The Prevalence of Diabetic Peripheral Neuropathy in an Outpatient Setting

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Summary

This study was undertaken to clinically estimate the prevalence of diabetic peripheral neuropathy amongst patients attending an outpatient clinic and to evaluate their risk factors for developing peripheral neuropathy. It was a cross-sectional study of 134 diabetes mellitus patients who attended the Primary Care Clinic, University Hospital, Kuala Lumpur. The patients were interviewed for their demographic data, past and present medical/surgical history, social history, personal habits and symptoms of peripheral neuropathy. Foot examination and clinical neurological tests were conducted and the presence of peripheral neuropathy was assessed. The main outcome measures were the Neuropathy Symptom Score and the Neuropathy Disability Score. The prevalence of diabetic peripheral neuropathy was found to be 50.7%. Peripheral neuropathy was related to the age of the patient and the duration of diabetes but did not seem to be significantly related to diabetic control. To conclude, there was a high prevalence of peripheral neuropathy amongst the diabetics in this study. These patients developed peripheral neuropathy at a younger age and shorter duration of diabetes compared to a similar study that was done in the UK.

Key Words: Peripheral neuropathy, Neuropathy symptom score, Neuropathy disability score

Introduction

This study was undertaken to address an important but often neglected area in diabetic care i.e the examination of the feet. Despite an increase in the prevalence of diabetes mellitus[1], the adequacy of foot examination was a dismal 0-2%[2]. In a retrospective study done in Kuala Lumpur General Hospital during the period 1972-79, diabetes mellitus was found to be the cause in 43% of all major lower limb amputations. The incidence would have been higher if toe amputations were also included in the study[3].

There is no local data on the prevalence of diabetic peripheral neuropathy. Other studies had estimated the prevalence to be between 8 to 100%[4-8]. The wide variation in the prevalence of diabetic peripheral neuropathy is due to the considerable lack of consensus on basic definitions and differences in patient selection and diagnostic

techniques. The studies reporting 100% prevalence rates had all been based on nerve conduction studies.

A clinical scoring system was employed to diagnose peripheral neuropathy in this study. This scoring system, known as the Neuropathy Symptom Score (NSS) and Neuropathy Disability Score (NDS) had been verified in a large UK study and a high correlation was found between the clinical scoring system and quantitative sensory testing of neuropathy. Although peripheral neuropathy studies should be confirmed by nerve conduction tests, this is not feasible in an outpatient setting[9].

Materials and Methods

This was a cross-sectional study of diagnosed diabetes mellitus patients attending the Primary Care Clinic, University Hospital, Kuala Lumpur between September 1998 to March 1999. Participation was voluntary and subjects were recruited after informed consent.

Participants were interviewed for their socio demographic data (age, gender, level of education, occupation, average monthly income, marital status, living arrangement), smoking and alcohol consumption, exercise habits, foot-wear, self care and clinical history (medical/surgical/drug history). All patients were weighed and their height, blood pressure and the latest fasting/random blood sugar, HbA1c and fasting serum cholesterol were recorded. Examination of the foot was conducted to detect presence of infection, pressure signs and deformities.

The Neuropathy Symptom Score (Fig. 1) and Neuropathy Disability Score (Fig. 2) for each patient was derived.

To verify the scoring system, a control group comprising of clinic staff who were non-diabetic and of various ages were tested for peripheral neuropathy.

The data was analysed using SPSS version 8.0. Chi-square significance test was used and the criterion for statistical significance was p-value< 0.05. This study was approved by the Medical Ethics Committee, University Malaya.

Fig. 1: Neuropathy Symptom Score

1. Burning/numbness/tingling	2
Fatique/cramping/aching	1
No above symptoms	0
2. Symptoms present in feet	2
Symptoms present in calves	1
Symptoms present elsewhere	0
3. Nocturnal exacerbation of symptom	2
Symptoms present day & night	1
Symptoms present at daytime only	0
4. Symptoms wake patient up from sleep	1
5. Manoeuvres to reduce symptoms :	
Walking	2
Standing	1
Sitting/lying	0
Total Score : _____	

(Mild symptoms 3-4, moderate symptoms 5-6, severe symptoms 7-9)

Fig. 2: Neuropathy Disability Score

1. Ankle Reflex :	Absent	2
	Present + reinforcement	1
	Normal	0
2. Vibration :	Reduced/Absent	2
	Present	1
3. Pin Prick :	Reduced/Absent	2
	Present	1
4. Temperature :	Reduced	2
	Present	1
	Total Score :	_____

(Mild sign 3-5,moderate sign 6-8, severe sign 9-10)

Results

In the control group, 20 non-diabetic volunteers were recruited; their ages ranging from 18 to 64 years old. None of the volunteers in the control group were found to have peripheral neuropathy using the scoring system.

