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ELECTROPHYSIOLOGICAL STUDY IN PATIENT WITH DIABETIC PATIENT WITH AND WITHOUT NEUROPATHY: OUR EXPERIENCE FROM URBAN DELHI

General Medicine

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ABSTRACT

Background: Diabetic mellitus is one of the most common metabolic diseases worldwide and diabetic neuropathy is now a day the commonest cause of peripheral neuropathy both in developing and developed countries. About 66% of patients have overt or sub- clinical peripheral neuropathy. **Objective:** To study the sensory and motor electrophysiological parameters in patient with diabetic patient with and without neuropathy. **Materials and methods:** This study was conducted at Jaipur Golden Hospital, Rohini, New Delhi. Including age range will be of 18 - 70 years with duration of diabetes of at least one year presenting at Jaipur Golden Hospital. **Results:** Among asymptomatic patients 52.50% were males as compared to 63.64% among symptomatic patients. Among asymptomatic patients 47.50% were females as compared to 36.36% among symptomatic patients. The involvement was symmetrical in 18.18% of participants and there was no positive motor symptom in 92.73% of the participants while wasting and restlessness were present in 3.64% each. The sensory involvement was symmetrical in 52.73% and asymmetrical in 3.64%. **Conclusion:** The sensory involvement was symmetrical in 52.73% and asymmetrical in 3.64%. Motor involvement showed 14.55% had distal involvement and 3.64% had both distal and proximal involvement.

KEYWORDS

Diabetic neuropathy, sensory, motor etc.

INTRODUCTION

Diabetic mellitus is one of the most common metabolic diseases worldwide and diabetic neuropathy is now a day the commonest cause of peripheral neuropathy both in developing and developed countries. About 66% of patients have overt or sub- clinical peripheral neuropathy.[1] By 2025 India will harbor the maximum number of diabetic patients (WHO). Diabetic Peripheral Neuropathy (DPN) is the commonest symptomatic complication of Diabetes.[2] It predisposes to foot ulceration and gangrene. Type 2 Diabetes Mellitus is characterized by long asymptomatic phase (ranges from 4 to 7 years) between the actual onset of hyperglycemia and clinical diagnosis which may explain the relatively high prevalence of microvascular complication in newly diagnosed patients with Type Diabetes Mellitus. In view of poor awareness and lack of regular screening programmes, the initial presentation to the physicians is delayed frequently.

This may predispose to increased rate of microvascular complication. Abnormalities of sensory nerve conduction are early features of diabetic nerve damage and such changes are the most common consistent indicator of sub clinical neuropathy, such changes involve a reduction in conduction velocity, together with diminishes amplitude and increased temporal dispersion of sensory action potential.[3,4]

Motor conduction velocity may also be diminishing in patients lacking symptoms or signs of neuropathy, but these changes are more marked in patients with neuropathy.[3,4]

OBJECTIVE:

To study the sensory and motor electrophysiological parameters in patient with diabetic patient with and without neuropathy.

MATERIALS AND METHODS:

Study site- 3

This study was conducted at Jaipur Golden Hospital, Rohini, New Delhi. Its a 242 bedded multi-Speciality tertiary care hospital and teaching institute.

Study population-

Age range will be of 18 -70 years with duration of diabetes of at least one year presenting at Jaipur Golden Hospital (both in-patient and out-patient department).

Study design-

This is a Prospective Observational Cross -Sectional Study.

Sample size-

On the basis of previous study (30), prevalence of clinical diabetic neuropathy was 33.3%. Taking this value as reference, the minimum required sample size with 10% margin of error and 5% level of significance is 86 patients. So minimal sample size is 86.

Study duration-

The study was conducted from December 2016 to November 2018.

Inclusion criteria:

Detailed history, clinical examination of the patients in Jaipur Golden Hospital, New Delhi. Age range will be of 18 -70 years with duration of diabetes of at least one year. Glycosylated Hb will be done on the assess the diabetic control. Blood sugar will be done on day of Electrophysiogical evolution Electrophysiogical evolution will includes – measurement of motor nerve conduction velocity of median, ulnar, tibial and peroneal nerve & F wave study. Measure of sensory nerve conduction velocity will be done on ulnar, median and sural nerve. H reflex study will be done in all patients. The patients will be advised not to consume coffee, tea or smoke in hour before and during electrophysiological investigation. SSR and RR interval will be recorded from hand or feet by means of surface electrode.

