

## A cross-sectional study to assess the knowledge and risk of diabetic polyneuropathy using Michigan neuropathy screening instrument among type 2 diabetes mellitus

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### Abstract

Diabetic polyneuropathy, arising from elevated blood sugar levels damaging nerves microvasculature, manifests as tingling, numbness, muscle weakness, coordination challenges, sensitivity alterations, digestive problems, and sexual dysfunction, necessitating meticulous blood sugar control, medications, physical therapy, lifestyle changes, and regular medical supervision for prevention and management.

**Aim:** The aim of the study is to assess the knowledge and risk of diabetic polyneuropathy using Michigan Neuropathy screening Instrument among type ii diabetes mellitus.

**Methods:** In this study Non Experimental Research study design and purposive sampling technique is used and a total of 599 samples were assessed. Knowledge Questionnaire and physical examination using standardized Michigan Neuropathy Screening Instrument were used. The mean score for knowledge is <5 and the preliminary assessment risk score is <4 and the physical examination mean score is <2.5.

**Results:** Participants above 50 years (46.6%) of age with chronicity of diabetes of 1- 10 years (77.5%) with abnormal preliminary risk score >4 (32.2%) and abnormal physical examination score >2.5(74.6%). Females has good knowledge on diabetic polyneuropathy and also they show high risk of developing diabetic polyneuropathy.

**Conclusion:** The study concluded that increasing years of chronicity of diabetes develops diabetic polyneuropathy, in this study females are much prone for developing diabetic polyneuropathy.

**Keywords:** Diabetes; Polyneuropathy; Peripheral Nerves; Michigan Neuropathy Screening Instrument

### 1. Introduction

Diabetic polyneuropathy (DPN) is a prevalent and debilitating complication of diabetes mellitus, affecting a substantial proportion of individuals with both type 1 and type 2 diabetes worldwide. This condition arises from nerve damage attributed to chronic hyperglycemia, leading to a range of sensory, motor, and autonomic dysfunctions [1]. Despite its clinical significance, the pathophysiology of DPN remains incompletely understood, complicating effective prevention and management strategies. Early detection and intervention are crucial to mitigate its progression and reduce the risk of associated complications, such as foot ulcers and cardiovascular autonomic neuropathy [2]. Therefore, assessing the current knowledge and understanding of DPN among healthcare providers and evaluating the associated risk factors among diabetic patients are imperative steps towards enhancing clinical outcomes and quality of life in this vulnerable population. This study aims to explore these aspects comprehensively, shedding light on potential avenues for improved diagnosis, treatment, and prevention of diabetic polyneuropathy.

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## 2. Methods and research methodology

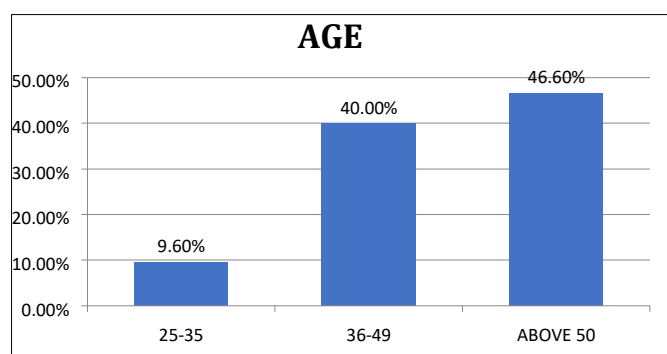
The study employed a quantitative research approach and utilized a non-experimental research design to establish a suitable framework. It focused on demographic variables such as age and gender to characterize the study population, with diabetic polyneuropathy identified as the independent variable and individuals with diabetes as the dependent variable. Conducted at ACS Medical College and Hospital in Chennai, which serves both urban and rural areas and handles 500 beds and 200 outpatient visits daily, the study defined key terms like polyneuropathy and diabetic polyneuropathy, highlighting their relevance in understanding nerve damage associated with diabetes. Sampling involved 599 patients selected through simple random sampling from those presenting chronic type 2 diabetes mellitus at medical OPDs and IPDs, with specific inclusion and exclusion criteria applied. The aim was to explore knowledge and assess the risk of diabetic polyneuropathy among type 2 diabetes mellitus, supported by objectives focusing on evaluating knowledge levels, using the Michigan Neuropathy Screening Instrument for assessment, and examining demographic variables' association with neuropathy severity

