International Journal of Advance Research in Community Health Nursing

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Prevalence and the determinants of diabetic peripheral neuropathy among type 2 diabetes patients in a selected rural primary health centre, Chengalpet

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DOI: https://doi.org/10.33545/26641658.2023.v5.i2b.154

Abstract
Background: Diabetes is a major health issue that has reached alarming levels. Diabetic peripheral neuropathy (DPN) is the most common complication among Diabetes patients with a prevalence ranging from 18.8 to 61.9% in India. Microvascular complications are disabling and affect quality of life. This study aimed to assess the prevalence of Diabetic Peripheral Neuropathy and its risk factors among type 2 Diabetes patients.
Methodology: A Descriptive cross-sectional study was conducted among 200 type 2 Diabetes patients attending the Rural Primary Health Centre, Chengalpet. Data was collected using a diabetic neuropathy symptom (DNS) score.
Results: Among the 200 participants, 136 (68%) had neuropathy of which 69 (53%) reported numbness of feet, 113 (86.92%) had burning and aching pain and 52 (40%) reported prickling sensation. Non-literate, age, duration of Diabetes and uncontrolled hyperglycaemia were risk factors for Diabetic peripheral neuropathy.
Conclusion: Regular screening using simple clinical examinations and affordable tools can help early identification of Diabetic Peripheral Neuropathy and prevent complications like foot problems and amputation.

Keywords: Diabetic peripheral neuropathy, type 2 diabetes mellitus, rural, diabetic neuropathy symptom score

Introduction

Diabetes mellitus, more simply called diabetes, is a serious, long-term (or "chronic") condition that occurs when raised levels of blood glucose occur because the body cannot produce any or enough of the hormone insulin or cannot effectively use the insulin it produces [1]. Type 2 diabetes is the most common type of diabetes, accounting for over 90% of all diabetes worldwide. Globally, the prevalence of type 2 diabetes is high and rising across all regions. This rise is driven by population ageing, economic development and increasing urbanisation, leading to more sedentary lifestyles and greater consumption of unhealthy foods linked with obesity.

According to IDF Atlas 10th edition (2021), an estimated 537 million adults aged 20–79 years are currently living with diabetes worldwide. It is predicted to rise to 643 million (11.3%) by 2030 and to 783 million (12.2%) by 2045. Furthermore, 240 million people are living with undiagnosed diabetes which lead them to the development of long-term complications. India accounts for 1 in 7 of all adults living with diabetes worldwide. Approximately 6.7 million adults (20–79) are estimated to have died as a result of diabetes, or its complications in 2021.

The complications are categorized into 2 main groups such as microvascular (Neuropathy, Nephropathy, and Retinopathy) and macrovascular (Cardiovascular, Peripheral Arterial Disease, and Cerebrovascular) with long-term uncontrolled hyperglycemia. The microvascular complications are significant risk factor for developing disabilities. Several studies suggest that at least 20% of Type 1 diabetics, 10-15% of newly diagnosed Type 2 diabetics and about 50% patients with diabetes over 10 years suffer from DPN.

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In India, various studies report a prevalence of diabetic neuropathy ranging from 18 to 51%. DM has emerged as the leading cause of adult blindness, end stage renal disease and non-traumatic lower extremity amputations [2].

This study has been done at the primary health care level which is the first contact point for rural diabetic patients. Early screening of DPN at this level would be of great help for diabetic patients to prevent further complications like foot ulcers and amputations and improve the quality of life [3]. This study aimed to determine the proportion of individuals with DPN and the determinants associated with its development among diabetic patients attending the rural primary health centre in Chengalpet [3].

Statement of the problem
A Descriptive cross-sectional study to assess the prevalence and the determinants of diabetic peripheral neuropathy among type 2 diabetes patients in a selected rural primary health centre, Chengalpet.

Objectives
- To assess the prevalence of diabetic peripheral neuropathy among diabetes patients.
- To associate the prevalence of diabetic peripheral neuropathy with the selected demographic variables.

Materials and Methods
It is a descriptive a cross sectional study among Type 2 diabetes mellitus patients who were diagnosed and attending Non communicable disease clinic in a Rural Primary health Centre, Chengalpet. 200 type 2 diabetes patients in the age group of >35 yrs were included in the study. Socio-demographic questionnaire and Diabetic Neuropathy Symptom score were used to collect the data.

Diabetic Neuropathy is assessed by DNS (Diabetic neuropathy symptom) score [4]. It is a four-item validated score with high predictive value to screen for peripheral polyneuropathy in Diabetes mellitus.

