
Results: Based on NSS, 40% of participants were asymptomatic (scores 0–2), 28% had mild symptoms (3–4), 18% moderate (5–6), and 14% severe (7–9). According to NDS, 65% had normal scores (0–2), 10% mild deficits (3–5), and 25% moderate deficits (6–8). DPN was present in 29% of participants with 16 males and 13 females. Among these, 86.2% had NDS ≥ 6 (moderate to severe neuropathy), while 13.8% (all females) exhibited NDS 3–5 with NSS ≥ 5, indicating early symptomatic neuropathy. Sensory evaluation revealed vibration loss in 86.2%, pain abnormalities in 68.9%, temperature loss in 51.7%, and ankle reflex impairment in 44.8% of DPN cases.
Conclusion: The combined application of NSS and NDS provides an effective and practical approach for the early detection and grading of DPN. Incorporating these tools into routine diabetes evaluation can aid in identifying high-risk patients, enabling timely preventive and therapeutic strategies.

Keywords: Diabetic peripheral neuropathy, Neuropathy Symptom Score, Neuropathy Disability Score, sensory deficit, vibration perception, diabetes mellitus

INTRODUCTION

Diabetes mellitus (DM) is one of the most prevalent metabolic disorders globally, characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both. According to the

International Diabetes Federation (IDF), over 500 million adults are currently living with diabetes worldwide, and this number is projected to rise significantly in the coming decades, particularly in developing nations such as India.[1,2] India, often referred to as the "diabetes capital of the world," harbors an enormous and growing population of individuals at risk for diabetes-related complications. Among these, diabetic peripheral neuropathy (DPN) remains one of the most common and disabling microvascular complications. DPN is defined as a symmetrical, length-dependent sensorimotor polyneuropathy attributable to metabolic and microvessel alterations as a consequence of prolonged hyperglycemia and related metabolic derangements.[3] It affects approximately 30–50% of individuals with diabetes, though prevalence varies depending on diagnostic criteria, population characteristics, and disease duration.[4] The condition not only leads to significant morbidity in the form of neuropathic pain, paresthesia, and sensory loss but also predisposes patients to foot ulcers, infections, and lower-limb amputations. The associated decline in quality of life and increase in healthcare burden make DPN a major public health concern.

The pathogenesis of DPN is multifactorial, involving complex metabolic and vascular mechanisms. Chronic hyperglycemia triggers oxidative stress, sorbitol pathway activation, microvascular ischemia, and advanced glycation end-product formation, which collectively contribute to nerve fiber damage. Factors such as poor glycemic control, obesity, dyslipidemia, hypertension, and smoking further amplify the risk.[5] Early identification and quantification of neuropathy are therefore essential for preventing irreversible neuronal injury and long-term complications. A major challenge in the clinical evaluation of DPN lies in the early and objective assessment of nerve dysfunction. While electrophysiological studies remain the gold standard, their limited availability, cost, and time requirements restrict their use in routine clinical settings, especially in resource-limited environments. Hence, bedside scoring systems such as the Neuropathy Symptom Score (NSS) and Neuropathy Disability Score (NDS) have gained prominence as reliable, simple, and validated clinical tools for diagnosing and grading DPN.

