Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2014; 2(6A):1973-1977 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com **DOI:** 10.36347/sjams.2014.v02i06.006

Research Article

Clinical Profile of Peripheral Neuropathy in Diabetes Mellitus by Nerve Conduction Study

Abhijeet A. Adgaonkar[1*], Anant A. Dawange[2], Shalaka A. Adgaonkar[3], V.G.Kale[4], Pravin P.Shekokar[5]
[1]Assistant Professor, Department of Medicine, Government Medical College, Akola (M.S.), India
[2]Assistant Professor, Department of Surgery, Government Medical College, Akola (M.S.), India
[3]Medical officer, District Women's Hospital, Akola (M.S.), India
[4]Associate Professor, Department of Medicine, Mahatma Gandhi Missions Medical College, Aurangabad (M.S.), India
[5]Assistant Professor, Department of Physiology, Government Medical College, Akola (M.S.), India

***Corresponding author**
Dr. Abhijeet A. Adgaonkar
Email: abhiadgaonkar@gmail.com

Abstract: Nerve damage or diabetic neuropathy resulting from chronically high blood glucose can be one of the most frustrating and debilitating complications of diabetes because of the pain, discomfort and disability it can cause, and because available treatments are not uniformly successful. The present study comprises study of profile peripheral neuropathy in 50 patients of diabetes mellitus clinically as well as by nerve conduction study. In the present study, the incidence of peripheral neuropathy was recorded as 30% on clinical examinations. Whereas on nerve conduction study it was found 42 %. The most frequent complaint detected in the present study was tingling and numbness. Type 2 diabetes is the most common cause of chronic peripheral neuropathy. Diabetes is more common in people who are overweight or obese. Therefore weight control may help to reduce risk of developing diabetes. Good control of the condition may help to prevent neuropathy from developing.
Keywords: Peripheral neuropathy, Diabetes, Nerve conduction

INTRODUCTION

Peripheral neuropathy is a term which describes damage to peripheral nerves. There are many different conditions that can lead to peripheral neuropathy. Diabetes is the most common cause of persistent (chronic) peripheral neuropathy. The symptoms of peripheral neuropathy depend on which type of peripheral nerves are damaged (sensory, motor or autonomic nerves) [1]. Neuropathy can affect any one, or a combination of all three types of nerves. Peripheral neuropathy in diabetics is nerve damage caused by chronically high blood sugar. It leads to numbness, loss of sensation, and sometimes pain in feet, legs, or hands [2]. About 60% to 70% of all people with diabetes eventually develop peripheral neuropathy, but not all suffer pain. Yet this nerve damage is not inevitable. People with diabetes can reduce their risk of developing nerve damage by keeping their blood sugar levels as close to normal as possible [3]. The treatment for peripheral neuropathy aims to treat any underlying cause, to control your symptoms and to help to achieve maximum independence. Investigations may include various blood tests, X-rays, scans, or other tests. Common tests are include Nerve conduction testing and Electromyography. The nerve conduction test looks at the speed that electrical signals pass through the nerves [1].

Aims and Objectives

The study was undertaken to study.

- Profile of peripheral neuropathy in diabetes mellitus.
- Correlation of diabetic peripheral neuropathy with various epidemiological factors.
- Assessment of severity of peripheral neuropathy clinically as well as by nerve conduction study

MATERIALS AND METHODS

The present study comprises study of profile of peripheral neuropathy in 50 patients of diabetes mellitus, attending indoor and outdoor departments of Mahatma Gandhi Missions College and hospital, Aurangabad from April 2003 to June 2005 .These cases include patients of both sex and different age group ranging from 20 to 70 years. They had varying duration of diabetes mellitus. Diagnosis of peripheral neuropathy was made by symptoms, signs. A detailed history was taken in each case. The patients were particularly

questioned to rule out factors which may cause peripheral neuropathy e.g. alcoholism, metallic poisoning, Hensen's diseases, deficiency conditions, syphillis and malignancy. Diabetic patients having obvious liver disease, malignancy, leprosy and patients having clinical evidence of renal involvement were excluded. Patients with a history of taking alcohol, ayurvedic medicine and drugs like INH were excluded from study. The physical examination was carried out in details as in proforma.

