DOI: 10.14260/jemds/2015/493

ORIGINAL ARTICLE

NERVE CONDUCTION PROFILE IN TYPE II DIABETICS

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HOW TO CITE THIS ARTICLE:
Balaji R, Mayilanandhi K, Sarah Subashini, Rajasekaran D. "Nerve Conduction Profile in Type II Diabetics". Journal of Evolution of Medical and Dental Sciences 2015; Vol.4, Issue 20, March 09; Page: 3412-3417, DOI:10.14260/jemds/2015/493

ABSTRACT: AIMS AND OBJECTIVES: 1.To study the types of neuropathy in type 2 diabetes mellitus 2. To find out the commonest nerves involved using nerve conduction studies. **MATERIALS:** About 50 cases satisfying the inclusion criteria admitted in Chettinad health city and research institute during the period of October 2013 to October 2015 were taken up for the study. **METHOD OF COLLECTION OF DATA:** Our study was conducted with an informed consent obtained from these patients. A proper consent shall be obtained from these patients. They were interviewed for a detailed history and clinical examination. After ruling out other causes of peripheral neuropathy these patients were subjected to nerve conduction studies. The patients were explained about the procedure. Fasting blood sugar, postprandial blood sugar, random blood sugar and glycosylated were estimated for these patients. The results were analyzed with the help of appropriate statistical methods. **RESULTS:** 1) The incidence of neuropathy was found to be 90% 2) Tingling sensation was the most commonest complaint noted in 62% of patients 3) Polyuria and Polydipsia was noted in 34% of patients 4) Ankle jerk was absent in 48% of patients 5) Vibration sense was reduced in 44% of patients 6) Commonest pattern of neuropathy noted was distal symmetrical sensory polyneuropathy 7) The most commonest nerve involved was peroneal nerves. **CONCLUSION:** 1. The most common pattern of neuropathy noted in our study was distal symmetrical sensory and motor polyneuropathy. 2. Involvement of peroneal nerve is more common in patients with type 2 diabetes mellitus.

KEYWORDS: Nerve conduction profile, Type 2 diabetes mellitus.

INTRODUCTION: Diabetes is one of the oldest diseases known. Clinical manifestations of diabetes were limited only to selected regions in the olden days. Due to industrialization newer discoveries were made in the field of diabetes. It is defined as a disorder of chronic hyperglycemia along with alterations in carbohydrate, fat and protein metabolism due to impaired insulin secretion, action or both. The microangiopathy and macroangiopathy as a result of diabetes mellitus involves almost all the organs in the body.

The main clinical manifestation of diabetes mellitus is polyuria, polydipsia, polyphagia and weight loss. The complications could be acute or chronic. Acute complications include diabetic ketoacidosis and hyperglycemic hyperosmolar state. Chronic complications include coronary artery disease, stroke, retinopathy, nephropathy and peripheral artery disease.

Diabetic neuropathy is the commonest of all neuropathies in developing countries. Since, diabetic population is increasing, the incidence of diabetic neuropathy is also expected to increase in the future. Dyck PJ et al has estimated that 51% of type I and 45% of type II diabetes mellitus had diabetic neuropathy. The incidence of neuropathy depends on the duration of diabetes, HBA1C levels and the tests employed for the detection of neuropathy. A study that examined 8757 patients attending an OPD 32.3% was found to have frank symptoms of peripheral neuropathy with the risk significantly increasing to 83.5% when these patients were subjected to sensory testing and nerve

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conduction studies 48. 8% of newly diagnosed diabetics had neuropathy compared to non-diabetics who had 2% neuropathy. Following a 10-year follow up the prevalence increased to 42% in diabetics and 6% in non-diabetics. Pirart's epidemiological study conducted from a period of 1947 to 1943 showed that the prevalence rose from 7.5% to 50% after 25 years.

The incidence of diabetic neuropathy ranges from 5% to 15%. The most common is the distal symmetric polyneuropathy. A study of 4, 400 people found that 7.5% of them had peripheral neuropathy and about 50% of them had progressive symptoms after 25 years of follow up.[1]

A longitudinal study of 132 patients was done using clinical and electro diagnostic criteria. Conduction abnormalities in these patients progressed from 8.3% to 16.7% after 5 years and 41.9% after 10 years. The sensory nerve action potential and compound muscle action potential was found to be reduced more than the conduction velocity. After 10 years 40% had lost ankle reflexes and 20% had lost vibration sense.[2]

The Rochester study showed that 54% of type I diabetes mellitus and 45% of type II diabetes mellitus was found to have peripheral neuropathy.[3] The EURODIAM IDDM complications study found a 28% incidence in 3, 250 randomly selected diabetics.[4] Similar results have been reported in Pittsburgh Epidemiology of Diabetes Complications Study.[5]

The study has been done to find out the commonest pattern of neuropathy in type 2 diabetes mellitus and to detect the presence of early neuropathy in asymptomatic diabetic patients to prevent serious complications such as trophic ulcers and diabetic foot which can lead to amputation by proper foot care in patients attending the outpatient department of general medicine department in Chettinad health city and research institute.