The Neuropathy Symptom Score (NSS) focuses on subjective symptoms reported by patients, including burning, numbness, tingling, fatigue, and nocturnal worsening. Each symptom is graded based on its severity, site, and temporal pattern. The total score (ranging from 0–9) categorizes neuropathy as normal (0–2), mild (3–4), moderate (5–6), or severe (7–9).[6,7] It serves as a sensitive measure for early symptomatic neuropathy, even before the appearance of overt sensory loss. In contrast, the Neuropathy Disability Score (NDS) objectively evaluates sensory and motor deficits through bedside clinical examination. Parameters assessed include vibration perception (using a 128-Hz tuning fork), temperature discrimination, pin-prick sensation, and ankle reflexes.[8] Each abnormal finding is scored, and the total score (0–10) classifies neuropathy as normal (0–2), mild (3–5), moderate (6–8), or severe (9–10). NDS provides a quantifiable estimate of nerve impairment and correlates well with electrophysiological findings, making it a practical tool for grading neuropathic disability in clinical and research settings. While numerous studies have explored DPN in Western populations, data from the Indian subcontinent remain limited, despite the country's rapidly increasing diabetic population.[9,10] Variations in genetic predisposition, dietary habits, glycemic control, and healthcare access make it imperative to assess DPN in regional contexts. Furthermore, comprehensive studies combining symptom-based (NSS) and disability-based (NDS) scoring with sensory testing parameters are scarce, yet such multidimensional assessment is crucial for

understanding the clinical spectrum and severity of DPN.Therefore, the present study was designed to determine the prevalence, grading, and clinical correlates of diabetic peripheral neuropathy among patients with type 2 diabetes mellitus attending a tertiary care hospital in North India. Using standardized scoring systems (NSS and NDS), the study aimed to assess both the subjective and objective components of neuropathy and to correlate these findings with sensory modalities (pain, temperature, vibration perception, and ankle reflex) as well as metabolic parameters. Such an approach not only provides a comprehensive understanding of DPN burden but also aids in developing effective screening strategies for early detection and management in clinical practice.

MATERIALS AND METHODS

This cross-sectional observational study was conducted at the Postgraduate Department of Physiology in collaboration with the Department of Medicine, Government Medical College and Hospital, Jammu for a period of one year w.e.f. November 2018 to October 2019. A total of 100 adult patients (aged 18–70 years) with newly diagnosed type 2 diabetes mellitus (diagnosis within 6 months) attending the outpatient department of Medicine, GMC Jammu, were consecutively enrolled after providing written informed consent. Patients with other causes of peripheral neuropathy (e.g., chronic alcohol use, hypothyroidism, vitamin B12 deficiency, malignancy, chemotherapy) were excluded. Ethical approval was obtained from the Institutional Ethics Committee bearing number: JEC|GMZo|2019|771

Clinical and Demographic Data: Demographic details (age, sex), duration of diabetes, duration of symptoms prior to diagnosis, smoking status and hypertension history were recorded. Height and weight were measured with participants in light clothing and without shoes; body mass index (BMI) was calculated as weight (kg) divided by height (m)^2. Blood pressure was measured after a 10-minute rest using a calibrated automated sphygmomanometer.

Neuropathy Assessment – NSS and NDS: For the Neuropathy Disability Score (NDS), four objective neurological parameters: pain, temperature, vibration perception, and ankle reflexes were systematically assessed in all participants following the standardized method described by Young et al. (1993). Vibration perception was evaluated using a 128 Hz tuning fork applied to the hallux of the great toe. The participant was asked to indicate when vibration was first perceived and when it ceased. Temperature sensation was assessed by gently applying the cold prong of a tuning fork to the dorsum of the great toe. Pain perception was tested using a sterile pin-prick stimulus at the proximal part of the great toe, exerting just enough pressure to depress the skin. The response was recorded as present if the participant could clearly distinguish sharpness, and absent if not. Each of the three sensory modalities (pain, temperature, vibration) was scored as 0 if normal and 1 if absent, reduced, or uncertain. The Achilles tendon reflex was examined using a standard reflex hammer. It was graded as 0 if present normally, 1 if elicited only with reinforcement, and 2 if absent. The total NDS ranged from 0 to 10, representing the cumulative deficit across modalities. The severity of neuropathic involvement was categorized as follows:

- Mild: 3–5
- Moderate: 6–8
- Severe: 9–10

The diagnosis of diabetic peripheral neuropathy (DPN) was established based on both subjective symptoms and objective signs: DPN was considered present when moderate to severe signs were identified with or without symptoms, or when mild signs coexisted with moderate to severe symptoms, as per the criteria proposed by Young MJ et al. (1993).[7]

