A study on prevalence of diabetic peripheral neuropathy in diabetic patients attending a rural health and training centre

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ABSTRACT

Introduction: Diabetic neuropathy is a common complication, affecting up to half the diabetics. Diabetic peripheral neuropathy (DPN) predominantly affects the hands and lower limbs. It leads to loss of protective sensation, resulting in continuous injury to insensitive feet. The early detection of DPN using an objective screening test followed by its appropriate management is important, as up to 50% of diabetic peripheral neuropathies may be asymptomatic. **Objectives:** To screen diabetic patients attending a Rural Health and Training Centre of a medical college in Tamil Nadu for DPN. To assess the association between DPN and sociodemographic factors, duration of diabetes, glycemic control, physical activity, body mass index, smoking and habit of alcohol consumption. **Materials and Methods:** The study was conducted among 206 diabetic patients attending a Rural Health and Training Centre. Participants were assessed using the Michigan Neuropathy Screening Instrument (MNSI), which involves using a questionnaire followed by a physical examination. **Results:** Of the 206 patients, 61.2% were male, and 38.8% were female. The mean age was 50.86 years (standard deviation [SD] = 12.26 years). The mean duration of diabetes was 8.3 years (SD = 5.5 years). The proportion of diabetics who were screened positive for peripheral neuropathy was 16.5% and 21.8% using the MNSI questionnaire and examination, respectively. Age of 60 years and above was significantly associated with DPN.(OR = 3.982, *P* value = 0.0001). Duration of more than 5 years of diabetes was also significantly associated with DPN.(OR = 6.01, *P* value = 0.003). **Conclusion:** A high proportion of diabetics were screened positive for peripheral neuropathy, and many of them were unaware of having the complication. Many risk factors associated with DPN were reported in this study. Thus, early diagnosis and management with MNSI or any other validated screening tool in health care institutions is essential.

Keywords: Diabetic neuropathy, diabetic peripheral neuropathy, MNSI

Introduction

There are 463 million diabetics worldwide, according to estimates. South East Asia is home to 88 million diabetics, 77 million of whom reside in India.[1] A major consequence that affects almost 50% of diabetes individuals is diabetic neuropathy (DN).[2] DN includes autonomic neuropathy, distal symmetric polyneuropathy (DSPN), and radiculopathy or polyradiculopathy.[2] Among them, DSPN is responsible for 75% of the diabetic neuropathies.

After ruling out other potential causes, DSPN is defined as the existence of symptoms and/or indications of peripheral nerve damage in diabetics. According to several studies, DSPN affects at least 20% of type 1 diabetics, 10% to 15% of newly diagnosed type 2 diabetics, and 50% of those with 10 years or more diabetic duration. According to several research, DN affects somewhere between 18–51% of people in India.[3-8]

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DSPN has a glove and stocking distribution. It often predisposes patients to foot ulceration. The neuropathic pain diminishes and finally goes away as DN advances, but sensory deficits endure, and motor abnormalities may arise. Due to the loss of protective sensibility brought on by DSPN, insensitive feet are continuously injured.[9,10] A rise in falls is brought on by altered balance and stride brought on by motor and sensory deficits. All of these elements have an indirect impact on life quality.[11] DSPN also places a heavy financial strain on society.[2]

Given that up to 50% of individuals with DN may be asymptomatic, it is crucial to identify the condition early with an objective screening test, followed by proper therapy.[2] Screening at the primary care setting for neuropathy will offer a way for early intervention and stop the disease's development. The goal of this study was to identify diabetic patients with peripheral neuropathy at a Rural Health and Training Centre (RHTC) in Tamil Nadu, as well as to determine whether diabetic peripheral neuropathy (DPN) is associated with certain sociodemographic factors, the duration of diabetes, modality of treatment, body mass index, smoking and alcohol use.

Materials and Methods

A cross-sectional study was conducted among the diabetic patients attending the RHTC of a medical college. It is located in Vayalanallur, Tiruvallur district, Tamil Nadu. The study duration was 1 month.