Symptoms of
1. Unsteadiness in walking.
2. Numbness.
3. Burning, aching pain or tenderness in legs /feet.
4. Prickling sensations.

The presence of 1 symptom is scored as 1 point. Therefore, Maximum scores are 4 points.

>1 score → Positive for Diabetic Peripheral neuropathy.

A descriptive analysis was done for socio-demographic and clinical factors. The prevalence of diabetic neuropathy was calculated with 95% Confidence Interval. The Odds ratio were calculated to determine the association between diabetic neuropathy and the following factors- socio-demographic variables, glycaemic control, duration of diabetes and body mass index.

Results
Two hundred patients who attended the non-communicable diseases clinic at Rural Primary Health Centre were enrolled for the study. The socio-demographic profile of the participants revealed that the mean age of participants was 56.87 years. Of the 200 patients, 71.5% were females. Mean duration of diabetes was 8.3 years. A fasting blood glucose of >126 mg/dl and a postprandial blood glucose of >200 mg/dl was taken as uncontrolled value of blood glucose. About 67.5% of the patients had uncontrolled fasting blood glucose levels and 67% of the patients had uncontrolled postprandial blood glucose levels. In 132 patients (66%), both fasting and postprandial blood sugar levels were uncontrolled. Majority 38.5% of the patients were overweight (BMI of 25.0 to <30). 12% patients were obese (BMI of 30 or higher) whereas only 49.5% had BMI within normal range (18.5 to <25). All of them were on Oral hypoglycaemic agents (OHA).

Table 1: Socio-demographic and clinical characteristics of the study participants N = 200

S. No.	Variables	Frequency (N)	Percentage (%)
	Age		
1.	35-44	28	14
	45-54	68	34
	55-64	75	37.5
	>65	29	14.5
	Gender		
2.	Male	57	28.5
	Female	143	71.5
	Education		
3.	Non-literate	73	36.5
	Literate	127	63.5
	Occupation		
4.	Employed	160	80
	Unemployed	40	20
	Duration of DM		
5.	< 5 years	123	61.5
	5 -10 years	47	23.5
	10 years	30	15
	BMI		
6.	Normal	99	49.5
	Overweight	77	38.5
	Obesity	24	12
	Family H/O DM		
7.	Yes	68	34
	No	132	66
	FBS		
8.	Controlled	65	32.5
	Uncontrolled	135	67.5
	PPBS		
9.	Controlled	66	33
	Uncontrolled	134	67

The proportion of diabetics who were screened positive for Peripheral Neuropathy Score was 68% and Diabetic Neuropathy symptom (DNS) score showed mainly the scores of DNS 2 and DNS 3.
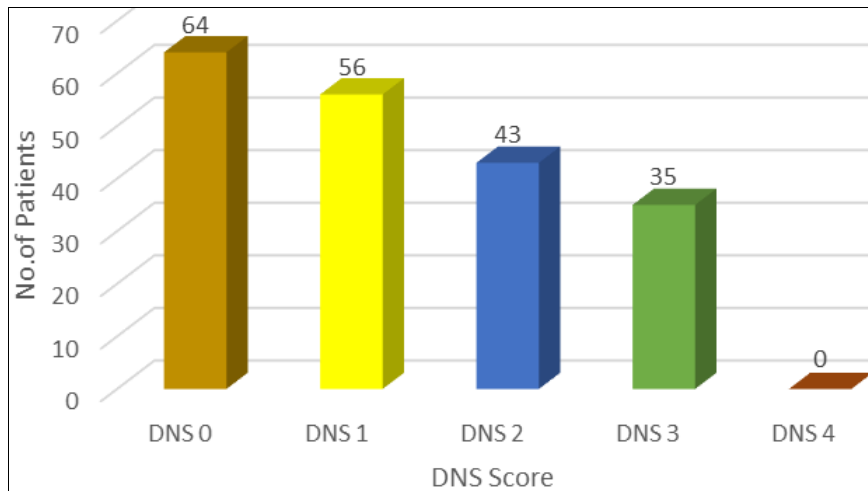
Fig 1: Prevalence of Diabetic Peripheral Neuropathy

In the 200 diabetics who took part in the study, numbness (34.5%), burning sensation in the feet (56.5%) and prickling sensation (26%) were the common reported symptoms among those specific for diabetic neuropathy.