Exclusion criteria-

Patients having neuropathy due to – infection, endocrinal disorder, hepatic & vitamin deficiency and toxic substance. Patients with cardiac arrhythmia & coronary artery disease. Patients with severe obesity & BMI => 35. Patients with edema of limbs or trauma. Patients taking drugs like, sympathomimetics. Patients with clinical and

electrophysiological evidence of hereditary neuropathy.

Methodology
Ninety-five diabetic patients (56 males, 39 females) with clinically manifest diabetes mellitus (with disease duration of at least one year) according to WHO criteria, attending medicine and neurology OPD or admitted in medicine and neurology Department of Jaipur Golden Hospital, New Delhi, were included in the study.

Laboratory Investigations:
The followings were done in all patients: hemogram blood sugar (fasting, post-prandial and at the time of electrophysiological study), liver function tests (LFT), kidney function tests (KFT), urine examination, electrocardiogram (ECG), chest X-ray and glycated haemoglobin (HbA1c).

Neurophysiologic Tests:
All the neurophysiologic tests were performed on MEDELEC SYNERGY (oxford instruments, USA) EMG machine. Silver- silver chloride mounted cup electrodes were used. Results were compared with normal values of our laboratory. The upper and lower limits of normal were defined by mean ± 2.5 SD of the controls.

Sympathetic skin response – active surface electrodes were placed on palmer surface and reference electrode was placed on dorsum of the hand. Median nerve was stimulated at wrist. the stimulus duration was 0.1 msec and frequency was variable. The electrode impedance was kept below 5k , band width 0.1-1000Hz and sweep time was 5 seconds.The motor conduction as well as the F-latency was studied with surface stimulating and recording electrodes in all patients by standard technique in the conventionally studied nerves: median and ulnar nerves in the upper limb; common peroneal and posterior tibial nerves in the lower limb. The skin temperature was maintained between 35-37° C. The sensory nerve conduction studies were obtained by the orthodromic technique using ring electrodes for the median and ulnar nerves and the antidromic technique using surface electrodes for the sural nerve. Thirty-two responses were averaged. It was done from all four limbs in all patients.

Data collection and analysis-
The findings of clinical history, examination and investigations of the patient were recorded on a structured study proforma, a master chart was prepared and analyzed as mentioned in the statistical methods.

Statistical methods
Categorical variables will be presented in number and percentage (%) and continuous variables will be presented as mean ± SD and median. Normality of data will be tested by Kolmogorov-Smirnov test. Qualitative variables will be correlated using Chi-Square test /Fisher s exact test. A p value of <0.05 will be considered statistically significant.

The data will be entered in MS EXCEL spreadsheet and analysis will be done using Statistical Package for Social Sciences (SPSS) version 21.0.

RESULTS
Table no 1. Gender distribution of the study participants

Gender	Asymptomatic Diabetic Neuropathy N = 40 Frequency (%)	Symptomatic Diabetic Neuropathy N = 55 Frequency (%)	Total N = 95 Frequency (%)	p-value
Male	21 (52.50)	35 (63.64)	56 (58.95)	0.276
Female	19 (47.50)	20 (36.36)	39 (41.05)	
Total	40 (100)	55 (100)	95 (100)	

The table above shows the gender distribution of the study participants according to the status of diabetic neuropathy. Among asymptomatic patients 52.50% were males as compared to 63.64% among symptomatic patients.