MATERIALS AND METHODS: About 50 cases satisfying the inclusion criteria admitted in Chettinad health city and research institute during the period of October 2013 to October 2015 were taken up for the study. Our study was conducted with an informed consent obtained from these patients. A proper consent shall be obtained from these patients.

They were interviewed for a detailed history and clinical examination. After ruling out other causes of peripheral neuropathy these patients were subjected to nerve conduction studies.

The patients were explained about the procedure. Fasting blood sugar, postprandial blood sugar, random blood sugar and glycosylated were estimated for these patients. The results were analyzed with the help of appropriate statistical methods.

All patients diagnosed as type II diabetes mellitus fulfilling the ADA criteria with or without symptoms of diabetic sensorimotor neuropathy were all included. Patients with Type 1 diabetes mellitus, Patients with diabetic foot ulcers and patients with other causes of sensorimotor neuropathy such as alcoholism and Vitamin B12 deficiency.

STATISTICAL ANALYSIS: All the continuous variables were assessed for the normality using Shapiro – wilk's test. If the variables were normally distributed it was expressed as mean ± standard deviation otherwise median (Inter quartile range).

All the categorical variables were expressed either as percentage or proportions. Comparison of normally distributed continuous variables was done by independent sample T test based on the number of groups. Comparison of non – normally distributed continuous variables were done by Mann – Whitney U test based on the number of groups.

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Comparison of categorical variables was done by either Chi square test or Fischer's exact test based on the number of observations. Box plot drawn to know the median difference between the variables.

RESULTS: The incidence of neuropathy was found to be 90% in the study group. Age analysis of patients in study group showed that patients in the age of 56 – 65 years had more incidences of diabetes mellitus with a mean age of 62 ± 12.9. Gender analysis showed that males had more incidence of diabetes in study group compared to females. Of all the clinical symptoms a diabetic patient can present with the following were more common: giddiness, polyuria & polydipsia, burning feet and tingling sensations out of which giddiness was the most common complaint noted in the study group.

Analysis of the co-morbidities showed that patients in the study group had an increased incidence of chronic kidney disease, hypertension and ischemic heart disease. Examination showed that 52% had absent ankle reflexes, 44.0% had reduced or absent vibration sense and 4% were clinically normal in the study group.

Comparing the CMAP amplitudes in patients in the study group showed that the most common nerve involved was the peroneal nerve followed by tibial indication lower limb involvement more than the upper limbs. CMAP latency was prolonged only median nerve compared to all other nerves. Conduction velocity was reduced most in tibial followed by peroneal and median nerves in the study group. SNAP amplitude was more pronounced in the superficial peroneal and sural nerves in the lower limbs compared to ulnar and median nerve indicating that distal.

Symmetrical polyneuropathy is the most common pattern noted in the study group. SNAP latency was prolonged only in median nerve compared to ulnar nerve in the study group. HbA1c levels in neuropathic patients had a median distribution of 10.4 mg/dl whereas non – neuropathic patients had a median distribution of 8.1 mg/dl.

The most common pattern of neuropathy noted was sensorimotor neuropathy and entrapment neuropathy. Few study subjects also had mono neuropathies and pure sensory neuropathies. The median duration of diabetes in patients with diabetic neuropathy was found to be 7 years and in non – neuropathic patients it was found to be 2 years.

DISCUSSION: Diabetic neuropathy is one of the most important complications of diabetes leading to significant morbidity and mortality, which can be prevented by early diagnosis and treatment.

This can lead to prevention of serious debilitating complications such as trophic foot ulcers and amputation.

Hence there is a requirement of early diagnosis of diabetic patients with peripheral neuropathy so that proper preventive measures can be taken even before the patient presents with symptoms of neuropathy.

