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Assess the Incidence of Peripheral Neuropathy in Recently Diagnosed Cases of Type II Diabetes Mellitus

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ABSTRACT

Background: Type II Diabetes Mellitus comes with a significant morbidity due to the common complication of peripheral neuropathy. It is vital to identify early in order to control and avoid more complications.

Objective: The purpose of this study was to assess the incidence of peripheral neuropathy in recently diagnosed cases of type ii diabetes mellitus

Material and Methods: This is a cross sectional study carried out at Sharif Medical and Dental College Lahore November 2022 to May 2024. 350 newly diagnosed Type II Diabetes Mellitus patients were recruited into the study. The Michigan Neuropathy Screening Instrument (MNSI) was used to assess peripheral neuropathy status. Age, BMI, symptom duration and hypertension status were collected as demographic and clinical data. Descriptive statistics and Chi square tests for categorical comparisons using $p \leq 0.05$ were used on data analysis.

Results: The mean age of patients was 56.01 years (SD = 11.231), with a mean symptom duration of 12.53 weeks (SD = 6.921) and a mean BMI of 27.88 (SD = 3.605). The prevalence of peripheral neuropathy was 31.4% (n=110). A significant association was found between age and neuropathy, with prevalence increasing from 17.9% in the 35-49 age group to 41.0% in patients aged 65-74 years (p=0.001). Obesity was also significantly associated with neuropathy, with 56.6% of obese patients affected versus 19.4% of non-obese patients (p=0.000). No significant associations were observed for gender, hypertension, or symptom duration.

Conclusion: Peripheral neuropathy is prevalent in newly diagnosed Type II Diabetes Mellitus patients, particularly among older and obese individuals. Early screening and targeted interventions focused on these risk factors may help reduce neuropathy-related complications.

Keywords: *Peripheral neuropathy, Type II Diabetes Mellitus, prevalence, obesity, age, early screening*

1. INTRODUCTION

Type II diabetes mellitus (T2DM) is a progressive metabolic disorder characterized by insulin resistance, hyperglycemia and affects millions worldwide. Similar to the surging numbers of T2DM cases has meant an equally significant increase in complications of that condition

including diabetic peripheral neuropathy (DPN). Developing peripheral neuropathy, damage to the peripheral nerves and pain, numbness and possible disability is a common and debilitating complication in people with diabetes. Evidence for DPN in individuals with newly diagnosed T2DM is early, and is based in part on the fact that prolonged hyperglycemia and metabolic imbalances associated with T2DM promote nerve degeneration [1,2]. Approximately half of diabetic patients will have DPN, which may implicate on the quality of life and increase healthcare burden [3].

The pathogenesis of DPN in T2DM is not simple and is based on oxidative stress, inflammatory pathways and vascular abnormalities. This process is central to hyperglycemia: oxidative stress and inflammatory responses result in damage to vascular and nerve tissues [4]. Moreover, advanced glycation end products (AGE) creates additional nerve damage as a result of long standing hyperglycemia, while microvascular complications of poor blood supply of nerves keeps regeneration of the nerves from progressing [5]. Dyslipidemia (high serum triglycerides and/or low levels of HDL cholesterol) and hypertension (the other major risk factor for mortality in T2DM), are common and their presence intensifies these risks, supporting the importance of early intervention [6, 7].

Treatment of DPN involves management of lifestyle, glucose control and pharmacological treatment. Effective control of blood glucose levels is underlined by studies in which poorer glycemic control is associated with greater rates of neuropathy and progression of complications [8]. Although newer antidiabetic agents and adjunct therapies are promising in the management of DPN, more research is necessary to develop the targeted treatments for the pathophysiology of DPN [9]. Asymptomatic cases of DPN may go unrecognized with early diagnosis and initiation of treatments critical in newly diagnosed T2DM. Current studies focus on the importance of comprehensive diabetes care, including regular screening for neuropathy which can hinder progression of and associated with the condition [10].

In conclusion, peripheral neuropathy is a prevalent and severe complication among newly diagnosed T2DM patients. Understanding the frequency and early risk factors of DPN can guide healthcare professionals in implementing preventative strategies and targeted treatments. Continuous research in DPN pathogenesis and therapeutic interventions will be vital for improving quality of life and reducing the overall burden on healthcare systems.