Sensory Examination

In addition to NSS/NDS scoring, specific sensory modalities were examined:

- Pin-prick (sharp sensation) using a disposable Neuropen device bilaterally at the dorsum of the feet
- Temperature sensation (cold/hot discrimination) using thermo-tubes
- Vibration perception using a 128-Hz tuning fork at the great toe until the patient no longer perceives vibration
- Ankle reflex (Achilles) assessed with reflex hammer, with reinforcement if needed

  The number and percentage of patients with abnormal sensation in each modality were recorded.

Laboratory Investigations

After overnight fasting, blood samples were collected for measurement of HbA1c (high-performance liquid chromatography), fasting plasma glucose, post-prandial plasma glucose, total cholesterol, LDL-cholesterol, HDL-cholesterol and triglycerides. Standard laboratory procedures were followed. The results were expressed as mean ± SD and compared by neuropathy status.

In our study, diabetic peripheral neuropathy (DPN) was defined according to the criteria proposed by Young et al., wherein DPN was considered present in patients with moderate to severe signs of neuropathy (NDS ≥6) irrespective of symptoms, or in those with mild signs (NDS 3–5) accompanied by moderate to severe symptoms (NSS ≥5).[7]

Statistical Analysis

Data were analyzed using SPSS version 20.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. The distribution of Neuropathy Symptom Score (NSS), Neuropathy Disability Score (NDS), and sensory abnormalities was analyzed. Associations between categorical variables, including gender and the presence of diabetic peripheral neuropathy, were evaluated using Pearson's Chi-square test. When the assumptions of the Chi-square test were not met, particularly when expected cell frequencies were less than five, Fisher's exact test was applied. As such the association between gender and neuropathy severity category among patients with diabetic peripheral neuropathy was evaluated using Fisher's exact test. A two-tailed p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 100 patients were enrolled in the present study. The mean age of the study population was 44.31 years, with ages ranging from 38 to 61 years. The majority of participants (65%) belonged to the 40–49-year age group, comprising 26% females and 39% males, indicating that middle-aged adults formed the predominant study cohort. This distribution reflects the higher susceptibility of individuals in this age range to diabetic complications such as peripheral neuropathy.

Table 1: Distribution of Neuropathy Symptom Score (NSS) and Neuropathy Disability Score (NDS) among Study Population (Gender-wise)

Score Type	Score Category	Score Range	Female (n=48)	Male (n=52)	Total (n=100)
Neuropathy Symptom Score (NSS)	Normal	0 – 2	18	22	40
	Mild	3 – 4	14	14	28
	Moderate	5 – 6	12	06	18
	Severe	7 – 9	04	10	14
Neuropathy Disability Score (NDS)	Normal	0 – 2	31	34	65
	Mild	3 – 5	08	02	10
	Moderate	6 – 8	09	16	25
	Severe	9 – 10	00	00	00

Based on NSS, which evaluates the subjective symptoms of neuropathy such as pain, numbness, tingling, and burning sensations, it was observed that 40% of the participants had normal scores (0–2), indicating no significant symptoms. Mild neuropathic symptoms (scores 3–4) were seen in 28% of cases, moderate symptoms (scores 5–6) in 18%, and severe symptoms (scores 7–9) in 14% of cases. Among those with severe symptoms, a higher proportion were male (10%) compared to female (4%), suggesting a slightly greater symptom burden among men. Similarly, evaluation using the NDS, which measures objective signs such as loss of vibration, pain, temperature sensation, and ankle reflex, revealed that 65% of the study population had normal scores (0–2), indicating intact peripheral nerve function. Mild neuropathic deficits (scores 3–5) were detected in 10% of participants, while moderate deficits (scores 6–8) were present in 25%. Notably, no cases exhibited severe disability (scores 9–10). A greater proportion of males (16%) demonstrated moderate neuropathic disability compared to females (9%), whereas mild disability was more frequent among females (8%) than males (2%)