The sample size was calculated using a reported prevalence of DPN of 32%,[3] relative precision of 20% and 95% level of confidence. The required minimum sample size was 204. All diabetic patients, including newly diagnosed ones attending the outpatient department (OD) at the RHTC, were eligible for the study.

Michigan Neuropathy Screening Instrument (MNSI) was used as a screening instrument to screen DN among diabetic patients. It is created to screen for DPNs in outpatient settings by health care providers. It has two sections, one for history and another for examination.

The history part consists of 15 questions. Symptoms such as prickling feeling, pain, previously diagnosed as having neuropathy, dryness or amputation can be answered as either yes or no. Questions on weakness and cramps are not taken up for the scoring. The higher the score, the more severe the neuropathic symptoms. A score of four or more on the history part of the questionnaire is considered as positive for DN. The examination part will be conducted by a medical professional, and it consists of an appearance where infections and cracks are seen. Then, the patient will be examined for the reflex of the ankle, vibration sense, ulcers and finally, monofilament test. A score greater than or equal to 2.5 in the examination part was considered to be DN-positive.

After obtaining written informed consent, sociodemographic details, history of smoking, alcohol consumption and details about diabetes duration and mode of treatment were taken. They were then administered the MNSI.

SPSS (Statistical Package for the Social Sciences) 16 version and Excel were used in helping with data entry and analysis. Sociodemographic factors were also taken for analysis. With the help of data, prevalence was calculated. The 95% CI (confidence interval) and odds ratio (OR) were used to show the association between DN and risk factors — sociodemographic variables, diabetic duration, treatment modality, body mass index (BMI), history of smoking and alcohol consumption. A *P* value less than or equal to 0.05 was considered to be statistically significant.

Ethical approval was obtained from the Institutional Ethics Committee.

Results

Two hundred and six diabetic patients who attended the RHTC affiliated with a medical college were enrolled for the study. The sociodemographic details of the participants are given in Table 1. The mean age of participants was 50.86 years (SD = 12.26 years). In total 206 participants, 61.2% were male. The mean diabetic duration among participants was 8.3 years (SD = 5.5). The prevalence of DN using the history part of the MNSI questionnaire was 16.5% (95% CI = 11.43–21.57). The

Table 1: The sociodemographic details of the participants

Characteristics	Frequency	Percentage
Age (mean=50.86±12.26)		
21–30	11	5.3
31–40	29	14.1
41–50	65	31.6
51–60	51	24.8
Above 60	50	24.3
Sex		
Male	126	61.2
Female	80	38.8
Education		
Literate	143	69.4
Illiterate	63	30.6
Employment status		
Employed	131	63.6
Unemployed	75	33.4
Socioeconomic status		
Upper class	35	16.9
Upper middle class	65	31.5
Middle class	66	32
Lower middle class	20	9.7
Lower class	20	9.7
Marital status		
Married	134	65
Unmarried	41	19.9
Widowed/divorced/separated	31	13

prevalence of DN using the physical examination part of the MNSI questionnaire was 21.8% (95% CI = 16.16-27.44).

A disease duration of more than 5 years of diabetes was associated positively with DPN (OR = 8.54, P value = 0.001).

Risk for DPN was found to be greater among patients aged ≥60 years (OR = 3.982, P value = 0.0001), longer duration of diabetes (OR = 6.01, P value = 0.003), history of smoking (OR = 2.85, P value = 0.008), history of alcohol intake (OR = 2.34, P value = 0.03) and obese/overweight individuals (OR = 3.11, P value = 0.004). The association between these variables and DPN is given in Table 2.

Discussion

In our study, the prevalence of diabetic peripheral neuropathy (DPN) among diabetic patients was 16.5% and 21.8% using the MNSI history questionnaire and examination, respectively.