2. MATERIALS AND METHODS

This cross-sectional observational study was conducted to determine the frequency of peripheral neuropathy in newly diagnosed cases of Type II Diabetes Mellitus (T2DM). The study took place at Sharif Medical and Dental College Lahore November 2022 to May 2024. A sample size of 350 patients was calculated based on an expected frequency of peripheral neuropathy of 35%, as reported by Yar AA et al., with a 95% confidence level and a margin of error of 5%.[11]

Participants were recruited using a non-probability consecutive sampling technique. Ethical approval was obtained from the hospital's Ethical Committee, and informed written consent was secured from all patients before inclusion. Inclusion criteria comprised adults (≥35 years) who were newly diagnosed with T2DM (within the last three months, based on ADA criteria). Exclusion criteria included any history of neuropathy due to other causes, such as chronic kidney disease, vitamin B12 deficiency, or alcohol abuse, as well as any history of Type I Diabetes or gestational diabetes.

Data collection focused on several key variables. These included age (in years), gender (male/female), and the duration of diabetes symptoms, recorded from symptom onset to diagnosis in weeks. HbA1c levels, as an indicator of glycemic control, were measured using high-performance liquid chromatography (HPLC) and documented as a continuous variable in percentage. Body Mass Index (BMI) was calculated based on height and weight (kg/m²) and classified according to WHO standards. Other variables included hypertension status (Yes/No), based on patient history or a recorded blood pressure reading, and smoking status, categorized as current smoker, former smoker, or non-smoker. The presence of peripheral neuropathy was assessed using the Michigan Neuropathy Screening Instrument (MNSI), with a score of 7 or higher indicating neuropathy.

Data collection was performed by trained medical personnel in both outpatient and inpatient departments of Civil Hospital, Bahawalpur. The MNSI assessment included a sensory symptoms questionnaire and a physical foot examination, allowing for accurate and standardized diagnosis of peripheral neuropathy. Venous blood samples were drawn to measure HbA1c levels, ensuring precision with HPLC. BMI calculations were performed during initial assessments.

SPSS Version 24 was used for data analysis. Continuous variables were presented as mean ± standard deviation; categorical variables as frequencies and percentages. The Chi Square test was used to assess association between categorical variables. We set the threshold for statistical significance at p value of ≤0.05.

3. RESULTS

The descriptive statistics for the study population (n=350) indicate that the **age** of patients ranges from 35 to 74 years, with a mean age of 56.01 years (SD = 11.231)**.**The duration of symptoms varies from 1 to 24 weeks, with a mean duration of 12.53 weeks (SD = 6.921)**. The** BMI values range from 19 to 42, with a mean of 27.88 (SD = 3.605)**.**

Among the 350 newly diagnosed patients with T2DM, 31.4% (n=110) were found to have peripheral neuropathy, while the

remaining 68.6% (n=240) did not exhibit neuropathy symptoms. This distribution indicates that nearly one-third of the sample population was affected by peripheral neuropathy, aligning with a significant prevalence in newly diagnosed diabetic patients. This finding underscores the importance of early screening and management of neuropathy in Type II Diabetes. (Table 1)

Table 1: Frequency of Peripheral Neuropathy

Peripheral Neuropathy Status	Frequency	Percent
Yes	110	31.4%
No	240	68.6%
Total	**350**	**100.0%**

The analysis of peripheral neuropathy across demographic and clinical variables reveals notable trends. Among age groups, patients aged 35-49 years showed a lower prevalence, with 19 patients (17.9%) having peripheral neuropathy and 87 patients (82.1%) unaffected, out of a total of 106 patients. In contrast, neuropathy prevalence increased with age: in the 50-64 years group, 48 patients (34.5%) were affected, and 91 patients (65.5%) were unaffected among 139 patients; for those aged 65-74 years, 43 patients (41.0%) had neuropathy, while 62 (59.0%) did not, out of 105 patients. This association was statistically significant ($p = 0.001$), suggesting a strong relationship between increasing age and higher rates of neuropathy in newly diagnosed T2DM.