## 3. Results

### 3.1. Description of demographic values

#### 3.1.1. Demographic Variables

This section describes background information of the respondents in the aspects Of gender and age such information is crucial \*as it helps to know if the respondents met the morally acceptable standards to be involved in the research and provides required information in regard to the study



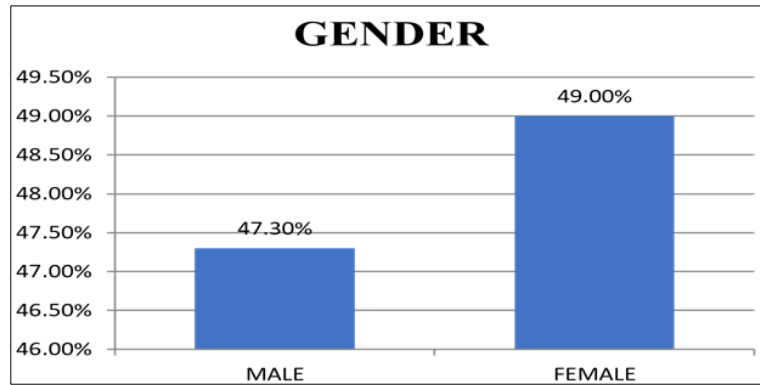
**Figure 1** Total Age distribution chart

Fig 1 shows the participants who responds the questionnaires. Age of the participants are categorized into three categories: The participants between 25-35 years are 9.6% (60), between 36-49 years are 40.0% (249), Above 50 are 46.6% (290). The given analysis implies the majority age Above 50 years are participated in the study.

#### 3.1.2. Gender Distribution

**Table 1** Total gender distribution

GENDER	N	%
MALE	294	47.3%
FEMALE	305	49.0%



**Figure 2** Total Gender distribution chart

Fig 2, shows the participants who responds the questionnaires. Out of the 599 participants 294 are male (47.3%) and 305 are female (49.0%), this implies both male and female are involved in the study. The following analysis shows that more female participants in the study than male participants.

**3.1.3. If chronic how many years of diabetes?**

**Table 2** Total If chronic how many years of diabetes? Distribution

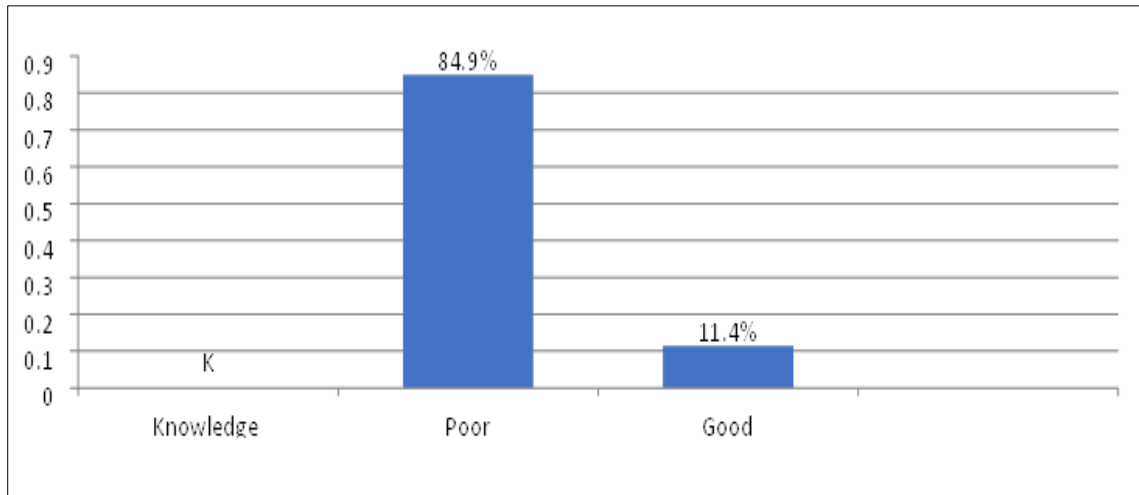
If chronic how many years	N	%
1-10	482	77.5%
11-20	112	18.0%
21-30	4	0.6%
31-35	1	0.2%

Figure 4, shows the participants who have chronic diabetes mellitus. Participants are categorized into four categories: The participants between 1-10 years are 77.5% (482),between 11-20 years are 18.0% (112),between 21-30 years are 0.6% (4) and 31-35 years are 0.2% (1) The given analysis shows that more female participants in the study than male participants.

