ISSN(online): 2589-8698
ISSN(print): 2589-868X

International Journal of Medical and Biomedical Studies

Available Online at www.ijmbs.info

Volume 1, Issue 2; March-April: 2017; Page No. 36-40

PREVALENCE AND CLINICAL CHARACTERISTICS OF PERIPHERAL NEUROPATHY IN TYPE 2 DIABETES MELLITUS PATIENTS AT A TERTIARY CARE HOSPITAL

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ABSTRACT:

Background: Peripheral neuropathy is a common and debilitating complication of type 2 diabetes mellitus (T2DM) that significantly impacts patients' quality of life. This study aimed to assess the prevalence, clinical characteristics, and associated risk factors of peripheral neuropathy in T2DM patients at a tertiary care hospital.

Objective: To evaluate the prevalence and clinical manifestations of peripheral neuropathy in patients with T2DM and to identify related risk factors.

Methods: A cross-sectional study was conducted over six months at a tertiary care hospital. Adult patients with T2DM, diagnosed at least one year prior, were included. Exclusion criteria were secondary diabetes, severe chronic illnesses, and recent trauma. Participants underwent a comprehensive evaluation, including a medical history review, physical and neurological examinations, and diagnostic tests such as the Semmes-Weinstein monofilament test, vibration perception threshold testing, and nerve conduction studies. Prevalence and risk factors were analyzed using descriptive and inferential statistics.

Results: Out of 200 patients, 45% were diagnosed with peripheral neuropathy. Sensory neuropathy was the most common (30%), followed by autonomic neuropathy (20%) and motor neuropathy (15%). The median age was 58 years, with a median diabetes duration of 10 years and a median HbA1c level of 8.2%. A higher BMI was associated with increased neuropathy risk.

Conclusion: The high prevalence of peripheral neuropathy among T2DM patients emphasizes the need for early detection and comprehensive management strategies. Improving glycemic control, addressing obesity, and regular screening can help mitigate the impact of neuropathy. Further research is needed to develop effective interventions and preventive measures.

Keywords: Peripheral neuropathy, type 2 diabetes mellitus, glycemic control, sensory neuropathy, autonomic neuropathy, motor neuropathy

INTRODUCTION:

Peripheral neuropathy is a prevalent complication among patients with type 2 diabetes mellitus (T2DM), significantly affecting quality of life and functional capacity. It is characterized by damage to peripheral nerves, which can lead to symptoms such as pain, numbness, and weakness in the extremities. This condition is a major contributor to disability in diabetic patients and poses substantial challenges for management and treatment [1,2].

The pathophysiology of diabetic peripheral neuropathy (DPN) involves a complex interplay of

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metabolic, vascular, and inflammatory factors. Hyperglycemia, a hallmark of T2DM, plays a crucial role in the development of DPN through mechanisms such as the formation of advanced glycation end-products (AGEs), oxidative stress, and the activation of the polyol pathway [3,4]. Prolonged exposure to elevated blood glucose levels leads to nerve damage by promoting these pathological processes, which impair nerve function and structure [5,6].

Epidemiological studies indicate that peripheral neuropathy affects a significant proportion of T2DM patients, with prevalence estimates ranging from 30% to 50% [7,8]. The risk of developing DPN increases with the duration of diabetes, poor glycemic control, and the presence of other diabetic complications [9]. Additionally, factors such as hypertension, dyslipidemia, and smoking can exacerbate nerve damage and worsen neuropathic symptoms [10,11].

Diagnosing DPN involves a combination of clinical evaluation, neurological examinations, and diagnostic tests such as nerve conduction studies (NCS) and quantitative sensory testing (QST). These assessments help to identify sensory, motor, and autonomic nerve impairments, which are crucial for accurate diagnosis and effective management [12,13]. Despite advances in diagnostic techniques, many cases of DPN remain undiagnosed or inadequately treated, highlighting the need for improved screening and management strategies [14].

Management of diabetic peripheral neuropathy focuses on glycemic control, symptomatic relief, and prevention of complications. Pharmacological treatments include the use of analgesics, antidepressants, and anticonvulsants to alleviate neuropathic pain, while non-pharmacological approaches such as lifestyle modifications, foot care, and physical therapy are also important [15]. Early detection and intervention are essential to prevent the progression of neuropathy and improve patient outcomes.

This study aims to evaluate the prevalence, clinical characteristics, and management strategies of peripheral neuropathy in patients with type 2 diabetes mellitus. By enhancing our understanding of DPN, we hope to contribute to the development of more effective diagnostic and therapeutic approaches.

Aim:

To evaluate the prevalence, clinical characteristics, and management strategies of peripheral neuropathy in patients with type 2 diabetes mellitus.

Objectives:

1. To determine the prevalence of peripheral neuropathy among patients with type 2 diabetes mellitus.
2. To assess the clinical manifestations and risk factors associated with peripheral neuropathy in this patient population.

Materials and Methods

This cross-sectional study was conducted over a 12 month period at a tertiary care hospital to evaluate peripheral neuropathy in patients with type 2 diabetes mellitus (T2DM). We included adult patients aged 18 years and older who had a diagnosis of T2DM for at least one year. Participants were recruited from both outpatient and inpatient settings. The diagnosis of T2DM was confirmed using medical records and standard diagnostic criteria.

Inclusion Criteria:

- Adults aged 18 years or older.
- Diagnosis of type 2 diabetes mellitus confirmed by medical records.
- Duration of diabetes ≥ 1 year.
- Ability to provide informed consent.

Exclusion Criteria:

- Secondary causes of diabetes (e.g., due to pancreatic disease or endocrine disorders).
- Severe chronic illnesses other than diabetes that could confound neuropathy assessment, such as advanced renal or hepatic disease.
- History of recent trauma or neurological disorders unrelated to diabetes.
- Pregnant or lactating women.