Table 2: Distribution of Neuropathy Disability Score (NDS) in the Study Population

Diabetic Peripheral Neuropathy	Gender		Total
	Female (n=48)	Male (n=52)	
Absent	35	36	71
Present	13	16	29
Total	48	52	100
Chisq=0.16, df=1; p-value=0.68			

Table 2 presents the distribution of diabetic peripheral neuropathy (DPN) among the study population according to gender. Out of 100 participants, 71% showed no evidence of DPN, with 36 males and 35 females in this group. Conversely, 29% of the participants were found to have diabetic peripheral neuropathy, comprising 16 males and 13 females. There was no statistically significant association between gender and the presence of diabetic peripheral neuropathy ($\chi^2 = 0.10$, df = 1, p = 0.75). The prevalence of DPN was comparable between females (27.1%; 13/48) and males (30.8%; 16/52)

Table 3: Distribution of Neuropathy Symptom Score (NSS) and Neuropathy Disability Score (NDS) in Cases with Diabetic Peripheral Neuropathy (Gender-wise)

Score Category	Female with DPN (n=13)	Male with DPN (n=16)	Total (n=29)
NDS ≥ 6	9	16	25
NDS ≥ 3 but < 6 and NSS ≥ 5	4	0	4
Total	13	16	29
Fisher exact test: p-value p=0.028			

Note: Diabetic Peripheral Neuropathy (DPN): 29 Present & 71 Absent

As presented in Table 3, among patients diagnosed with diabetic peripheral neuropathy (n = 29), 25 cases (86.2%) exhibited an NDS ≥ 6, indicative of moderate to severe neuropathic disability. Of these, 16 were males and 9 were females. Additionally, 4 female patients (13.8%) demonstrated NDS ≥ 3 but < 6 combined with NSS ≥ 5, reflecting early neuropathic involvement with prominent symptoms. There was a statistically significant association between gender and neuropathy severity category among patients with diabetic peripheral neuropathy (Fisher's Exact Test, p = 0.028). This suggests a higher proportion of severe neuropathy

among male patients compared with female patients in the present study.

Table 4: Distribution of Sensory Modalities and Ankle Reflex Findings among Patients with Diabetic Peripheral Neuropathy (n = 29)

Parameter	Abnormal Sensation n (%)	Normal Sensation n (%)	Total n (%)
Pain	20 (68.97%)	09 (31.03%)	29 (100%)
Temperature	15 (51.72%)	14 (48.28%)	29 (100%)
Vibration Perception	25 (86.21%)	04 (13.79%)	29 (100%)
Ankle Reflex	13 (44.83%)	16 (55.17%)	29 (100%)

Table 4 illustrates the relationship between diabetic peripheral neuropathy (DPN) and specific sensory impairments assessed through the Neuropathy Disability Score (NDS). The findings reveal that abnormal vibration perception was the most prevalent deficit, observed in 86.21% of DPN cases, followed by pain sensation abnormalities in 68.97% and temperature perception deficits in 51.72% of patients. In contrast, ankle reflex impairment was noted in 44.83% of cases, with the majority (55.17%) retaining normal reflexes. These results highlight that vibration sense loss represents the earliest and most consistent sensory abnormality in diabetic peripheral neuropathy, underscoring its diagnostic value in early detection.

DISCUSSION

In the present study of 100 patients with type 2 diabetes mellitus, the mean age was 44.31 years (range 38–61 years), and 65% of participants fell into the 40–49-year age group (26% female, 39% male). This middle-aged predominance aligns with the increasing recognition of diabetic peripheral neuropathy (DPN) risk in younger diabetic cohorts. For example, a meta-analysis by Moi et al., found the prevalence of DPN rising progressively with age: 8.4% in ages 20–34, 22.7% in 35–49, 33.0% in 50–64 and 42.4% in ≥65 years.[11] Similarly, an Indian hospital-based study by Abdissa et al., reported that patients aged 40–49 years were approximately 3.8 times more likely to develop DPN compared with those under 30 years (AOR 3.8; 95% CI 1.30–10.60).[12] These findings reinforce the view that even in a middle-aged population, neuropathic complications may already be emerging and warrant early screening.

