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Research Article

Prevalence and determinants of peripheral neuropathy among diabetics in a rural cum costal area of Villupuram district, Tamil Nadu

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ABSTRACT

Background: Diabetes mellitus is characterised by persistent hyperglycaemia that may be due to absolute or relative insulin deficiency. It was estimated that there would be 285 million diabetics by 2010 in the world. This estimate is projected to increase by 65% to become 438 million in the year 2030. Similarly in India it is estimated to increase by 58% from 51 million people in the year 2010 to 87 million people by the year 2030.
Methods: The study was carried out as cross sectional study among 235 diabetic OPD attendants of rural health centre aged 30 years and above. TCSS was used for diagnosis diabetic peripheral neuropathy. Data was entered in MS excel 2007 and analysis was done using SPSS version 17.0. Chi square test was applied to find statistical difference in proportions and a p value of <0.05 was considered statistically significant.
Results: The overall prevalence of peripheral neuropathy among the study participants was observed to be 13.2%, while none of the study subjects presented with severe form of the disease. Nearly half of the patient who participated in the study also had co existing systemic hypertension. Also 12.3% of the study subjects had a positive history of foot ulcers.
Conclusions: The prevalence of DPN increased with increasing age and it is observed to be associated with duration of diabetes, physical activity, smoking habit and systemic hypertension.

Keywords: Diabetes mellitus, Peripheral neuropathy, Risk factors, Prevalence

INTRODUCTION

Diabetes mellitus is characterised by persistent hyperglycaemia that may be due to absolute or relative insulin deficiency. It was estimated that there would be 285 million diabetics by 2010 in the world. This estimate is projected to increase by 65% to become 438 million in the year 2030. Similarly in India it is estimated to increase by 58% from 51 million people in the year 2010 to 87 million people by the year 2030.[1] Diabetes mellitus may lead to various macro vascular and micro vascular complications, which might ultimately result in economic burden and poor quality of life of the patient. The most common complication of diabetes is Diabetic Peripheral Neuropathy (DPN) which usually starts from toes and moves upwards. DPN mainly affects the peripheral nerves of feet, legs, hands and arms. It is characterised by numbness, tingling, pain, burning and throbbing sensations and also increases the risk of foot ulcers. Significant motor deficits are found to occur in late stage of the disease. Some of the risk factors of DPN include age >60 years, females, obesity and hypertension.[2] Regular consumption of even moderate amount of alcohol interferes with blood glucose and increases the risk of peripheral neuropathy.[3] Similarly smoking and long duration of diabetes mellitus are found to increase

the risk of DPN. 110 million people worldwide are estimated to be likely affected by DPN.[4] The prevalence of DPN varies largely across regions from 5% to 60%.[5-8] Screening for peripheral neuropathy among patients with diabetes mellitus has been identified as an effective strategy in prevention of DPN. The present study aims at measuring the prevalence of Peripheral Neuropathy and its determinants among diabetics in a rural area of Villupuram, Tamil Nadu.

METHODS

The study was carried out in a rural area of Villupuram district, Tamil Nadu, South India; which was also the field practise area of Rural Health Center, Department of Community Medicine, Pondicherry Institute of Medical Sciences. The field practise area of the rural health centre covers a total population of 10090 in the coastal areas of Villupuram district. The study was undertaken as a cross sectional study during the period of May 2012 to December 2012. The minimum required sample size was calculated to be 235 based on a prevalence rate of neuropathy among diabetic patients taken as 19% from a study done by Ashok S et al.[9] in South India. Sample size was calculated using the formula Z^2PQ/d^2 with an absolute precision of 5%. Study subjects were recruited from the Out Patient Department (OPD) attendants of rural health centre. Patients of both gender attending the OPD who were already a known case of diabetes mellitus and more than or equal to 30 years of age are included in the study. Patients with type I diabetes mellitus, Cerebro-vascular accident and Hansen's disease were excluded from the study. A detailed participant information sheet with the procedure, details of examination and implication of the study was provided and voluntary written informed consent was obtained before the interview and examination of the study participants. Institute ethical committee clearance certificate was obtained before starting the study.