**3.2. Knowledge**

**Table 3** Knowledge Distribution

Knowledge	N	%
Poor	528	84.9 %
Good	71	11.4 %



**Figure 3** Total knowledge distribution chart

Figure 5, shows the Knowledge of the patients. Participants are categorized into two categories: Out of 599 participants 11.4% (528) have good knowledge and 84.9% (71) have poor knowledge. The given shows that majority of participants have good knowledge

### 3.3. Preliminary Assessment Score

**Table 4** Preliminary Assessment Score distribution

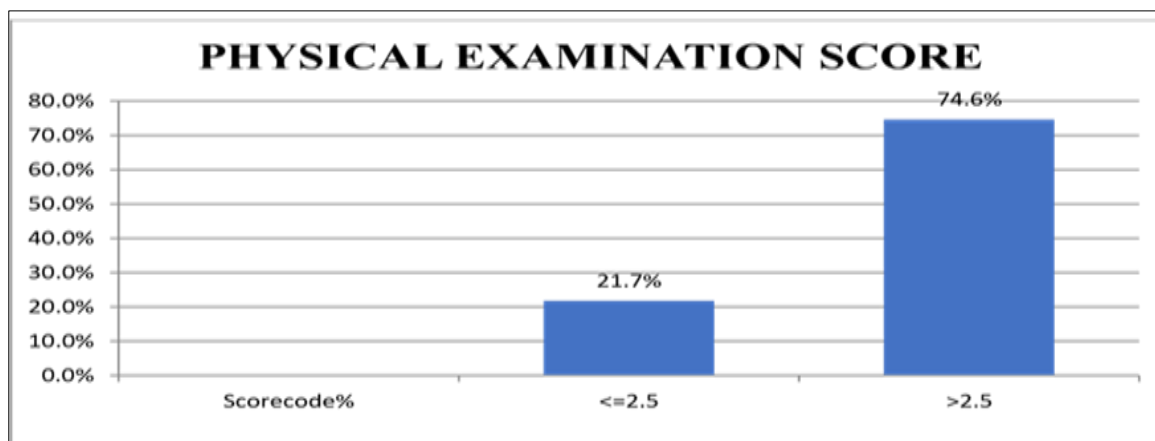
Preliminary Assessment score	N	%
<4(normal)	399	64.1%
>=4(abnormal)	200	32.2%

Figure 4.1.6, shows that the preliminary assessment of the patient. Participants are categorized into two categories: Out of 599 participants <4 are 64.1% (399) and >=4 are 32.2% (200). Through this mean value <4 are considered as normal and >= 4 are at the verge of diabetic polyneuropathy.

### 3.4. Physical examination score

**Table 5** Physical examination score distribution

Physical Examination Score	N	%
<=2.5(Normal)	135	21.7%
>2.5(Abnormal)	464	74.6%



**Figure 4** Total Physical examination Score distribution chart

Figure 6, shows that the Physical examination of the patient. Out of 599 participants <=2.5 are 21.7%% (135) and > 2.5 are 74.6% (464). Through this mean value <=2.5 are considered as normal and >2.5 are at the risk of diabetic polyneuropathy.

### 3.5. Section 8: assessment of diabetic polyneuropathy

#### 3.5.1. Gender VS Knowledge

The age distribution of individuals Above 50 years is a significant factor to consider when analysing data using the MNSI scale. Consequently, we are able to document the experiences and difficulties that people encounter in their professional, personal, and general well-being. It is important to consider how this age group is impacted by Diabetic polyneuropathy because they can have a substantial influence on productivity, quality of life, and general functionality.