Clinical peripheral neuropathy was excluded using questionnaire. On neuropathy, the calculation was done as absent (0) & present (1). The calculation of peripheral neuropathy disability score were determined by presence of DTR (Deep Tendon Reflex) (1) decreased DTR & (2) absent DTR sensations. Vibration perception was tested by tuning fork (128 Hz) on each medial malleolus. Pain sensations by pinprick touch sensation with wisp of cotton, temperature sensation by hot and cold water, position sense & DTR were also tested conventionally. In this study peripheral neuropathy was diagnosed clinically with one or two of abnormalities of NSS & NDS. The following was the criteria for detection of peripheral neuropathy by nerve conduction study and the peripheral neuropathy were graded as mild, moderate and severe. The nerves tested are median, peroneal and sural. Hemoglobin estimation, TLC, differential count, Peripheral smear, Urine sugar and ketones, Kidney functions tests, LFT, ECG was done as per needed. The criteria taken for diabetes mellitus are fasting > 110mg% and post meal > 140mg%.

Table 1: Criteria taken for Nerve conduction study in study group

Nerve	Mild		Moderate		Severe	
	Velocity ($Ms^{-1)}$	Amplitude (mV)	Velocity (Ms^{-1})	Amplitude (mV)	Velocity (Ms^{-1})	Amplitude (mV)
Median (M) NR = 49	45-49	2-4 NR=4	40-45	1-2	<40	<1
Median (M) NR = 54	50-54	10-12 NR = 13	46-50	8-10	<46	<6
Peroneal (M) NR = 42	40-42	1-2 NR = 2	36-40	0.5-1	<36	<0.5
Sural (S) NR = 43	40-42	0.5-1 NR = 1	36-40	0.2-0.4	<36	<0.2

(NR – Normal range)

RESULTS

Present study was carried out in dept of Medicine Mahatma Gandhi Missions Medical College and hospital, Aurangabad. Total 50 cases of diabetic peripheral neuropathy were studied.

Table 2: Age and sex-wise distribution of study population

Age	Male	Female	Total
21-30	03	07	10
31-40	03	02	05
41-50	13	05	18
51-60	08	03	11
61	03	03	06

It is evident from above table that majority of cases diabetes mellitus was in age group 41-50 years. Total of cases include 30 males & 20 females with 1.5:1 ratio.

Table 3: Conduction study (Age and Sex-wise) distribution

Age (Yrs)	Total cases	Total neuropathies	Male	Female	(%)
21-30	10	01	--	01	10.0
31-40	05	01	--	01	20.0
41-50	18	08	05	03	44.4
51-60	11	10	07	03	90.9
61-70	06	01	01	--	16.6
Total (%)	50	21 (42%)	13 (43%)	08 (40.0%)	42.0%

The above table shows, incidence of peripheral neuropathy as 42% (as compared to 30% on clinical examination). Maximum incidence was recorded in age group 51 to 60 years (90.9%). Clinical examination did not reveal evidence of

peripheral neuropathy in age group of 20 to 30 years. On nerve conduction the incidence of neuropathy in male i.e. 43% over female (40%) was found.

Table 4: Correlation of symptomatology of peripheral neuropathy with duration of diabetes

Duration of Diabetes mellitus in Yrs	Total cases	Total Cases of neuropathies	Total Males showing peripheral neuropathy	Total females showing peripheral neuropathy	(%)
1	08	--	--	--	--
2	08	01	--	01	12.5
3	09	03	01	02	33.3
4	07	02	01	01	28.5
5	03	01	01	--	33.3
6	06	05	04	01	83.3
>6	09	09	06	03	100.0
	50	21	13	08	42.2

Maximum incidence was noted with duration >6 years. Males have predominance as compared to females.

Table 5: Correlation of symptomatic peripheral neuropathy with blood sugar levels

Blood Sugar (mg%)	Total cases	Total cases of neuropathies	Male	Females	(%)
120-180	03	--	--	--	--
180-200	10	02	01	01	20.0
200-230	12	04	02	02	33.3
230-260	10	05	03	02	50.0
260-300	09	06	04	02	66.6
>300	06	04	03	01	66.6
	50	21	13	08	42.0

Maximum incidence of peripheral neuropathy was noted in blood sugar >300 mg%. Below 200 mg% no patient was symptomatic. Clinical symptoms of peripheral neuropathy are directly proportional to blood sugar levels.