Among asymptomatic patients 47.50% were females as compared to 36.36% among symptomatic patients. This difference in gender distribution among the study participants was not found to be statistically significant with a p-value of 0.276

Table no 2. Pattern of motor symptoms among the subjects with symptomatic diabetic neuropathy

Pattern of motor symptom	Frequency (%)	
Site of weakness		
No weakness	45	(81.82)
Both lower limbs	8 (14.55)	
All four limbs	2	(3.64)
Proximal/Distal		
None	45	(81.82)
Distal	8 (14.55)	
Both distal and proximal	2	(3.64)
Symmetry of involvement		
No Involvement	45	(81.82)
Symmetrical	10	(18.18)
Positive Motor Symptoms		
None	51	(92.73)
Wasting	2	(3.64)
Restlessness	2	(3.64)

The table above shows the pattern of motor symptoms among the subjects with symptomatic diabetic neuropathy. 81.82% of symptomatic subjects had no weakness, 14.55% had weakness in both lower limbs and 3.64% had weakness in all limbs. 81.82% has no involvement, 14.55% had distal involvement and 3.64% had both distal and proximal involvement. The involvement was symmetrical in 18.18% of participants and there was no positive motor symptom in 92.73% of the participants while wasting and restlessness were present in 3.64% each.

Table no. 3: Pattern of sensory symptoms among the subjects with symptomatic diabetic neuropathy

Sensory symptoms	Frequency (%)
Type	
None	24(43.64)
Touch/Pain/Temp	3(5.45)
JPS/Vibration	1(1.82)
All sensations	27(49.09)
Level	
None	26(47.27)
Up to ankle	9(16.36)
Up to knee	8(14.55)
Up to knee + up to wrist	11(20)
3+ whole lower limbs	1(1.82)
Symmetry of involvement	
No Involvement	24(43.64)
Symmetrical	29(52.73)
Asymmetrical	2(3.64)

The table above shows the pattern of sensory symptoms among the subjects with symptomatic diabetic neuropathy. There was no involvement in 43.64%, Touch/Pain/Temp was involved in 5.45%, JPS/Vibration was involved in 1.82% and all sensations were involved in 49.09%. The involvement was up to ankle in 16.36%, up to knee in 14.55%, up to knee + up to wrist in 20% and additionally involved whole lower limbs in 1.82%. The sensory involvement was symmetrical in 52.73% and asymmetrical in 3.64%

Table no. 4: Pattern of post sensory symptoms among the subjects with symptomatic diabetic neuropathy

Post Sensory symptoms	Frequency (%)
Type	
Paraesthesia	55 (100)
Dysesthesias	2(3.64)
Hyperesthesia	2(3.64)
Sensory ataxia	8 (14.55)
Pain Level	31(56.36)
None	2(3.64)
Up to ankle	15(27.27)
Up to knee	11(20)
Up to knee + up to wrist	26(47.27)
3+ whole lower limbs	1(1.82)

The table above shows the pattern of post sensory symptoms among the subjects with symptomatic diabetic neuropathy. Paresthesia was present in all cases i.e. 100%, dysesthesias and hyperesthesia in 3.64% each, sensory ataxia in 14.55% and pain in 56.36%. The involvement was up to ankle in 27.27%, up to knee in 20%, up to knee + up to wrist in 47.27% and additionally involved whole lower limbs in 1.82%.

DISCUSSION

Peripheral neuropathy is one of the most common complications of diabetes mellitus and has an important socioeconomic concern because of its high morbidity.[5]

In addition to the proximal segment involvement of peripheral nerves, diabetes can also involve the central nervous system, particularly the spinal cord; however, its clinical importance is still underestimated. The etiology and pathogenesis of peripheral and central nervous system damage in diabetes remain unknown but it seems to be multi factorial involving vascular and metabolic factors.[6]

Glycemic control appears to be of fundamental importance and tight metabolic control may improve nerve function but there are conflicting reports.[7,8]

In a population-based cohort study, it is suggested that two thirds of diabetics show objective evidence of some form of neuropathy and furthermore, it seems that the severity of neuropathy increases with duration of diabetes mellitus.[9,10]

Abnormal nerve conduction studies have been reported in peroneal nerve [46%] and in sural nerve conduction studies [40%] in diabetes mellitus patients.[10]

