

Evaluation of incidence of peripheral neuropathy in patients with Diabetes Mellitus Type 2: An observational study

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Abstract

Background: Diabetes mellitus is a group of metabolic diseases characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The present study was undertaken for evaluating the incidence of peripheral neuropathy in patients. **Materials & methods:** A total of 200 diabetic subjects were enrolled. Neuropathy disability score was used for assessing the prevalence of peripheral neuropathy among diabetic patients. A case record form of each patient was filled which contained the patients detailed diabetes profile including their age, sex, duration of diabetes, their personal habits smoking, dietary habits, medical history and treatment taken. Each patient's weight and height was measured using a fixed weighing scale (preferably light clothing, without shoes) and stadiometer (distance from top of the head to the feet, without shoes). Neuropathic deficits in the feet were determined using the NDS (neuropathy disability score). **Results:** 165 (82.5%) has normal NDS while 35 (17.5%) had abnormal. Hence; the incidence of diabetic neuropathy was 17.5 percent. Significantly higher incidence of diabetic neuropathy was seen in patients with longer duration of diabetes. **Conclusion:** Diabetic peripheral neuropathy is a common and costly disease. Duration of diabetes is considered to be the risk factors for neuropathy.

Key words: Peripheral neuropathy, Diabetes

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Introduction

Diabetes mellitus is a group of metabolic diseases characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Metabolic abnormalities in carbohydrates, lipids, and proteins result from the importance of insulin as an anabolic hormone. Low levels of insulin to achieve adequate response and/or insulin resistance of target tissues, mainly skeletal muscles, adipose tissue, and to a lesser extent, liver, at the level of insulin receptors, signal transduction system, and/or effector enzymes or genes are responsible for these metabolic abnormalities[1]. Symptoms of marked hyperglycemia include polyuria, polydipsia, weight loss, sometimes with polyphagia, and blurred vision. Impairment of growth and susceptibility to certain infections may also accompany chronic hyperglycemia. Acute, life-threatening consequences of uncontrolled diabetes are hyperglycemia with ketoacidosis or the nonketotic hyperosmolar syndrome[2]. Among the various microvascular and macrovascular complications of diabetes, neuropathy is a major health problem responsible for substantial morbidity, increased mortality and impaired quality of life. The incidence of diabetic neuropathy (DN) in India is not well known. Diabetic peripheral neuropathy is common, affecting up to 50% of patients and predisposes patients to severe functional limitations through symptoms of unremitting pain. It is a leading cause of non traumatic lower extremity amputations, foot ulcers and poor wound healing leading thus leading to reduced quality of life[3-5]. Treating diabetic neuropathy is a difficult task for the physician and patient. Most of the medicines mentioned in the Medication section do not lead to complete symptom relief. Hence; the present study was undertaken for evaluating the incidence of peripheral neuropathy in patients.

Materials & methods

The present study was undertaken for evaluating the incidence of peripheral neuropathy in patients. A total of 200 diabetic subjects were enrolled. Neuropathy disability score was used for assessing the prevalence of peripheral neuropathy among diabetic patients.

Inclusion criteria

- Patients of either sex diagnosed with type 2 diabetes mellitus of any duration, established as per American Diabetes Association (ADA) guidelines (random blood sugar >200 mg/dL or fasting blood sugar >126 mg/dL) & willing to participate
- Both genders eligible

The diagnosis of type 2 diabetes was done according to the criteria laid down by American Diabetic Association. Type 2 diabetic outpatients fulfilling the inclusion and exclusion criteria were selected for the study. A case record form of each patient was filled which contained the patients detailed diabetes profile including their age, sex, duration of diabetes, their personal habits smoking, dietary habits, medical history and treatment taken. Each patient's weight and height was measured using a fixed weighing scale (preferably light clothing, without shoes) and stadiometer (distance from top of the head to the feet, without shoes). Neuropathic deficits in the feet were determined using the NDS (neuropathy disability score). All the results were analyzed by SPSS software. Chi- square test and Mann-Whitney U test were used for assessment of level of significance. P-value of less than 0.05 was taken as significant.

Results

The mean age of the patients was 58.16 years with SD 8.39. The present study had 122 (66%) males and 78 (34%) females. Duration of diabetes was less than 5 years seen in 32.5%, 5-10 years in 35% and >10 years in 32.5% patients. 165 (82.5%) has normal NDS while 35 (17.5%) had abnormal. Hence; the incidence of diabetic neuropathy was 17.5 percent. Significantly higher incidence of diabetic neuropathy was seen in patients with longer duration of diabetes.