One hundred and thirty-eight diabetic patients were recruited into the study. Four patients were reluctant to participate and were excluded. The response rate was 97.1% and analysis was done on the remaining 134 patients.

The overall prevalence of diabetic peripheral neuropathy was found to be 50.7%.

There were 77 (57.5%) females. The three main races were of equal distribution: Malay 32.8%, Chinese 32.1% and Indian 32.8%. Their ages ranged from 22 years to 84 years with a mean age of 56.49 years. 98.5% were of Type 2 diabetes.

Regarding their habits, 9% were current smokers, 5.2% were current alcohol consumers and 87.3% did little or no exercise. 62.7% wore open sandal/slippers and only 33.6% wore footwear in the house. Despite 13.4% not being able to see their feet clearly, only 5.2% depended on their family to trim their toenails. Only 13.5% did home self-monitoring.

Peripheral neuropathy was not found to be related to sex (p=0.979), race (p=0.411), smoking (p=0.571) and exercise (p=0.171). 9.7% gave a history of past/present foot ulcer, 3 patients had digital amputation and 1 patient had below knee amputation. Foot examination revealed that 31.3% had skin lesions such as calluses (23.8%) and one patient had a foot ulcer. 5.9% had fungal /bacterial infection. Foot deformities were present in 17.7% (hallux valgus, prominent metatarsal head, amputated toe, Charcot's joint)

There was a high proportion of patients with poor diabetic control attending the Primary Care Clinic. Fasting/random blood sugar were raised in 60.4% and Hba1c was above the acceptable value of <7.7% in 42-50%. Not surprisingly, 42.5% had high BMI and 39.6% had raised blood pressure.

Peripheral neuropathy was surprisingly not found to be related to the glycaemic level (p=0.588) and Hba1c level (p=0.906). It was also not related to BMI (p=0.996).

Peripheral neuropathy was found to be significantly related to age (p=0.001) (Fig.3). Age

was found to be a significant independent predictor of peripheral neuropathy (p=0.00).

The mean number of years of education was 6.9 years. Six patients were found to be illiterate. Peripheral neuropathy was present in 59.7% of patients with less than 6 years of formal education and 28.6% in patients with more than 12 years of formal education. However, statistically, the relationship of peripheral neuropathy with level of education was not found to be significant (p=0.091).

The duration of diabetes ranged from 2 months to 35 years with a mean of 8.49±7.33 years. The mean duration of diabetes of patients without peripheral neuropathy was 5.77±5.12 years while the mean duration of diabetes mellitus of patients with peripheral neuropathy was 11.12±8.19 years. Peripheral neuropathy was found to be significantly related to the duration of diabetes mellitus (p=0.000). The duration of diabetes mellitus was also found to be a significant independent predictor of peripheral neuropathy (p=0.0048). It was noteworthy that 40.2% of patients with less than 10 years of diabetes were found to have peripheral neuropathy (Fig. 4). It was also found that one person did not have peripheral neuropathy despite having diabetes for 35 years.
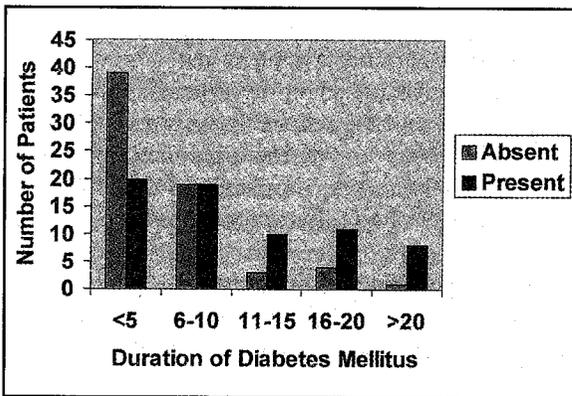
Discussion

This study showed a higher prevalence of peripheral neuropathy (50.7%) than the prevalence of 32.1% obtained in a multicenter study in the United Kingdom[1]. Although ideally these two studies are not comparable, the absence of local data has made this comparison necessary.