Increased frequency of carpal tunnel syndrome [32.7%] has been cited in patients of diabetes mellitus. Peroneal motor nerve to have the highest abnormality followed by sural nerve, median sensory nerve and median motor nerves, in that order.[113]

Tironi et al. examined the conduction in the H-reflex pathways and showed evidence of a proximo-distal gradient of slowing.[12]

Hendricksen et al. evaluated the nerve dysfunction in 60 IDDM patients, without symptoms of polyneuropathy and reported that H-reflex investigation was the most sensitive electrophysiological method and could be used for detection of sub clinical diabetic neuropathy (N1).[13]

CONCLUSION;

- The sensory involvement was symmetrical in 52.73% and asymmetrical in 3.64%
- Paresthesia was present in all cases i.e. 100%.
- Motor involvement showed 14.55% had distal involvement and 3.64% had both distal and proximal involvement.
- Longer duration of DM strongly correlated with abnormalities in NCS

REFERENCES

1. Simmons Z, Feldman EL. Update on diabetic neuropathy. Current opinion in neurology. 2002 Oct 1;15(5):595-603.
2. Boulton AJ, Malik RA. Diabetic neuropathy. Medical Clinics of North America. 1998 Jul 1;82(4):909-29.
3. Braune HJ. Early detection of diabetic neuropathy: a neurophysiological study on 100 patients. Electromyography and clinical neurophysiology. 1997 Oct;37(7):399-407.
4. Pastore C, Izura V, Geijo.Barrientos E, Dominguez JR. A comparison of electrophysiological tests for the early diagnosis of diabetic neuropathy. Muscle & Nerve: Official Journal of the American Association of Electrodiagnostic Medicine. 1999 Dec;22(12):1667-73.
5. Sadikot SM, Nigam A, Das S, Bajaj S, Zargar AH, Prasannakumar KM, Sosale A, Munichoodappa C, Seshiah V, Singh SK, Jamal A. The burden of diabetes and impaired glucose tolerance in India using the WHO 1999 criteria: prevalence of diabetes in India study (PODIS). Diabetes research and clinical practice. 2004 Dec 1;66(3):301-7.
6. Chawla A, Chawla R, Jaggi S. Microvasular and macrovascular complications in diabetes mellitus: distinct or continuum. Indian journal of endocrinology and metabolism. 2016 Jul;20(4):546.
7. Singh R, Kishore L, Kaur N. Diabetic peripheral neuropathy: current perspective and future directions. Pharmacological research. 2014 Feb 1;80:21-35.
8. Tesfaye S, Selvarajah D. Advances in the epidemiology, pathogenesis and management of diabetic peripheral neuropathy. Diabetes/metabolism 2012 Feb;28:8-14.
9. Callaghan BC, Cheng HT, Stables CL, Smith AL, Feldman EL. Diabetic neuropathy: clinical manifestations and current treatments. The Lancet Neurology. 2012 Jun 1;11(6):521-34.
10. Callaghan BC, Hur J, Feldman EL. Diabetic neuropathy: one disease or two?. Current opinion in neurology. 2012 Oct;25(5):536.
11. Tesfaye S, Chaturvedi N, Eaton SE, et al. Vascular risk factors and diabetic neuropathy. N Engl J Med.2005; 352(4): 341–50.
12. Dyck PJ, Kratz KM, Karnes JL, Litchy WJ, Klein R, Pach JM, Wilson DM, O'brien PC, Melton L. The prevalence by staged severity of various types of diabetic neuropathy, retinopathy, and nephropathy in a population.based cohort The Rochester Diabetic Neuropathy Study. Neurology. 1993 Apr 1;43(4):817-.
13. Dyck PJ, Norell JE, Dyck PJ. Microvasculitis and ischemia in diabetic lumbosacral radiculoplexus neuropathy. Neurology. 1999 Dec 1;53(9):2113-.
14. Said G, Elgrably F, Lacroix C, Planté V, Talamon C, Adams D, Tager M, Slama G. Painful proximal diabetic neuropathy: inflammatory nerve lesions and spontaneous favorable outcome. Annals of neurology. 1997 Jun;41(6):762-70.