

FREQUENCY OF SENSORY NEUROPATHY AND ITS CORRELATION WITH TYPE AND DURATION OF DIABETES IN PATIENT WITH DIABETIC FOOT ULCER, A CROSS- SECTIONAL STUDY AT A TERTIARY CARE HOSPITAL

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ABSTRACT

BACKGROUND: Diabetes mellitus is linked to significant microvascular and macrovascular complications, posing considerable challenges to public health. Diabetic neuropathy stands out as a troublesome complication of diabetes, contributing to substantial morbidity, mortality, and a considerable economic burden. Diabetes mellitus, a chronic metabolic disorder, is rapidly becoming a significant global challenge, carrying substantial social, health, and economic implications. Statistics suggest that in 2010, around 285 million individuals, accounting for approximately 6.4% of the adult population, were affected by this ailment on a global scale

OBJECTIVE: To determine the frequency of peripheral sensory neuropathy in diabetic patients with diabetic foot ulcer admitted to a tertiary care hospital in Peshawar.

METHODOLOGY: This descriptive Cross-sectional study was conducted from 1st November, 2020 to 30th April, 2021 in the Department of Medicine, Khyber Teaching Hospital, Peshawar. A total of 150 patients, between 14-70 years, of both gender, suffering from diabetes mellitus for at least 2 years, and fulfilling our inclusion criteria, were included. All diabetic patients with diabetic foot ulcer were examined for the presence or absence of sensory neuropathy clinically and later confirmed by nerve conduction studies.

RESULTS: In our study, 21% patients were in age 20-40 years, 37% patients were in age 41-60 years, 42% patients were in age 61-70 years. 89(59%) patients were male while 61(41%) patients were female. 39% patients had diabetes for 20 years. The frequency of diabetic sensory neuropathy was reported as 25%.

CONCLUSION: The frequency of peripheral sensory neuropathy secondary to diabetes is on the rise and calls for more better diabetes control in our population and increased awareness for early detection and interventions.

KEYWORDS: Sensory neuropathy, Diabetes Mellitus, Diabetic foot ulcer.

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INTRODUCTION

Diabetes Mellitus is defined as a metabolic syndrome due to deficiency, resistance to the action of insulin or both, resulting in impaired metabolism of carbohydrates, fats, proteins, water, and electrolytes.¹ Chronic hyperglycemia results in various microvascular and macrovascular complications leading to ophthalmological, neurological, cardiac, and renal complications.² Diabetes mellitus is a major public health issue. An estimated 451 million people were diagnosed with diabetes worldwide in 2017, and the number will increase to 693 million by 2045.³ Compared with other chronic diseases, diabetes causes greater mortality, morbidity, disability, and financial loss due to its complications.⁴ As a major contributor to peripheral nerve injury, DPN impairs quality of life and potentiates risks of disability in diabetic subjects.⁵ However, the prevalence and the risk factors of

DPN on a global scale, especially in low- and middle-income countries, remain unclear. The prevalence of diabetes amongst adults over 18 years of age has almost doubled from 4.7% in 1980 to 8.5% in 2014.⁶ Asians, from Pakistan, India, and China, have a higher prevalence as compared to Caucasians. About, 425 million people in the world had diabetes in 2017 and the number is expected to rise to 629 million by 2045, according to International Diabetes Federation (IDF). In Pakistan, diabetes is a major health issue, 6.94% of the Pakistani population has diabetes, and it is likely to increase to 8.45% by the year 2045 according to the International Diabetes Federation.⁷

Diabetic foot ulcer is a serious complication resulting from chronic uncontrolled Diabetes Mellitus, which may lead to the amputation of the foot or even a leg of variable length. Peripheral neuropathy, mechanical changes in the bony architecture of the

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foot, and atherosclerotic peripheral arterial disease play an important role in the development of diabetic foot ulcers.^{8,9} Currently global prevalence of Diabetic foot ulcer is 6.3%, whereas local studies show prevalence from 7% to 11.36%.⁸ Peripheral sensory neuropathy (PSN) occurs due to damage to the entire nerve cells or nerve fibers only. The patient may be symptomatic or asymptomatic. The prevalence of Diabetic peripheral sensory neuropathy varies from 9.6 to 88.7% in different populations across the globe with variation in the frequency concerning the frequency and type of diabetes, the glycaemic control of the patients and associated comorbid especially the local peripheral arterial disease.⁸ In a study from Islamabad, the prevalence of sensory neuropathy in diabetic foot ulcer patients was reported to be 94.5%.¹⁰ The rationale of the study is to find out the frequency of sensory neuropathy and its association with the duration and type in our patients presenting with diabetic foot ulcers. This would help us to improve the awareness amongst the patients with diabetes to seek the early help for detection besides improving the early detection amongst the treating doctors and expected better cure in early stages of the illness.

METHODOLOGY:

This descriptive cross-sectional was conducted from 1st November 2020 to 30th April 2021, in the Department of Internal Medicine, Khyber Teaching Hospital, Peshawar, Pakistan after formal approval from the hospital's ethical committee. We included 150 patients, as a sample size by using a 25.64% prevalence of peripheral sensory neuropathy in diabetic patients with diabetic foot ulcer, 95% confidence interval and 5% margin of error according to the WHO formula of sample size determination.⁸ We included all the patients, aged between 14-

70 years, of both genders, diagnosed with both type 1 and type 2 diabetes mellitus for at least 2 years. Patients with systemic illnesses that can cause neuropathies like Vitamin B12 deficiency, chronic liver disease, chronic renal failure, hypothyroidism, vasculitides, malignancies, or leprosy were excluded from the study. Patients taking medicines that may cause neuropathy like lead, Phenytoin, Cisplatin, Vincristine, amiodarone, isoniazid, dapson, etc. were also excluded from the study. After detailed history and clinical examination, all the patients were examined for the signs and symptoms of peripheral sensory neuropathy and the findings were confirmed by doing Nerve Conduction Studies. All information was collected on an especially designed proforma.