Hence, while the finding of increased prevalence with age and duration of diabetes concurred with other studies, it is disturbing to note that our patients seem to be getting peripheral neuropathy at a comparatively younger age and at shorter duration of diabetes. In the United Kingdom, 44.2% of diabetics aged 70-79 years had peripheral neuropathy[1] whilst this study found that 52.2% of patients aged 50-59 years had developed peripheral neuropathy.

Furthermore, among local patients with 6-10 years duration of diabetes mellitus, 50% were found to have peripheral neuropathy. In comparison, only 36.8% of UK patients who had diabetes for more than 10 years had peripheral neuropathy[1].

This finding could be attributed to late diagnosis and poor diabetic control[3,10,11]. In concordance with this, a study done in Mentakab showed that 12% of diabetic patients less than 40 years old had diabetic retinopathy even though their average
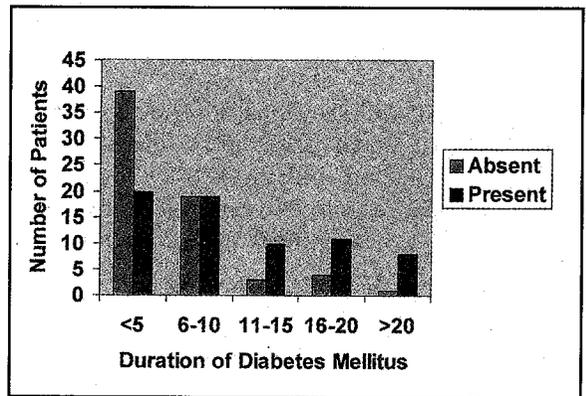

Fig. 3: Relationship of Age and Diabetic Peripheral Neuropathy

Fig. 4: Relationship of the duration of Diabetes Mellitus and Diabetec Peripheral Neuropathy

duration of diabetes was only 4.5 years[11]. These findings underline the need for earlier diagnosis and more effective management of diabetes. Another possible reason could be that diabetes mellitus affects people in a younger age group here compared to the UK population. Further studies will need to be done to confirm or disprove this.

The Diabetes Control and Complications Trial and the UK Prospective Diabetes Study Group had strong and consistent evidence that improved glycemic control is likely to prevent or delay diabetic neuropathy[12,13]. However, in this study, the finding that peripheral neuropathy did not seem to be related to glycaemic control is possibly because a single and latest blood result is a poor indicator of the overall diabetic control. A more useful indicator would have been the mean Hba1c accrued throughout the duration of the diabetes.

Although a strong interaction existed between socio economic status, level of education[14], smoking and high alcohol intake with the development and progression of long-term diabetic complications, this study did not find a statistically significant correlation between these variables; perhaps due to the small sample size.

In this study, sex was not a significant factor for the development of peripheral neuropathy. However, it was established that the male sex was a significant risk factor for ulceration[15]. Hence, a male diabetic patient with established peripheral neuropathy should be more intensely managed to prevent foot ulceration and possible amputation.

One way of reducing foot injuries is by using proper footwear. The majority of patients interviewed were not wearing adequately protective footwear both within and outside their homes. This study has also identified patients who had previous foot ulcers. These patients should be targeted for earlier intervention to prevent complications.

In a critical review of medical literature on the outpatient care of patients with Type 2 diabetes

mellitus, it was stated that 'neurologic examination is time-consuming and may identify abnormal findings for which we cannot improve patient outcomes'[16]. Although it is true that patient outcome cannot be improved, the diagnosis of peripheral neuropathy is nonetheless important since it predisposes to foot ulcers that can lead to amputations. This potential complication could be prevented with patient education, early detection and referral[17].

This study has its limitations. The sampling was not random, hence the applicability of this study's finding to the general diabetic population is restricted. The sample size was also small and may not be representative of the other diabetics attending the Primary Care Clinic. Furthermore, this study was conducted in an outpatient clinic attached to a referral hospital and was therefore more likely to recruit patients with complications of diabetes mellitus.

There may be bias on the part of the observer as the same researcher did the interview and performed the physical examination. There may also be technical mistakes made during the neurological testing although this is minimised by having the same person conduct the tests.

There is considerable variation in the patients response to the Neuropathy Symptom Score questionnaire. This scoring system did not take into account the frequency of the symptoms. Hence it is difficult to assign a score if the symptoms occur infrequently. Also, neurological testing is highly subjective and the reproducibility of the tests if conducted by another person has not been determined.

Conclusion

This study has identified a high prevalence of clinical peripheral neuropathy amongst our local diabetic patients. Another important finding in this study is that peripheral neuropathy occurred at a younger age and shorter duration of diabetes in our population.

ORIGINAL ARTICLE

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