Regarding symptom burden in our cohort of 100 patients with type 2 diabetes, symptom-based screening with the Neuropathy Symptom Score (NSS) showed that 40% of participants were asymptomatic (NSS 0–2), while 28% had mild symptoms, 18% moderate, and 14% severe symptoms (see table 1). Objective assessment using the Neuropathy Disability Score (NDS) found that 65% had normal signs (NDS 0–2), 10% mild, and 25% moderate disability; no patient had severe disability (NDS 9–10). Overall, a greater proportion of males had moderate or severe findings (NSS severe: 10% male vs 4% female; NDS moderate: 16% male vs 9% female), whereas mild disability was more common among females (table 1). These observations accord with the well-recognised dissociation between symptom burden and objective signs in diabetic peripheral neuropathy (DPN). Large reviews and guideline documents report that a substantial proportion of patients with DPN may be asymptomatic despite objective deficits, whereas others report pain in the absence of marked clinical signs, a pattern explained by differing involvement of small versus large nerve fibres and by inter-individual variability in pain perception.[13-15] For example, recent authoritative reviews note that up to 50% of patients with DPN may be asymptomatic on symptom questionnaires while showing objective deficits on testing, and that painful DPN affects a smaller subset (commonly 13–26% in population series). [16-18] These phenomena explain why symptom-based and sign-based instruments yield different prevalence and severity

distributions. The proportion with moderate NDS (25% in our sample) is comparable to clinic-based studies that used structured bedside scoring, although reported prevalences vary markedly across studies depending on case mix, duration of diabetes, and the diagnostic instrument employed. Meta-analytic and multicentre work emphasises that screening instruments such as NSS/NDS typically produce lower prevalence estimates than methods that include quantitative sensory testing or nerve conduction studies; nonetheless, NSS/NDS remain valuable for pragmatic, resource-limited screening because they capture complementary symptom and sign domains and correlate reasonably well with electrophysiological abnormalities. The variability between studies therefore primarily reflects methodological heterogeneity rather than true biological contradiction.[19] Our finding of a somewhat higher neuropathic burden among males (greater proportions with severe NSS and moderate NDS) is consistent with multiple observational reports that have identified male sex as a risk factor for DPN in some cohorts, though sex associations are not universally observed.[20,21,22] The inconsistency across studies suggests that apparent sex differences may be mediated by differences in exposure to other risk factors (longer duration of hyperglycaemia, smoking, visceral adiposity, or occupational exposures) rather than a simple biological sex effect; consequently, sex should be treated as a potential effect modifier to be explored in multivariable models rather than as a direct causal factor. Methodological points help interpret our pattern of results. First, NSS preferentially captures small-fibre and symptomatic pathology, whereas NDS emphasizes loss of large-fibre function (vibration, reflexes); hence, a patient may score high on NSS yet have a low NDS (small-fibre painful neuropathy), or vice versa (painless large-fibre loss). Studies comparing bedside scores to quantitative sensory testing and nerve conduction show that NDS has acceptable sensitivity for clinically relevant polyneuropathy but will miss early or small-fibre predominant disease, while NSS improves detection of symptomatic small-fibre involvement but is observer-dependent and influenced by patient reporting. [23] These instrument properties explain why our cohort shows more individuals with normal NSS than normal NDS, and why combining both instruments yields a more comprehensive case ascertainment strategy. The absence of severe NDS (scores 9–10) in this study likely reflects the relatively early stage of diabetes among participants, given the short mean duration of disease and symptoms, as well as the outpatient-based sample. Previous longitudinal studies have shown that neuropathic signs progress with increasing diabetes duration and poor glycaemic control; thus, early or recently diagnosed cohorts typically exhibit lower rates of advanced disability.[24] This finding highlights the importance of periodic neuropathy screening and the need for future longitudinal studies in this population to monitor progression and identify modifiable risk factors for worsening neuropathy.

