PREVALENCE OF PERIPHERAL NEUROPATHY IN NEWLY DIAGNOSED TYPE 2 DIABETICS

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ABSTRACT

Our objective was to determine the prevalence and risk factors of peripheral neuropathy in newly diagnosed type 2 diabetes mellitus. One hundred newly diagnosed type 2 diabetic patients attending Diabetes Clinic, Regional Institute of Medical Sciences, Imphal were randomly selected for clinical and electrophysiological studies for diagnosis of peripheral neuropathy. Peripheral neuropathy was evaluated by using Neuropathy Symptoms Score (NSS), Neuropathy Disability Score (NDS) and Nerve Conduction Studies (NCV) and the diagnosis of peripheral neuropathy was made when two or more of the three abnormalities of NSS, NDS and NCV were present.

29 patients (29%), 17 males (28%) and 12 females (31%) of the 100 newly diagnosed type 2 diabetic patients had peripheral neuropathy. Multiple logistic regression analysis shows that duration of diabetes has maximum contribution and age, systolic blood pressure and blood glucose have some contribution to the development of diabetic peripheral neuropathy.

The prevalence of peripheral neuropathy in newly diagnosed type 2 diabetic patients in Manipur using clinical and electrophysiological methods is 29 percent and shows significant correlation between peripheral neuropathy and duration of diabetes, age of the patients and postprandial blood glucose levels.

KEY WORDS: Peripheral neuropathy, Type 2 diabetes mellitus, Neuropathy symptoms score (NSS), Neuropathy disability score (NDS), Nerve conduction velocity (NCV).

INTRODUCTION

Type 2 diabetes mellitus is frequently asymptomatic and the associated complications of diabetes like neuropathy may be the first clinical indication of the disease (1). The reported prevalence of diabetic neuropathy varies from less than 5 to 60% (2). Few studies have been done to study the prevalence of neuropathy in newly diagnosed diabetes. The prevalence and the risk factors of peripheral neuropathy in the newly diagnosed or detected type 2 diabetics in Manipur were evaluated.

MATERIALS AND METHODS

One hundred newly diagnosed type 2 diabetic patients attending the Diabetes Clinic, Regional Institute of Medical Sciences, Imphal, Manipur from March 2002 to September 2003 were selected randomly for the study. Patients with chronic renal failure, chronic liver disease, chronic airways disease, carcinoma, infections and critical illness are excluded from the study. The diagnosis of type 2 diabetes was done according to the criteria laid down by American Diabetic Association (1997). A detailed clinical history was taken using a structured questionnaire. A complete clinical examination was done including the height and weight in light clothes. Body mass index was calculated using the formula weight in kilograms divided by height in meters squared. Evaluation of neuropathy was done clinically as well as electrophysiologically using MEDLEC (Sapphier, England) Electromyograph by trained personnel using conventional method with surface electrodes.

Clinical neuropathy was evaluated using a questionnaire on neuropathic symptoms and Neuropathy Symptoms Score (NSS) (3) like presence of neuropathic pain or paraesthesia. The calculation was done as present [1] or absent [0]. Neuropathic pain was defined as pain in the limbs in the absence of a history of trauma or other external cause. Paraesthesia was defined as a sensation which is characteristically perceived as tingling, numbness, sharpness or burning.

The calculation of Neuropathy Disability Score (NDS) (3), the presence of deep tendon reflexes and sensation are graded as normal [0]), decreased [1], or absent [2]. A score of 2 or more was taken as abnormal. Vibration perception threshold (VPT) was tested with a tuning fork (128 Hz) on each malleolus, pain sensation by pin prick, touch sensation with a

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wisp of cotton and temperature sensation by a cold tuning fork. Position sense and deep tendon reflexes were also tested conventionally. Nerve Conduction velocity (NCV) (4) were studied by conventional method with surface electrodes with limbs kept warm at a temperature of 38°C. Motor nerve conduction velocity (NCV) and compound muscle action potential (CMAP) amplitude were measured in the leg segment (ankle to knee) of peroneal nerves. If the NCV was less than or equal to 39 m/s and/or CMAP amplitude was less than or equal to 1 mv, it was recorded as abnormal.