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Table 1: Mean age and SD of the patients of the present study

Age (years)	Number
Mean	58.16
±SD	8.39

Table 2: Distribution of subjects according gender

Gender	Frequency	Percentage
Males	122	66
Females	78	34
Total	200	100

Table 3: Distribution of subjects according duration of diabetes

Duration of diabetes	Frequency	Percentage
Less than 5 years	65	32.5
5 to 10 years	70	35
Greater than 10 years	65	32.5
Total	200	100

Table 4: Distribution of subjects according to NDS

NDS	Frequency	Percentage
NDS less than 5 (normal)	165	82.5
NDS 5 or more (abnormal)	35	17.5
Total	200	100

Discussion

The cause of DN though remains unknown but ischaemic and metabolic components are implicated. Hyperglycaemia induces rheological changes, which increases endothelial vascular resistance and reduces nerve blood flow. Hyperglycaemia also causes depletion of nerve myoinositol through a competitive uptake mechanism. Moreover, activation of polyol pathway in the nerve through enzyme aldose reductase leads to accumulation of sorbitol and fructose in the nerve and induces non enzymatic glycosylation of structural nerve proteins. Hyperglycaemia also induces oxidative stress. Activation of protein kinase C has been linked to vascular damage in DN. These changes result in abnormal neuronal, axonal, and Schwann cell metabolism, which result in impaired axonal transport. Direct measurement of glucose, sorbitol, and fructose in nerves of diabetic patients showed correlation with the severity of neuropathy. Endoneurial hypoxia is produced by increased vascular resistance and reduced blood flow in the nerve. Hypoxia leads to further capillary damage, which in turn aggravates disturbance in axonal transport and reduced Na K ATPase activity leading to axonal atrophy and impairment of nerve conduction[6-10]. Hence; the present study was undertaken for evaluating the incidence of peripheral neuropathy in patients. The mean age of the patients was 58.16 years with SD 8.39. The present study had 122 (66%) males and 78 (34%) females. Duration of diabetes was less than 5 years seen in 32.5%, 5-10 years in 35% and >10 years in 32.5% patients. 165 (82.5%) has normal NDS while 35 (17.5%) had abnormal. Khawaja N et al determined the prevalence of diabetic peripheral neuropathy (DPN) and its associated factors among patients with type 2 diabetes mellitus in Jordan. A total of 1003 patients with type 2 diabetes were recruited. Data were collected from participants during a face-to-face structured interview. DPN was assessed using the translated version of Michigan Neuropathy Screening Instrument (MNSI). The overall prevalence of DPN based on MNSI was 39.5%. The most frequently reported symptoms were numbness (32.3%) and pain with walking (29.7%), while the least reported symptoms were the history of amputation (1.3%) and loss of sensation in legs/feet while walking (3.8%). Logistic regression analysis revealed that unemployment, cardiovascular disease, dyslipidemia, diabetic retinopathy and long standing DM (diabetes of ≥ 5 years) were significantly associated with DPN. Peripheral Neuropathy was highly prevalent among Jordanian patients with type 2 diabetes mellitus[10]. In the present study, the incidence of diabetic neuropathy was 17.5 percent. Significantly higher incidence of diabetic neuropathy was seen in patients with longer duration of diabetes. Pai YW et al investigated the prevalence and risk factors for diabetic peripheral neuropathy with or without neuropathic pain in Taiwanese. They enrolled 2837 adults with type 2 diabetes mellitus. Diabetic peripheral neuropathy with or without pain were diagnosed using 2 validated screening tools,

namely the Michigan Neuropathy Screening Instrument and Douleur Neuropathique 4 questionnaire. In their sample, 2233 participants had no neuropathy, 476 had diabetic peripheral neuropathy without pain, and 128 had diabetic peripheral neuropathy with neuropathic pain, representing an overall diabetic peripheral neuropathy prevalence of 21.3%, and the prevalence of neuropathic pain in diabetic peripheral neuropathy was 21.2%. Multivariate analysis revealed that older age, treatment with insulin, microalbuminuria or overt proteinuria were independently associated with diabetic peripheral neuropathy, whereas older age, elevated glycated haemoglobin, lower high-density lipoprotein cholesterol, and overt proteinuria were independently associated with diabetic peripheral neuropathy with neuropathic pain. During clinical visits involving biochemical studies, the risk for diabetic peripheral neuropathy with neuropathic pain should be considered for people with older age, elevated glycated haemoglobin, low high-density lipoprotein cholesterol and overt proteinuria, with particular attention given to increased levels of albuminuria while concerning neuropathic pain[11].

Conclusion

Diabetic peripheral neuropathy is a common and costly disease. Over the past decade, there have been great strides in understanding the underlying pathophysiology and the interplay of metabolic risk factors. Duration of diabetes is considered to be the risk factors for neuropathy.

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