Table 2: Prevalence of Diabetic Peripheral Neuropathy based on the symptoms N=200

S. No	Symptoms	No. of patients
1	Unsteadiness in walking	0
2	Numbness	69
3	Burning, aching pain or tenderness in legs /feet	113
4	Prickling sensations	52

Table 3: Association between selected variables and prevalence of diabetic peripheral neuropathy

Variables	Screened positive for DPN by DNS score (N)	%	Odds Ratio	Confidence interval	p value
Age					
<54	63	65.62	0.88	0.49 -1.58	0.69
>55	67	64.42			
Gender					
Male	36	37.5	0.89	0.47 - 1.69	0.73
Female	94	65.73			
Education					
Illiterate	50	68.49	1.27	0.69 - 2.35	0.43
Literate	80	62.99			
Occupation					
Employed	100	62.5	0.55	0.25 - 1.21	0.14
Unemployed	30	75			
Family H/o					
Yes	36	52.94	0.45	0.24 - 0.83	0.01
No	94	71.21			
Duration					
<5 years	57	46.34	0.04	0.01 - 0.13	0.0001
>5 years	73	94.8			
BMI					
Normal	62	62.62	0.81	0.45 - 1.45	0.48
Overweight	50	64.93			
Obesity	18	75			
FBS					
Controlled	41	63.07	0.88	0.47 - 1.63	0.69
Uncontrolled	89	65.92			
PPBS					
Controlled	40	60.6	0.75	0.40 - 1.38	0.36
Uncontrolled	90	67.16			

Table 3 shows that the association between selected demographic variables and prevalence of DPN. An age of 55 years and above was significantly associated with DPN (OR = 0.88, *P* value = 0.69). A duration of more than 5 years of diabetes was also significantly associated with DPN (OR = 0.04, *P* value = 0.0001). Females, illiterate diabetics, those with uncontrolled blood sugar levels, longer duration of diabetes, and obese individuals were found to be at greater risk for peripheral neuropathy, though their association with diabetic neuropathy was not statistically significant.

Discussion

Diagnosis of diabetic neuropathy is done by different methods including neurological examination to rule out the disease at its earliest stage. Early detection or diagnosis of neuropathy helps to halt its progress. Educating the client regarding diabetic neuropathy prevents foot ulcers and amputations.

The study utilized the assessment of diabetic neuropathy symptoms score for the diagnosis and it is being a quick, inexpensive, and simple instrument to evaluate the high-risk patients. In the present study, prevalence of peripheral neuropathy was assessed using DNS questionnaire showed 68% and mainly the scores of DNS 2 and 3. This result is consistent with the study done by Palta R, et.al., in a tertiary care hospital, Uttar Pradesh, India to analyse diabetic neuropathy by using Diabetic Neuropathy symptom score showed mainly the scores of DNS 2 and 3 [2].

Another study by Maniarasu *et al*. examined the prevalence of certain chronic complications among diabetes patients in Kancheepuram, TamilNadu based on the DNS chart showed 59% of them had peripheral neuropathy [7].

Neuropathy was more prevalent in the advanced age groups and among those with longer duration of the disease. This result was supported by a study conducted by Maiga Y *et al*., reported the occurrence of DPN was higher in those aged more than 55 years and with more than one year of diabetes [5].

Kamalarathnam *et al*., reported an age of 60 years and above was significantly associated with DPN (OR = 2.505, P value = 0.003) [6]. A duration of more than 4 years of diabetes was also significantly associated with DPN (OR = 1.872, P value = 0.02820).

The proportion of females affected by neuropathy was more than males, in the present study contrary to findings by Bansal *et al*., who reported that there were no sex-specific differences [8].

The higher prevalence of diabetic neuropathy among the illiterate and the unemployed patients may be due to inadequate foot care practices, which is common in these vulnerable groups. This highlights the significance of foot care education in managing diabetic neuropathy.

DNS is a simple, easy to use tool to identify the patients with risk of neuropathy. Since DNS is based on subjective response, it has to be used along with other examinations such as monofilament test for sensation etc to arrive at a diagnosis. Neuropathy was found to be more prevalent among the people with FBS >126 mg/dl (OR = 0.88, P value = 0.69) in the present study. Most of the patients who were symptomatic were overweight and obese based on BMI (OR = 0.81, P value = 0.48), Hence lifestyle modifications can be adapted as a preventive strategy to delay the onset of complications like peripheral neuropathy.

Conclusion

More than 60% of the diabetes patients had peripheral neuropathy based on the DNS tool. Advancing age, female gender, longer duration of diabetes, and BMI were found to have a higher proportion of neuropathy. Only advancing age and longer duration of the disease were found to be significantly associated with the presence of neuropathy. The DNS-score is a sensitive, validated symptom score, fast and easy to perform in clinical practice, for screening peripheral neuropathy among diabetics.

Acknowledgment

Conflict of Interest

Authors declare no conflict of interest

Funding Support

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