In our study of 100 diabetic patients, 29% were documented to have diabetic peripheral neuropathy (DPN), with a slightly higher proportion among males (55%) than females (45%) as reflected in table 2. This prevalence aligns with previous Indian-based reports where DPN prevalence ranged widely but often clustered around the 29–40% mark in clinic populations. For instance; Bansal et al. reported an overall prevalence near 29% in an outpatient Indian population, while Darivemula et al. found clinic prevalences around 40% with a modest male predominance (males). [25,26] Meanwhile, a large multinational meta-analysis in painful diabetic neuropathy found female sex to be a risk factor (OR ~1.42) rather than male, which is not compatible with our study.[27] Furthermore, among 29 patients clinically diagnosed with diabetic peripheral neuropathy (DPN), a majority of 25

individuals (86.2%) exhibited an NDS ≥ 6, indicating moderate to severe neuropathic disability, while 4 female patients (13.8%) demonstrated NDS ≥ 3 but < 6 combined with NSS ≥ 5, suggestive of early symptomatic neuropathic involvement (table 3). These findings show a clear relationship between higher Neuropathy Disability Scores (NDS) and the presence of clinically significant DPN, consistent with the pattern observed in several other studies employing the NDS–NSS scoring system for neuropathy assessment. Our results corroborate previous literature that has consistently identified an NDS ≥ 6 as a reliable threshold for moderate to severe neuropathic impairment. Yang et al. Abbott et al., and Weintrobb et al. reported that an NDS ≥ 6 is strongly predictive of the presence of clinically meaningful neuropathy and correlates well with abnormalities found on nerve conduction studies.[19,28,29] Similarly, studies by Burgess et al. and Tesfaye et al. have supported the use of NDS cut-offs between 5 and 6 to define moderate neuropathy, emphasizing that these scores demonstrate good diagnostic accuracy compared to electrophysiological testing. [3,30] The high proportion of patients in our study meeting this threshold therefore reflects a pattern of established DPN and highlights that the NDS remains a robust tool for grading neuropathic severity.

The subgroup of four female patients with NDS 3–5 coupled with NSS ≥ 5 represents an important clinical category characterized by early or symptomatic neuropathy with relatively mild objective signs. This observation aligns with findings from Partanen et al. and Herman et al., who noted that in the early stages of DPN, symptoms such as burning, tingling, or numbness (reflected by a higher NSS) often precede measurable sensory loss or reflex impairment (represented by NDS). [31,32]Similar to our findings, these studies advocated for the combined interpretation of both symptom and sign scores to improve early detection of neuropathy, as reliance on either alone can underestimate the true burden of disease. Comparative data from other regional and international studies also support our observations. For example, Kisozi et al. reported that among diabetic patients with neuropathy in Uganda, 53.4% exhibited moderate neuropathy (NDS 6–8) and 30.2% mild neuropathy (NDS 3–5).[33] Similarly, Pinto et al observed that NDS and NSS were positively correlated with both the duration of diabetes and poor glycaemic control, further validating their use as clinical predictors of neuropathy progression.[34]Sex-based differences in our study are also noteworthy. The predominance of males (16 out of 25) in the moderate-to-severe NDS group corresponds with prior reports suggesting that male patients tend to exhibit greater objective deficits, possibly related to differences in metabolic profile and duration of diabetes. Conversely, the occurrence of early symptomatic neuropathy (NDS 3–5 + NSS ≥ 5) exclusively among females may reflect a higher symptom reporting tendency or pain sensitivity among women, as documented in several neuropathy studies.[35,36] This observation suggests that symptom-based instruments like NSS may be particularly sensitive in detecting early neuropathic changes among female patients. The sensory profile we observed marked predominance of vibration loss (86.21%), followed by pain (68.97%), temperature (51.72%) and less-frequent ankle-reflex loss (44.83%) fits well with prior clinic-based and validation studies of diabetic peripheral neuropathy (DPN). Clinically, impaired vibration sense has been repeatedly reported as the commonest and most sensitive bedside sign of DPN: Martin et al. showed that vibration-perception threshold (VPT) testing is highly sensitive for confirmed clinical neuropathy and closely correlates with electrophysiological abnormalities, supporting vibration testing as a reliable marker of large-fiber dysfunction.[37] Similarly, Liu and colleagues found that quantitative VPT performed consistently as a specific measure for clinician-diagnosed