**Table 6** Gender VS Knowledge distribution

Gender		Knowledge			%
		Poor	%	Good	
Male	271	45.24%	23	3.83%	
Female	257	42.90%	48	8.01%	

Fig 7 shows the number of participants from which gender having knowledge about diabetic polyneuropathy. From the above mentioned pie chart we can clearly determine that Female 8.01% (48) have good knowledge than Male 3.83% (23) among 599 participants

#### 3.5.2. Gender VS Preliminary Assessment Score

**Table 7** Gender VS Knowledge distribution

Gender		Preliminary assessment			%
		<4 (N)	%	>=4 (AN)	
Male	205	34.2%	89	14.8%	
Female	194	32.3%	111	18.53%	

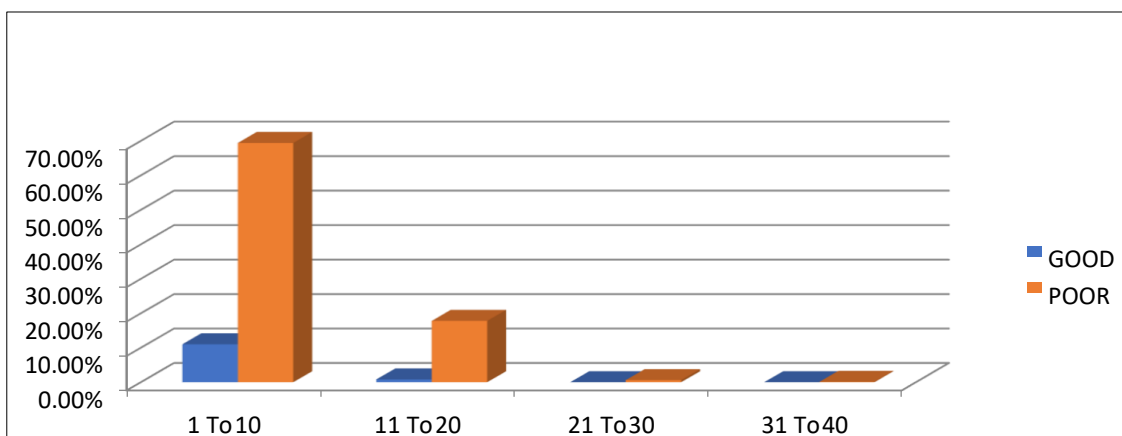
Fig 8 shows the number of participants from which gender having high Preliminary assessment score .From the above mentioned pie chart we can clearly determine that Female 18.53% (111) have high preliminary assessment score than Male 14.8% (89) among 599participants.

3.5.3. Gender VS Physical Examination

**Table 8** Gender VS Physical Examination score distribution

Gender	Physical examination score			
	<=2.5	%	>2.5	%
Male	59	9.84%	235	39.23%
Female	76	12.68%	229	38.23%

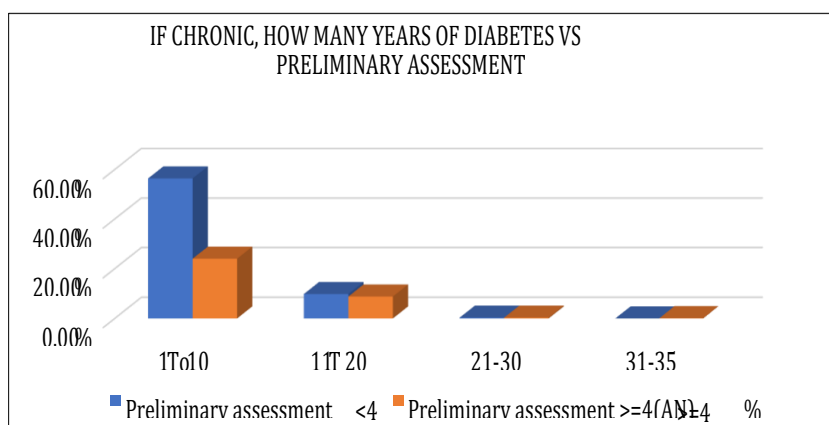
Fig 9 shows the number of participants from which gender having high Physical examination score .From the above mentioned pie chart we can clearly determine that Male 39.23% (235) have high physical examination score than Female 38.23% (229) among 599 participants.