Gender analysis indicated no significant association with neuropathy, as 58 males (34.3%) had neuropathy and 111 males (65.7%) did not, from a total of 169 males; among females, 52 (28.7%) were affected by neuropathy, while 129 (71.3%) were unaffected, out of 181 females ($p = 0.260$). Similarly, the duration of diabetes symptoms did not show a significant impact: of the 174 patients with a symptom duration of 1-12 months, 55 patients (31.6%) had neuropathy, while 119 (68.4%) did not. Among those with symptoms lasting 13-24 months, 55 patients (31.3%) were affected, and 121 patients (68.7%) were unaffected, out of 176 total patients ($p = 0.942$).

However, obesity demonstrated a clear and significant association with neuropathy status ($p = 0.000$). Among obese patients, 64 (56.6%) had peripheral neuropathy compared to 49 (43.4%) who did not, out of a total of 113 obese patients. In contrast, only 46 non-obese patients (19.4%) had neuropathy, while a substantial 191 patients (80.6%) did not, out of 237 non-obese patients. This highlights obesity as a significant risk factor for neuropathy in newly diagnosed diabetic patients.

Hypertension did not display a significant association with neuropathy status. Among hypertensive patients, 60 (31.7%) had neuropathy, and 129 (68.3%) did not, from a total of 189 patients. Similarly, in normotensive patients, 50 (31.1%) were affected, while 111 (68.9%) were unaffected, out of 161 patients ($p = 0.890$).

In summary, older age and obesity were strongly associated with peripheral neuropathy, as indicated by significant p-values ($p = 0.001$ and $p = 0.000$, respectively). In contrast, gender, symptom duration, and hypertension showed no significant association with neuropathy in this study population. These findings suggest that age and obesity are important factors in peripheral neuropathy risk, highlighting the need for focused screening and management in these patient groups. (Table 2)

Table 2: Distribution of Peripheral Neuropathy Status by Demographic and Clinical Characteristics (n = 350)

Variable	Category	Peripheral Neuropathy - Yes (n, %)	Peripheral Neuropathy - No (n, %)	Total (n)	p-value
Age Group	35-49 years	19 (17.9%)	87 (82.1%)	106	0.001
	50-64 years	48 (34.5%)	91 (65.5%)	139	
	65-74 years	43 (41.0%)	62 (59.0%)	105	
Gender	Male	58 (34.3%)	111 (65.7%)	169	0.260
	Female	52 (28.7%)	129 (71.3%)	181	
Symptom	1-12 months	55 (31.6%)	119 (68.4%)	174	0.942

Variable	Category	Peripheral Neuropathy - Yes (n, %)	Peripheral Neuropathy - No (n, %)	Total (n)	p-value
Duration	13-24 months	55 (31.3%)	121 (68.7%)	176	
Obesity	Obese	64 (56.6%)	49 (43.4%)	113	0.000
	Non-obese	46 (19.4%)	191 (80.6%)	237	
Hypertension	Hypertensive	60 (31.7%)	129 (68.3%)	189	0.890
	Normotensive	50 (31.1%)	111 (68.9%)	161	

4. DISCUSSION

This study identifies a significant prevalence of peripheral neuropathy among newly diagnosed Type II Diabetes Mellitus patients, with 31.4% of the sample affected. This rate aligns with findings from other studies in Pakistan, reflecting the early onset and considerable frequency of this complication. For instance, Yar et al. reported a peripheral neuropathy frequency of 35% in newly diagnosed diabetes patients, emphasizing that neuropathy may develop at early stages of diabetes [11]. This finding is corroborated by Akram et al., who found a slightly lower prevalence of 20.67% but underscored the substantial economic and health burden associated with neuropathy, which often presents without a clear age or gender correlation [12]. These studies, together with our findings, suggest that peripheral neuropathy is a prevalent complication in early-stage diabetes and highlight the importance of prompt detection.