Table 6: Common clinical features and signs

Duration (in Years)	Mild	Moderate	Severe	Total
3	--	01	--	01
4	01	--	--	01
5	--	01	--	01
6	--	03	01	04
>6	--	01	05	06

Common mode of diabetic peripheral neuropathy is tingling and numbness which was found in 15 cases (30%) followed by impaired vibration 13(26%), impaired ankle jerk (24%), impaired touching (18%) and pain in 8 (16%).

Table 7: Showing correlation of blood sugar level with severity of peripheral neuropathy in male patients

Blood Sugar (mg%)	Mild	Moderate	Severity	Total
180-200	01	--	--	01
200-230	--	02	--	02
230-260	--	03	--	03
260-300	--	01	03	04
>300	--	--	03	03

In this study, above table shows that, in male patient as the blood sugar level rises, severity of peripheral neuropathy increases.

Table 8: Showing correlation of duration of diabetes mellitus in female patients with severity of peripheral neuropathy according to nerve conduction study

Years	Mild	Moderate	Severity	Total
2	01	--	--	01
3	--	02	--	02
4	--	01	--	01
5	--	--	---	--
6	--	01	--	01
>6	--	--	03	03

In the present study, as the duration of diabetes mellitus increases the severity of peripheral neuropathy increase in females.

Table 9: Showing correlation of diabetic status with severity of peripheral neuropathy in female patients

Blood Sugar (mg%)	Mild	Moderate	Severity	Total
180-200	01	--	--	01
200-230	--	02	--	02
230-260	--	02	--	02
260-300	--	--	02	02
>300	--	--	01	01

Above table shows that, in female patient as the blood sugar level rises, severity of peripheral neuropathy increases.

DISCUSSION

In the present study, out of 50 cases studied, 30 were males & 20 were females. The age of patient varies from 21 to 70 years; maximum patients were in age group of 51 to 70 years.

Clinical incidence

In the present study, incidence of peripheral neuropathy was found to be 30% on clinical examination, the figure tallies with Kuruvilla *et al*. [4]. The variability may depend upon selection of cases, high age group, longer duration and severity of diabetes.

Age incidence

The diabetic neuropathy is commonest after 5^{th} decade. Bhal *et al*. [5] demonstrated that middle age/elderly diabetic were generally more affected. Shaw *et al*. [6] showed incidence of peripheral neuropathy was 17.6% between age group of 20-40 years and 56.8% between 40-70 years. Kasturi *et al*. [7] successfully done study on 100 patients and found incidence of peripheral neuropathy. Incidence of neuropathy was more in patients over 40 years of age (60 out of 70 patients) with duration of disease over two years (78.33 percent). Thus it is common that peripheral neuropathy in general was common in middle age and elderly diabetics. It can sometimes occur in younger diabetic and may be absent in older diabetics.

Blood Sugar levels:-

Maximum patients have peripheral blood sugar levels of fasting 200 to 220 & post meal 280-300 mg%.

Partanen *et al*. [8] demonstrated rising incidence of peripheral neuropathy with crease of blood sugar levels.

Dutta *et al*. [9] found incidence of peripheral neuropathy with blood sugar level in lower range.

In the present study it was observed that severity of peripheral neuropathy was related with blood sugar. Higher the blood sugar level, severe is the neuropathy.

Thus it can be concluded that peripheral neuropathy is common in diabetic & who has higher blood sugar levels. However the patients with lower blood sugar level have decreased incidence of peripheral neuropathy.

Duration of diabetes mellitus

In the present study neurological involvement were noted in relation to duration of diabetes mellitus. Kasturi *et al*. [7] also found the positive correlation between duration of diabetes mellitus and incidence of peripheral neuropathy. Present study very well matched with workers like Shaw *et al*. [6] and Kasturi *et al*. [7].

Severity of peripheral neuropathy by nerve conduction study

Through the criteria for defining the severity of disease were slightly different by various authors. However the study of Parati [10] and Biju Paul [11] were comparable with present study. They found direct positive relation of the incidence of peripheral neuropathy with the blood sugar and the duration of diabetes mellitus by nerve conduction study.