In this study peripheral neuropathy was diagnosed if two or more of the three abnormalities of Neuropathy Symptoms Score, Neuropathy Disability Score and abnormal Nerve Conduction Velocity were present.

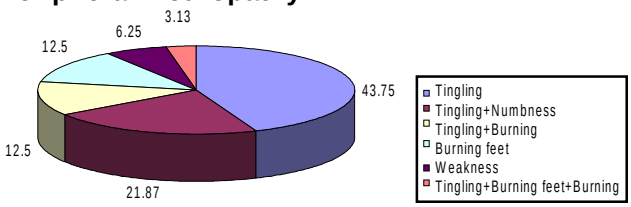
Statistical Analysis: X^2 test and Student's t-test were applied to compare frequencies and means respectively. Multiple logistic regression model was fitted to look for risk factors associated with peripheral neuropathy.

RESULTS

The 100 newly diagnosed patients of type 2 diabetes comprised of 61 males and 39 females with their age ranging from 30 years to 75 years. 16 patients had hypertension of which 11 were males (18.03%) and 5 females (12.82%). BMI more than 25 was seen in 23 patients (23%) of which 10(16.39%) were males and 13 females (33.33%). 18 patients (18%) who were all males drank alcoholic beverage. Smoking was associated in 16 patients (16%) comprising of 14 males and 2 females.

In this study 32 patients (32%) had neuropathic symptoms (NSS) of more than or equal to 1 as shown in Figure 1. Tingling was the most common symptom (43.75%), followed by tingling and numbness (21.87), tingling and burning feet (12.5%). Burning feet alone (12.5%), weakness of the limbs (6.25%) and combination of tingling, numbness and burning feet (3.13%) were the other findings.

Figure 1: Presenting symptoms in Diabetic Peripheral Neuropathy

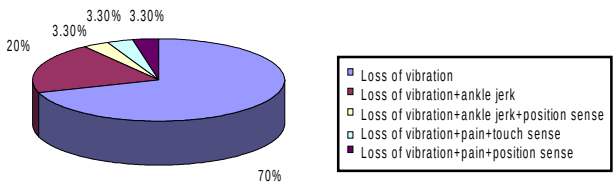


30 out of the 100 newly diagnosed diabetic patients had neuropathic signs, Neuropathy Disability Score (NDS) more than or equal to 2 as shown in Figure 2. Impaired vibration sense was the most common abnormality in 21 patients (70%), followed by loss of vibration with absent ankle jerk (20%), loss of vibration and position sense with absent ankle jerk (3.3%), loss of vibration, pain and touch (3.3%) and loss of vibration, pain and position sense (3.3%)

Abnormal nerve conduction velocity was found in 27 patients (27%) comprising 15 males (24.6%) and 12 females (30.7%) out of the newly diagnosed diabetics. Out of the 27 patients, 15 patients had both reduced nerve conduction velocity i.e. less than or equal to 39 m/s and reduced CMAP amp i.e. less than or equal to 1 mv. 6 patients had only reduced velocity.

According to the criteria for the diagnosis of peripheral neuropathy, 29 patients, 17 males (28%) and 12 females (31%) out of the 100 newly diagnosed type 2 diabetic patients had peripheral neuropathy and females were affected more than the males (31:28) although it is not statistically significant. The average age of the neuropathic group (50.44±10.35) is significantly higher ($p<0.018$) than the non-neuropathic group (45.15±9.8). It is also seen that peripheral neuropathy has a highly significant correlation to the duration of diabetes ($p<0.001$). Both systolic and diastolic blood pressures are higher in the neuropathic group (129.86±19.9 mm.Hg and 82.2±9.32 mm.Hg) compared to the non-neuropathic group (123.57±13.09 mm.Hg and 80.28±9.33 mm.Hg), although this is not statistically significant.