The **association of age** with neuropathy was a critical finding in this study, with neuropathy prevalence increasing markedly in older age groups—from 17.9% in patients aged 35-49 years to 41.0% in those aged 65-74 years. Similar associations were observed by Pfannkuche et al., who reported that neuropathy prevalence escalated with age, exceeding 50% in patients over 70 years [13]. Akhtar et al., in their meta-analysis, echoed these findings, noting that diabetic peripheral neuropathy risk significantly increased with age and was particularly high in those with prolonged diabetes duration [14]. Similarly, in a cross-sectional study by Tahir et al., neuropathy prevalence was 21% in newly diagnosed patients, and older age was linked to increased neuropathy, reinforcing that age serves as a key risk factor in diabetic populations [17]. Jadhao et al. also emphasized that older age is a prominent predictor of neuropathy, further highlighting age as a factor requiring close monitoring [18]. These findings emphasize the necessity for age-targeted screening initiatives to detect neuropathy early among older diabetic patients.

In addition to age, obesity emerged as a strong predictor of neuropathy in this study, with 56.6% of obese patients affected, compared to only 19.4% of non-obese patients. This finding aligns with the results of Jadhao et al., who identified obesity as a major neuropathy predictor in newly diagnosed Type II diabetes patients and found neuropathy strongly associated with a cardiovascular-metabolic profile, which includes obesity, hypertension, and dyslipidemia [15]. Similarly, Pfannkuche et al. observed that a cardiovascular-metabolic profile, encompassing high BMI, hypertension, and low HDL-C levels, was significantly associated with neuropathy in Type II diabetes patients, reinforcing that obesity and associated metabolic abnormalities contribute to neuropathy risk [13]. This strong correlation between obesity and neuropathy suggests that weight management could be a critical preventive strategy for diabetic peripheral neuropathy, particularly in newly diagnosed patients.

Interestingly, gender, symptom duration, and hypertension did not show significant associations with neuropathy in this study. Akram et al. also reported no significant link between gender or symptom duration and neuropathy, suggesting that these factors may not independently predict neuropathy risk [12]. However, Kebede et al. found that symptom duration did contribute to neuropathy risk, particularly in patients with comorbidities like anemia, which accelerated the onset of neuropathy [16]. Additionally, while hypertension was not independently associated with neuropathy in our study, Jadhao et al. found that hypertension, particularly in combination with other cardiovascular risk factors, was linked to an increased neuropathy risk [15]. Furthermore, Lakhiar et al. emphasized that early neuropathy assessment, using both clinical and electrophysiological criteria, can identify neuropathy in a substantial portion of newly diagnosed Type II diabetes patients, supporting the notion that timely evaluation may reveal neuropathy even when symptom duration is short [19].

The general prevalence of diabetic peripheral neuropathy observed in this study is consistent with that reported in the broader literature. Akhtar et al. conducted a meta-analysis that estimated a pooled prevalence of 43.16% for diabetic peripheral neuropathy in Pakistan, with the rate for newly diagnosed cases around 26.52% [14]. A systematic review by Pfannkuche et al. also estimated a neuropathy prevalence of 42.2% among Type II diabetes patients, supporting the observation that neuropathy is frequently present even in newly diagnosed cases [13]. Studies by Shahid et al. and Akram et al. demonstrated that peripheral neuropathy could manifest as early as four weeks post-diagnosis, with rates of 19.2% and 16.8%, respectively, for those diagnosed within one month, further underscoring the rapid onset of this complication in diabetes [18,20].

Additionally, the study by Ali Lakhiar et al. highlights that electrophysiological assessments of neuropathy reveal early signs in newly diagnosed patients, supporting the argument for early detection strategies. Their study, which identified a neuropathy rate of 32.7% in recently diagnosed patients, demonstrates the importance of comprehensive assessments that go beyond clinical symptoms to include sensory and functional tests [19].

5. CONCLUSION

This study demonstrates a majority of newly diagnosed patients with Type II Diabetes Mellitus (T IIDM) with peripheral neuropathy (31.4 %). Both age and obesity were significant predictors, and older and obese patients had distinctly higher rates of neuropathy. Assessment to gender, hypertension status and symptom duration did not show significant associations with neuropathy, but in contrast did show a significant association with neuropathic pain. However, these findings highlight the importance of early neuropathy screening in older and obese patients to help control long-term complications of diabetes as part of initial management. We propose early intervention strategies targeting metabolic health including weight management and lifestyle changes may be an important strategy to reduce neuropathy risk and enhance patient outcomes in this population.

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