Parati [10] very well concluded that, as the blood sugar level increases above 260 mg%, the conduction

velocity and amplitude of sensory and motor nerve decreases.

Similarly Biju Paul [11] concluded that there is inverse relation of the duration of diabetes mellitus with the velocity and amplitude of the various nerves (sensory and motor by nerve conduction study).

Present study also shows the findings which matches with the above mentioned authors. Present study also showed that as the duration of diabetes of diabetes mellitus increases more than 5 years and as the blood sugar levels increases > 260 mg%, the velocity and amplitude of nerves decreases.

Patterns of presentation of diabetic neuropathies:

- Patients with peripheral neuropathy show sensory involvement predominantly. It was observed in every case of peripheral neuropathy.
- Clinically patients showed signs of mixed sensory and motor involvement in the form of paresthesia and sensory loss together with diminished power and absent or diminished ankle jerk.
- No case of pure motor involvement was found in present study.
- Diabetic peripheral sensory motor peripheral neuropathy was the commonest type of presentation in present study.
- The lower limbs were almost always affected. The upper limbs were less affected.
- However, the upper limb was involved in 18 out of 21 cases. There are 6 cases, which do not show any symptom and signs of peripheral neuropathy. However they are detected on nerve conduction study.
  In our study, no mononeuritis multiplex patient was observed.

CONCLUSION

In the present study, the incidence of peripheral neuropathy was recorded as 30% on clinical examinations. Whereas on nerve conduction study it was found to be 42 %. The most frequent complaint detected in the present study was tingling and numbness. The most frequent signs detected were impaired sense of vibration, impaired sensation, loss the ankle jerk. On clinical examination, incidence of peripheral neuropathy in males was found to be 33% and in females it is 25% on clinical examinations where as on nerve conduction study it was 43% in male and 40% female. Not a single case was observed in age group 21-30 yrs. As the age increases, severity of peripheral neuropathy increases. It is observed that, as duration of diabetes mellitus increases, the severity of peripheral neuropathy increases, with the increase of blood sugar, more cases of peripheral neuropathy were detected clinically. The severity of peripheral neuropathy was found to be a directly related with the levels of blood sugar i.e. blood sugar >300mg. In severe form of diabetic according to blood sugar is blood sugar i.e. > 300 mg. Nerve conduction study was not of much significance because in this clinical incidence of neuropathy is obvious. From the present study it is concluded that nerve conduction study was of significant importance in detecting mild to mod form of peripheral neuropathy which is missed on only by clinical examination.

REFERENCES

1. Peripheral Neuropathy. Available from http://www.patient.co.uk/health/peripheral-neuropathy-leaflet
2. Diabetic neuropathy and low carbs. Available from http://forum.lowcarber.org/archive/index.php/t-198692.html
3. Peripheral Neuropathy and Diabetes. Available from http://www.drstevenjdolgoff.com/diabetic_peripheral_neuropathy_described_by_dr_steven_j_dolgoff.html
4. Kurivilla N; Thesis for M.D., Vellore, 1970.
5. Bahl A, Khosla HL, Caroli RK; A study of the involvement of the nervous system with special reference to neuropathy in diabetes mellitus. Indian Med Gaz., 1967; 24: 53.
6. Shaw JE, Hodge AM, deCoruten M, Dowse GK, Gareeboo H, Tuomilehto J *et al.*; Diabetic peripheral neuropathy in Mauritius: Prevalence and risk factors. Diabetes Res Clin Pract., 1998; 43(2): 131-139.
7. Kasthuri AS, Sofat MS, Kumar CN; Somatic Neuropathy in Diabetes Mellitus. MJAFI, 2000; 56: 33-36.
8. Partanen J, Niskanen L, Lehtinen J, Mervaala E; Natural history of peripheral neuropathy in patients with non-insulin dependent diabetes mellitus. New Engl J Med., 1995; 333(2): 89-94.
9. Dutta A, Naorem S, Singh TP, Wangjam K; Prevalence of peripheral neuropathy in newly diagnosed type 2 diabetics. Int J Diab Dev Countries, 2005; 25: 30-33.
10. Parati NL; Neuropathies in diabetes mellitus with special reference to autonomic peripheral neuropathy. Dissertation for M.D., 1979.
11. Paul B; Peripheral neuropathy. Dissertation for M.D., 1994.