DPN and argued that VPT is especially useful for identifying established neuropathy.[38] Our high rate of vibration abnormality therefore aligns with these authors' emphasis on large-fiber involvement in many clinically ascertained DPN cohorts and with more recent screening work that also identifies vibration testing (or elevated VPT) as an efficient method to detect patients at risk of foot ulceration. The comparatively high prevalence of pain abnormalities in our sample (≈69%) echoes the literature showing that neuropathic pain features are common in clinic populations and often coexist with large-fiber deficits. Several phenotype studies report that painful symptoms may be present even when electrophysiological measures primarily reflect large-fiber loss, because small-fiber dysfunction and central sensitization can produce prominent pain despite variable objective sign patterns. This heterogeneity co-existence of small- and large-fiber involvement is documented across reviews and cohort studies and helps explain why pinprick/temperature deficits and subjective pain are frequently observed alongside vibration loss.[39,40]The intermediate frequency of temperature perception deficits in our cohort (approx.52%) is also consistent with prior work showing that small-fiber modalities (thermal thresholds) are commonly affected but may be less consistently detected by crude bedside testing than vibration. VPT and thermotesting often correlate, yet bedside temperature testing can under-estimate small-fiber impairment compared with quantitative sensory testing hence the lower but still substantial prevalence we observed.[41]Finally, the finding that a majority of patients retained ankle reflexes (55.17%) while 44.83% had reflex impairment matches reports that reduced/absent ankle reflexes are specific but not uniformly sensitive markers of DPN. Martin et al. and other investigators emphasize that reflex loss tends to appear later or in more advanced neuropathy, so preserved reflexes do not exclude clinically meaningful sensory deficits particularly large-fiber vibration loss or early small-fiber dysfunction.[37] In nutshell, the modality-specific prevalences in our study dominant vibration impairment, frequent pain and temperature involvement, and variable reflex loss mirror those reported by investigators who have validated bedside vibration and thermal testing against electrophysiology and quantitative sensory testing. These parallels reinforce the validity of our NDS-based modality assessment and underline the importance of multimodal bedside testing (vibration, pinprick/ temperature, and reflexes) to capture the mixed small- and large-fiber phenotypes typical of clinic-based DPN cohorts.

CONCLUSION

This study reinforced the value of the Neuropathy Symptom Score (NSS) and Neuropathy Disability Score (NDS) as reliable and complementary tools for the clinical evaluation of diabetic peripheral neuropathy (DPN). The findings indicate that while a substantial proportion of individuals with diabetes remain asymptomatic, many exhibit varying degrees of sensory symptoms and functional deficits, reflecting both early and advanced stages of neuropathic involvement. A pattern of greater objective disability among males and higher symptomatic presentation among females suggests possible gender-related differences in neuropathy expression. Sensory testing further identified vibration sense loss as the most consistent and early indicator of peripheral nerve dysfunction. Overall, the combined use of NSS and NDS provides a practical and effective approach for early detection, grading, and monitoring of DPN in clinical settings, underscoring the importance of routine neuropathy assessment in comprehensive diabetes management.

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