Similar to our study, D'Souza et al.[3] reported in their study, the proportion of DN among diabetics was 18.3% and 32.2% by MNSI history questionnaire and physical examination, respectively. A study done in Saudi Arabia by Al-Kaabi et al.[12] reported a prevalence of 10.4% by the MNSI questionnaire and 25.6% by the MNSI examination. Hanu George et al.[13] reported 47%, and Vibha et al.[5] reported 51.8% prevalence using MNSI examination alone. The variations in the prevalence reported could be due to the different cut-off points used to diagnose DN, though they all used the MNSI tool only. Factors like local factors, the study population chosen, differences in the proportion of diabetes and diabetic disease duration in the participants chosen are thought to be the reasons behind the different prevalence results obtained. There was always a difference in prevalence obtained using the two parts of the MNSI questionnaire, which may be attributed to difficulties in the patient's self-perception of

symptoms.[13] This shows the importance of physical examination by a medical professional for screening in health care settings. Iceberg phenomenon is the major factor behind DPN; almost 50% of diabetics with DPN may be asymptomatic, according to several studies.[2]

In this study, the age of 60 years and above was positively associated with DN (OR = 3.98, P value = 0.001). Yadav et al.[14] reported that diabetics above 60 years of age were at a greater risk for DN. Furthermore, the risk was mentioned as 1.7 times by them, which is very significant. Various studies also stated that there is an increasing risk of DN with ageing.[7] Biological processes that come with older age are the main reason behind this association. These biological processes contribute to the development of peripheral neuropathy in these elderly diabetics.[15] Foot ulcers and falls due to poor vision and vascular changes, all related to old age, already have an impact on them, so early diagnosis and management of DN would be very helpful in reducing morbidity. Duration of diabetes was also positively associated with DN in this study (OR = 8.51, P value = 0.001).

The prolonged duration of diabetes causes many structural and metabolic alterations in neurons, which results in the cause of DN in humans. American Diabetes Association recommends that DPN should be screened with the help of a validated tool (like MNSI) to reduce morbidity associated with it.[2] By screening, early detection and management of DN is possible, and it helps in preventing morbidities like foot ulcerations, amputation, etc. Health education based on screening is another important aspect towards reducing morbidities like foot ulcers.

A high proportion of the patients attending the OD of the RHTC were found to be positive for DPN. The prevalence was more in those aged more than 60 years, those with diabetes duration of more than 5 years, those with smoking

Table 2: Association between selected variables and diabetic peripheral neuropathy						
Characteristics	n	MNSI +ve	%	Odds ratio	95% CI	P
Duration of diabetes (mean=8.32±5.5)						
Above 10 years	45	29	**64.4**	36.85	9.94–136.58	0.0001
6 to 10 years	97	13	13.4	3.14	0.85–11.52	0.083
5 years and less	64	3	4.6	1		
H/o smoking						
Present	36	14	**38.8**	2.85	1.31–6.19	0.008
Absent	170	31	18.2			
H/o Alcohol consumption						
Present	40	14	**35**	2.34	1.09–5.00	0.027
Absent	166	31	18.6			
BMI						
Normal and underweight	108	14	12.9	1		
Overweight	92	27	29.3	2.78	1.35–5.72	0.005
Obese	6	4	**66.6**	13.42	2.24–80.25	0.004
Modality of treatment						
OHA	165	30	18.2	2.59	1.22–5.48	0.012
Insulin/ Insulin + OHA	41	15	**36.5**			

Bold values to emphasize higher prevalence of diabetic peripheral neuropathy. BMI=Body mass index, MNSI=Michigan Neuropathy Screening Instrument, OHA=Oral Hypoglycemic drugs

history, alcohol history and patients who were obese and overweight.

MNSI is an efficient tool which can be used by health care providers to screen for DPN. It can be used by various nations in their NCD programs to diagnose DPN early and manage it efficiently.

Conclusions

A high proportion of diabetics were screened positive for peripheral neuropathy, and many of them were unaware of having the complication. Many risk factors associated with DPN were reported in this study. Thus, early diagnosis and management with MNSI or any other validated screening tool in health care institutions is essential.

Conflicts of interest

There are no conflicts of interest.

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