The data was analyzed using SPSS version 22. Frequency and percentages were calculated for the quantitative variables. The correlation of sensory neuropathy with the type and duration of diabetes was assessed by calculating p-values and chi-square tests. All data was presented in the form of tables and graphs.

The ethical approval No. 1180/REC/2020 was taken from IREB Khyber Medical College/Khyber Teaching Hospital on 26 March 2020

RESULTS

The mean age of the included 150 patients was 55 ± 12.12 years with 89 (59%) patients being males while 61 (41%) patients were females. The age distribution is shown in Table 1. A total of 58 (39%) patients had diabetes for more than 20 years. Sensory neuropathy was present in 37(25%) of our patients. Further risk stratification was done to the duration and type of diabetes as shown in table 2 and table 3.

TABLE 1. AGE DISTRIBUTION

S No.	AGE in groups	FREQUENCY	PERCENTAGE
1.	20-40 years	32	21%
2.	41-60 Years	55	37%
3.	61-70 Years	63	42%
	Total	150	100%

TABLE 2: STRATIFICATION OF SENSORY NEUROPATHY CONCERNING DURATION OF DIABETES

SENSORY NEUROPATHY	≤ 20 years	> 20 years	Total	P value
Yes	14	23	37	0.9050
No	44	69	113	
Total	58	92	150	

TABLE 3: STRATIFICATION OF SENSORY NEUROPATHY CONCERNING TYPE OF DIABETES

MELLITUS SENSORY NEUROPATHY	T1DM	T2DM	Total	P value
Yes	8	29	37	0.8687
No	23	90	113	
Total	31	119	150	

DISCUSSION

Diabetes Mellitus stands as a prominent global health concern. Diabetic neuropathy, a serious complication linked to diabetes, exhibits connections with various risk factors. This investigation aimed to assess the relationship between sensory neuropathy and both duration and type of diabetes. The majority, accounting for 79% of our participants, were aged 40 years and above, with a mean age of 55 years. Our findings align closely with a study conducted by Jember G, where the reported mean age was 49 with a standard deviation of ± 14.3 years¹¹

Within our study, 59% of the participants were male, and 41% were female. This distribution closely mirrors the sample composition observed in a study conducted by NA Alshammari. Furthermore, our findings indicate that the male gender was identified as a significant risk factor for Diabetic Peripheral Neuropathy (DPN).¹²

Among our patients with Diabetic foot ulcers, 25% exhibited the presence of Sensory Neuropathy. Ponirakis G et al's findings reported a DPN prevalence of 33.3%, with 52.2% at risk of Diabetic Foot Ulcers (DFU) and 53.6% remaining undiagnosed. Additionally, the prevalence of painful DPN was 43.3%, with 54.3% of cases undiagnosed. DFU itself was present in 2.9% of the cases.¹³ Yet, data specific to the Islamabad region indicates a reported frequency of 94.5%, while Khawaja N et al have cited a figure of 39.5%.¹⁰ The variance in the reported decrease in sensory neuropathy frequency within our population may be attributed to distinctions in population dynamics and diabetes control

In our study, 25.81% of patients diagnosed with Type 1 Diabetes Mellitus (T1DM) and 24.36% of those with Type 2 Diabetes Mellitus (T2DM) exhibited sensory neuropathy. Conversely, a separate study by Tung DD in Vietnam reported a high prevalence of peripheral neuropathy among T2DM patients, noting decreased conduction rates, motor response amplitudes, and nerve sensation.¹⁴

In our investigation, the correlation of sensory neuropathy with the duration of diabetes was deemed insignificant. In contrast, Kargi D et al.'s study revealed a notable increasing trend of Diabetic Peripheral Neuropathy (DPN) with the prolonged duration of diabetes. Their findings indicated the presence of DPN in over 55% of patients with more than 5 years of diabetes ($p=0.004$).¹⁵ The limitation of our study was conducting the study at a single tertiary care hospital may limit the generalizability of

the findings to a broader population. The patient demographics, treatment protocols, and healthcare practices in this specific setting might not represent the diversity seen in other regions or healthcare facilities. The study may not have included all relevant clinical parameters that could influence the development of sensory neuropathy. Factors such as genetic predisposition, lifestyle, and concurrent medical conditions might not have been adequately addressed.

CONCLUSION

The findings of this study underscore the need for heightened awareness among patients to promptly report signs and symptoms of peripheral sensory neuropathy. Additionally, they highlight the importance of healthcare providers exercising increased vigilance in early detection and intervention for better symptom control.

Ethical approval: Ethical approval was granted by the ethical review board, Department of Medical Education Khyber Medical College, Peshawar.

Conflict of interests: None to declare.

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Key for Author Contributions:

- A. Conception and Planning of the research
- B. Acquisition of data/participation in designing methodology
- C. Interpretation, analysis and discussion
- D. Review of the manuscript