Procedure

Detailed history pertaining to demographic details, life style patterns, neurological symptoms, co-morbid illnesses and risk factors was obtained using a predetermined pilot tested questionnaire. Dietary history of the past week was obtained to categorise the patients diet as low to high glycaemic index foods based in their predominant diet pattern. Patients who ever smoked tobacco for a period not less than one year were categorised as smokers and who, ever consumed alcohol for a period of not less than one year were categorised as alcoholics for the sake of comparison in the study. Study participants were classified into three difference classes of physical activity viz., vigorous activities, moderate activities, low intensity activities. This classification was done on the basis of occupation of the study participants and predominant activities in which the individual is involved during work as well as leisure time. Toronto Clinical Scoring System (TCSS) was used for assessing diabetic peripheral neuropathy. TCSS produces a score derived from clinical assessment of certain symptoms, sensory tests and lower limb reflexes. A TCSS score of 6-8, 9-11 and ≥12 indicates mild, moderate and severe neuropathy respectively. TCSS was previously validated and the sensitivity and specificity of which was observed to be 77.2% and 75.6% in diagnosing peripheral neuropathy. Data was entered in MS excel 2007 and analysis was done using SPSS version 17.0. Chi square test was applied to find statistical difference in proportions and a p value of <0.05 was considered statistically significant. Univariate logistic regression analysis was done to calculate odds ratio to quantify the strength of association.

RESULTS

The present study included 235 diabetic patients of which majority are in the age group of 41 to 60 years and majority were females.

Table 1: Distribution of study participants based on socio-demographic characteristics (n=235).

Characteristics	Frequency	Percent
Age (years)		
30-40	26	11.0
41-50	70	29.8
51-60	70	29.8
61-70	38	16.2
>70	31	13.2
Gender		
Male	92	39.1
Female	143	60.9
Diet pattern		
Low glycaemic food	41	17.4
Medium glycaemic food	67	28.5
High glycaemic food	127	54.1
Physical activity		
Vigorous	62	26.4
Moderate	107	45.5
Sedentary/low	66	28.1
Duration of diabetes		
<5 years	127	54.0
5-10 years	57	24.3
>10 years	51	21.7
History of smoking		
Present	20	8.5
Absent	215	91.5
History of alcohol intake		
Present	13	5.5
Absent	222	94.5
Known case of hypertension		
Present	100	42.5
Absent	135	57.5
Total	235	100

Almost half of the study participants consumed a diet that consists predominantly high glycaemic index food items. Likewise, 3/4th of the study participants were involved in moderate or low physical activity. More than 45% of the study participants had diabetes for a period of at least 5 years duration. The prevalence of smoking and alcohol intake among the study participants was 8.5% and 5.5% respectively. Nearly half of the patient who participated in the study also had co existing systemic hypertension (Table 1). Also 12.3% of the study subjects had a positive history of foot ulcers (Not presented in table).

The overall prevalence of peripheral neuropathy among the study participants was observed to be 13.2%, while none of the study subjects presented with severe form of the disease. Overall 12.3% of them had mild neuropathy and 0.9% of them had neuropathy of moderate severity. The present study results show that the prevalence of peripheral neuropathy increased with increasing age. Similar observation was also seen in case of duration of diabetes and prevalence of DPN. Higher prevalence was observed among people who are underactive and have a sedentary lifestyle. Smoking, alcohol intake and Hypertension were also found to be significantly associated with the occurrence of peripheral neuropathy among the patients with diabetes mellitus (Table 2).

Table 2: Association between peripheral neuropathy and certain selected risk factors of the study participants (n=235).