Figure 2: Neuropathic signs in Diabetic Peripheral Neuropathy



Both fasting and postprandial blood glucose levels are higher in neuropathic group compared to the non-neuropathic group. The fasting blood glucose in the neuropathic group (220±68.17mg/dl) is higher than that of the non-neuropathic group (197.23±57.65 mg/dl) although it is not statistically significant ($p<0.08$). However the postprandial blood glucose of the neuropathic group (333.3±84.01 mg/dl) is significantly

higher (p<0.016) than the non-neuropathic group. There is no significant difference in the BMI of the neuropathic and non-neuropathic groups (22.61±3.03 and 22.95±3.15) as shown in Table 1.

Multiple logistic regression analysis was conducted where peripheral neuropathy (non-neuropathy and neuropathy) is responsed / dependent variables, sex, alcohol use and smoking are categorical variables and age, duration of diabetes, blood pressure, blood glucose (fasting and postprandial) are pooled under co-variate. The analysis shows that duration of diabetes has maximum contribution to diabetic peripheral neuropathy (p<0.00). The values of odd ratio (OR) suggests age (OR1.0568), systolic blood pressure (OR 1.0452), blood glucose (OR 1.0054) have contribution to some extent in the development of diabetic peripheral neuropathy.

Table 1: Clinical and Biochemical Characteristics of the Neuropathy and Non-neuropathy Groups

Parameters	Non-Neuro (n=71)	Neuro (n=29)	t-value	P value
Age	45.15±9.80	50.44±10.35	2.41	0.018
Sex				
Male	44	17		
Female	27	12	0.97	0.755
Alcoholic use				
Alcoholic	9	8		
Nonalcoholic	62	21	3.244	0.072
Smoking				
Smoker	13	5		
Nonsmoker	58	24	0.16	0.9
Duration (months)	4.73±4.88	13.10±6.9	6.855	0.001
Blood Pressure				
SBP	123.57±13.09	129.86±19.9	1.857	0.066
DSP	80.28±9.33	82.2±9.93	0.936	0.352
P. Glucose				
Fasting	197.23±57.65	220.97±84.0	12.452	0.016
PP	296.44±60.75	333.3±84.01	2.452	0.016
BMI	22.95±3.15	22.61±3.03	0.501	0.617

DISCUSSION

Diabetic peripheral neuropathy is one of the commonest complications of diabetes mellitus and it may be the first presenting symptom in type 2 diabetes. In our study, 29% of the newly diagnosed patients of type 2 diabetes have clinical and electrophysiological evidence of diabetic peripheral neuropathy which agrees with the finding of 27.8% by Franklin et al (5). Hamman et al (6) also found the prevalence of diabetic peripheral neuropathy in 29.7% and 26.9% in their study among the non- Hispanic whites and Hispanics respectively. Using vibration sensation Nielsen et al (7) observed neuropathy in 38% of their patients and Cheng et al (8) in 33.9% among their Taiwanese patients of diabetes.

However Ratzman et al (9) and Pirart (10) observed a lower prevalence of diabetic peripheral neuropathy in 6.3% and 7% respectively in their studies. Weerasuriya et al (11) observed 9.8 % of their diabetics had evidence of diabetic neuropathy at the time of diagnosis in their study from Sri Lanka. Ashok and his colleagues(12) observed a prevalence of neuropathy in 5.4% of their patients with type 2 diabetes at the time of diagnosis. This difference in the prevalence of peripheral diabetic neuropathy between their study and ours can be explained because our study used clinical and electrophysiological studies (Neuropathy Symptom Score, Neuropathy Disability Score and Nerve Conduction Studies) whereas neuropathy was assessed by Ashok et al using a biothesiometer, which is comparatively a less sensitive method. Another factor may be because our patients attend the Diabetes Clinic much later compared to patients of Ashok et al (12) because of less awareness of the disease.

The present study shows by multiple logistic analysis that there is significant correlation between peripheral neuropathy and duration of diabetes, age of the patients and postprandial blood glucose levels. This association is also observed by Weerasuria et al (11), Ashok et al (12) and Young et al (13) in their multicentre study.

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