**Figure 5** If chronic how many years of diabetes VS knowledge distribution chart

Fig 10 shows the number of participants who having chronic diabetes mellitus having good knowledge. From the above mentioned pie chart we can clearly determine that patient having 1-10 years 11.01% (66) shows good knowledge among 599 participants.

3.6. If chronic, how many years of diabetes VS Preliminary assessment



**Figure 6** if chronic, how many years of diabetes VS Preliminary assessment score distribution chart

Fig 11 shows the number of participants who having chronic diabetes mellitus having high preliminary assessment score. From the above mentioned pie chart we can clearly determine that patient having 1-10 years 24.0% (144) shows good knowledge among 599 participants.

3.6.1. *If chronic, how many years of diabetes VS Physical Examination***Table 9** If chronic, how many years of diabetes VS Physical Examination score distribution

If chronic ,how many years of diabetes	Physical examination score			%
	<=2.5(N)	%	>2.5(AN)	
1-10	76	12.6%	406	67.7%
11-20	55	9.1%	57	9.5%
21-30	3	0.5%	1	0.1%
31-35	1	0.1%	0	0

Fig 12 shows the number of participants who having chronic diabetes mellitus having high Physical examination score. From the above mentioned pie chart we can clearly determine that patient having 1-10 years 67.7% (406) shows high physical examination score among 599 participants.

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#### 4. Discussion

The objectives of the study were multifaceted. First, it aimed to assess the knowledge of diabetic polyneuropathy (DPN) among individuals with type 2 diabetes mellitus (DM). Findings revealed that among 599 participants, 11.4% demonstrated good knowledge, while 84.9% had poor knowledge of DPN. This highlights a significant gap in awareness within this population (Suez Canal University)(4). Gender-wise, females exhibited higher awareness, with 8.01% having good knowledge compared to 3.83% of males. Age-wise, those above 50 years showed better understanding, with 5.84% demonstrating good knowledge(5)(6). Additionally, the study evaluated the preliminary assessment of DPN using the Michigan Neuropathy Screening Instrument (MNSI), categorizing participants based on scores <4 (64.1%) and >=4 (32.2%). It noted that females (18.53%) and older participants (22.0% above 50 years) had higher preliminary assessment scores indicative of potential DPN. Furthermore, the study aimed to screen abnormalities through physical examination using MNSI, where 74.6% of participants had scores >2.5, suggesting a risk of DPN(7). This assessment revealed that males (39.23%) and those with chronic DM of 1-10 years duration (67.7%) tended to exhibit higher physical examination scores. Lastly, the study sought to correlate demographic variables like age, gender, years with DM, and history of diabetic drugs with MNSI scores, highlighting variations in knowledge and physical examination scores among different demographic groups(8). Overall, the findings underscored the prevalence and varying levels of awareness and risk associated with diabetic polyneuropathy among individuals with type 2 DM(9).

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#### 5. Conclusion

In conclusion, evaluating the prevalence of diabetic polyneuropathy requires a comprehensive assessment of its occurrence, distribution, and contributing factors among individuals with diabetes. By examining various aspects such as the diabetic population, risk factors identification, screening methods, and population-based studies, we can gain valuable insights into prevalence rates and their variations across different populations and settings. Prevalence estimates vary widely, ranging from a few percent to more than 50%, underscoring the significant impact of diabetic polyneuropathy. These variations are influenced by factors like duration of diabetes, glycemic control, and demographic characteristics. Temporal trends suggest potential changes over time, reflecting advancements in diabetes care and diagnostic approaches. Understanding the prevalence of diabetic polyneuropathy holds crucial clinical implications, emphasizing the importance of early detection, preventive measures, and effective management strategies to reduce its impact on healthcare utilization, quality of life, disability rates, and healthcare expenditures. By addressing modifiable risk factors and implementing targeted interventions, healthcare providers can actively work towards alleviating the burden of neuropathy and enhancing outcomes for individuals affected by diabetes.

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#### Compliance with ethical standards

##### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

### *Statement of Ethical Approval*

The study is approved by Institutional Ethical Committee No.972/2023/IEC/ACSMCH Dt.17.11.2023.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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