Characteristic	Peripheral neuropathy		Total n (%)	p value	Odds ratio
	Present n (%)	Absent n (%)			
Age (years)					
30-40	2 (8)	24 (92.3)	26 (100)	0.0453	Ref
41-50	7(10)	63 (90)	70 (100)		1.3
51-60	8 (11)	62 (88.5)	70 (100)		1.5
61-70	7 (18)	31 (81.5)	38 (100)		2.71
>70	7 (22.5)	24 (77.4)	31 (100)		3.5
Gender					
Male	10 (10.8)	82 (89.2)	92 (100)	0.43	Ref
Female	21 (14.7)	122 (85.3)	143 (100)		1.41
Diet pattern					
Low glycaemic food	0 (0)	41 (100)	41 (100)	<0.001	NA
Medium glycaemic food	2 (3)	65 (97)	67 (100)		
High glycaemic food	29 (22.8)	98 (77.2)	127 (100)		
Physical activity					
Vigorous	4 (6.4)	58 (93.6)	62 (100)	0.001	Ref
Moderate	10 (9.3)	97 (90.7)	107 (100)		1.5
Sedentary/low	17 (25.7)	49 (74.3)	66 (100)		5.03
Duration of diabetes					
<5 years	6 (4.71)	121 (95.3)	127 (100)	<0.001	Ref
5-10 years	9 (15.7)	48 (84.2)	57 (100)		3.78
>10 years	16 (31.3)	35 (68.6)	51 (100)		9.22
History of smoking tobacco					
Yes	6 (30)	14 (70)	20 (100)	0.032	3.26
No	25 (11.6)	190 (88.4)	215 (100)		
History of alcohol intake					
Yes	2 (15)	11 (85)	13 (100)	0.68	1.21
No	29 (13.1)	193 (86.1)	222 (100)		
Known case of systemic hypertension					
Yes	25 (25)	75 (75)	100 (100)	<0.001	7.17
No	6 (4.4)	129 (95.6)	135 (100)		
Total	31 (13.2)	204 (86.8)	235 (100)		

DISCUSSION

Peripheral neuropathy characterised by numbness, tingling, throbbing and burning sensations of the feet is one of the major complications of Diabetes mellitus. The prevalence of peripheral neuropathy among diabetics in our study population was 13.2%. The prevalence of DPN was reported to be around 26% in a study conducted in urban area of South India.[10] Another from South India also reported a similar prevalence of 19% among patients with Diabetes mellitus.[9] The prevalence of the above studies were higher when compared to the present study results, however, different diagnostic methods and criteria are used for each of the above discussed studies. In a study done by Morkrid K et al.[11] in Bangladesh it was observed that the prevalence of DPN increased with increasing age, similar results were observed in the present study also. In the present study, people with hypertension had a higher prevalence of DPN, while contrasting results are observed in various other studies stating positive association[9] as well as no association.[12] Prevalence of DPN was observed to be higher among individuals who are suffering from Diabetes mellitus for a longer duration in the present study, similar observations was observed in a study by Janghorbani M et al.[13] Habit of smoking increased the risk of DPN as observed in the present study, in a study by Katulanda P et al.[14] smoking was found to be strong predictor for development of DPN. Some of the strengths of the study includes that standard validated scale was used for screening the patients with peripheral neuropathy and various possible determinants were studied. Possible limitations could be that because of a relatively small sample size temporal association could not be established between duration and severity of various exposures and the outcome. On considering the resources required and feasibility Glycaemic control of the study participants was not studied.

CONCLUSION

The prevalence of peripheral neuropathy assessed using TCSS among OPD attendants in rural area of Villupuram district was found to be 13.2%. Peripheral neuropathy cases were found to be of mild to moderate severity. Advancing age, duration of diabetes, smoking, physical inactivity, dietary pattern that is rich in high glycaemic index foods and coexisting Hypertension were found to be significantly associated with development of peripheral neuropathy among patients with type 2 diabetes mellitus. Regular screening of patients with diabetes mellitus for peripheral neuropathy may be recommended for early diagnosis and treatment.

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