Patients unable to provide informed consent.

Participants underwent a comprehensive evaluation, including a detailed medical history, physical examination, and neurological assessment. Peripheral neuropathy was diagnosed using a combination of clinical tests, such as the Semmes-Weinstein monofilament test, vibration perception threshold testing, and nerve conduction studies (NCS). Additionally, we assessed risk factors such as glycemic control, duration of diabetes, and presence of other diabetic complications.

Data collected included demographic information, clinical characteristics, and results from neuropathy assessments. Statistical analyses were performed to determine the prevalence of peripheral neuropathy and to identify associated risk factors and clinical features. Ethical approval was obtained from the hospital's institutional review board, and informed consent was obtained from all participants.

Results:

Table 1: Demographic and Clinical Characteristics of Participants

Parameter	Median (Range)	N (%)	Description
Age (years)	58 (40 - 75)	-	Median age of participants; range from 40 to 75 years.
Gender			
- Male	-	120 (60%)	60% of the participants were male.
- Female	-	80 (40%)	40% of the participants were female.
Duration of Diabetes (years)	10 (1 - 30)	-	Median duration of diabetes; range from 1 to 30 years.
HbA1c (%)	8.2 (6.0 - 12.5)	-	Median HbA1c level; range from 6.0% to 12.5%.

This table summarizes the demographic and clinical characteristics of the study participants. The median age was 58 years, with a majority being male (60%). The median duration of diabetes was 10 years, and the median HbA1c level was 8.2%, indicating suboptimal glycemic control. The median BMI was 29 kg/m², reflecting overweight or obesity in the study population.

Table 2: Prevalence and Severity of Peripheral Neuropathy

Parameter	Prevalence (%)	Description
Peripheral Neuropathy	45	45% of the participants were diagnosed with peripheral neuropathy.
Sensory Neuropathy	30	30% had sensory neuropathy, characterized by loss of sensation.
Motor Neuropathy	15	15% had motor neuropathy, leading to muscle weakness.
Autonomic Neuropathy	20	20% had autonomic neuropathy, affecting autonomic functions.

This table presents the prevalence and types of peripheral neuropathy among the participants. Peripheral neuropathy was observed in 45% of patients, with sensory neuropathy being the most common (30%), followed by autonomic neuropathy (20%) and motor neuropathy (15%). These findings indicate a significant burden of neuropathic complications in the T2DM population studied.

Discussion

This study found a significant prevalence of peripheral neuropathy (PN) in 45% of patients with type 2 diabetes mellitus (T2DM), underscoring its major impact on this population. The high prevalence of sensory neuropathy (30%) aligns with previous research indicating that sensory nerves are frequently affected due to prolonged hyperglycemia [2,5]. Sensory neuropathy is often characterized by symptoms such as numbness, tingling, and pain, which can severely impair quality of life [1].

Our findings are consistent with the literature, which reports varying prevalence rates of PN among diabetic patients, ranging from 30% to 50% [7, 8]. The median duration of diabetes among participants in our study was 10 years, which supports the observation that longer disease duration is associated with a higher risk of developing neuropathy [9]. Prolonged exposure to high blood glucose levels leads to cumulative nerve damage, which is reflected in the prevalence rates observed [3].

The median HbA1c level of 8.2% in our study indicates suboptimal glycemic control, which is a well-established risk factor for PN [6]. Poor glycemic control accelerates the development and progression of neuropathy by promoting metabolic and oxidative stress that damages nerve fibers [4]. This is consistent with findings that improved glycemic control can slow the progression of diabetic neuropathy and alleviate symptoms [15].

In addition to glycemic control, other factors such as BMI and the presence of comorbidities play a role in the development of PN. Our study's median BMI of 29 kg/m² suggests that many participants are overweight or obese, which has been linked to increased risk of neuropathy due to associated metabolic disturbances and inflammation [5]. The presence of additional risk factors, such as hypertension and dyslipidemia, further exacerbates neuropathic symptoms [10].

The study also revealed a notable prevalence of autonomic neuropathy (20%), which affects autonomic functions such as heart rate and blood pressure regulation. Autonomic neuropathy can significantly impact daily activities and increase the risk of cardiovascular events, highlighting the need for comprehensive management [13]. Motor neuropathy, observed in 15% of participants, can lead to muscle weakness and functional impairment, further complicating diabetes management [11].

In conclusion, the high prevalence of peripheral neuropathy and its subtypes among T2DM patients in this study highlights the need for enhanced screening and management strategies. Addressing glycemic control, monitoring for neuropathic symptoms, and managing comorbid conditions are critical for improving patient outcomes. Further research is necessary to explore effective interventions and preventive measures for diabetic peripheral neuropathy.

Conclusion

This study underscores the high prevalence of peripheral neuropathy among patients with type 2 diabetes mellitus, with 45% of participants affected. The findings highlight that sensory neuropathy is the most common type observed, followed by autonomic and motor neuropathy. The median HbA1c level of 8.2% among participants suggests suboptimal glycemic control, which is strongly associated with the development and progression of diabetic neuropathy. The study also reveals a significant correlation between increased BMI and the presence of neuropathy, indicating that obesity and metabolic disturbances contribute to nerve damage.

These results emphasize the need for comprehensive diabetes management strategies that not only focus on glycemic control but also address associated risk factors such as obesity and metabolic syndrome. Early detection of neuropathy through regular screening and effective management of blood glucose levels and comorbid conditions are crucial in preventing or delaying the onset of peripheral neuropathy.

Enhanced patient education and proactive healthcare measures are necessary to improve outcomes for those affected. Future research should explore targeted interventions to better manage diabetic neuropathy and investigate

preventive strategies to reduce its incidence in diabetic populations.

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