The most common pattern of neuropathy noted in our study was distal symmetrical sensory and motor polyneuropathy. A study done in France showed that distal symmetrical form was the most common in diabetes.[6]

Another study done by Gerard et al showed a similar pattern with sensory and autonomic neuropathy predominating.[7]

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Out study showed a prevalence of neuropathy at 90%. Similarly, another Indian study done by kakrani et al showed that 92% had tingling sensations and 64% had burning feet. The study showed 100% involvement of lower limbs and 48% had involvement of upper limbs.[8]

Our study showed that the risk of neuropathy increased with increasing HBA1C levels. HBA1C is the single most important prognostic factor for diabetic neuropathy. One study showed that the severity of diabetic neuropathy increased with increasing HBA1C levels.[9]

The Duration of diabetes increases the risk of diabetic neuropathy. As the patients have more and more uncontrolled sugars for a prolonged period of time, they are more prone to development of diabetic neuropathy. A study done by valensi et al showed that higher the duration of diabetes in a patient, higher and severe the incidence of neuropathy. Our study also showed that increase in duration increases the risk of neuropathy.

CONCLUSION: The most common pattern of neuropathy noted was the distal symmetrical sensory and motor polyneuropathy.

Age and sex of the patient did not have any statistically significant P value due to the low sample size.

The median duration of diabetes mellitus in neuropathic patients was 7 years and in non – neuropathic patients 2 years and the median difference was 5 years, which had a statistically significant P value of 0.022.

The median HbA1c levels in neuropathic patients was 10.4 mg/dl and in non – neuropathic patients it was 8.1 mg/dl with a median difference of 2.3 mg/dl, which is statistically significant with a p value of 0.05.

Patients without any symptoms of tingling or burning sensations had an incidence of 85.7% of neuropathy on NCS whereas patients with symptoms had an incidence of 91.7%, which signifies that patients even without any symptoms has a high incidence of neuropathy which is why NCS is important in such patients for the early diagnosis and treatment.

ACKNOWLEDGEMENT: I would like to thank my professors and my colleagues in helping me collect the data and follow up the patient.

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FIGURE 1: COMPOUND MUSCLE ACTION POTENTIAL OF VARIOUS NERVES SHOWING NORMAL OR ABSENT IMPUSES WITH THE PERONEAL NERVE MOST FREQUENTLY INVOLVED.

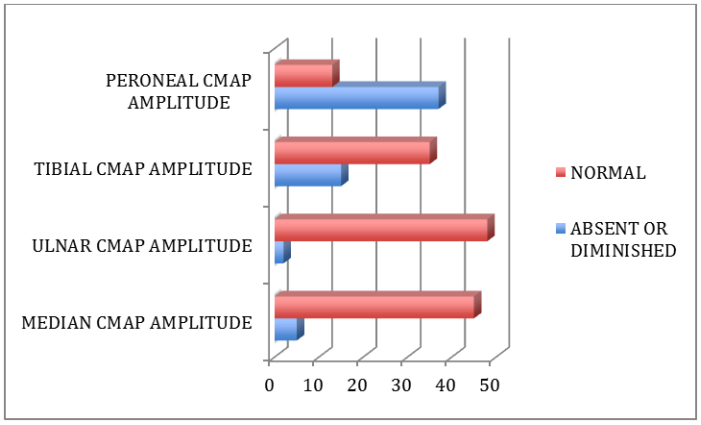

FIGURE 1

FIGURE 2: SHOWING PATTERNS OF NEUROPATHY IN PATIENTS WITH DIABETES MELLITUS WITH SENSORIMOTOR NEUROPATHY BEING THE MOST COMMON PATTERN NOTED.

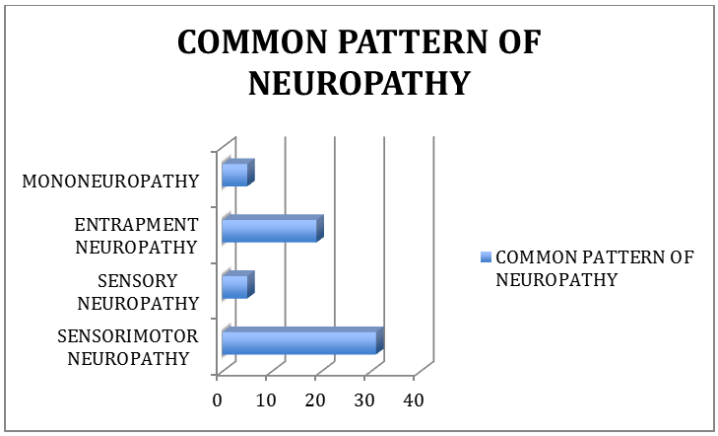

FIGURE 2

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FIGURE 3: A COMPARISON SHOWING INCIDENCE OF DIABETIC NEUROPATHY IN SYMPTOMATIC VS ASYMPTOMATIC DIABETIC INDIVIDUALS.

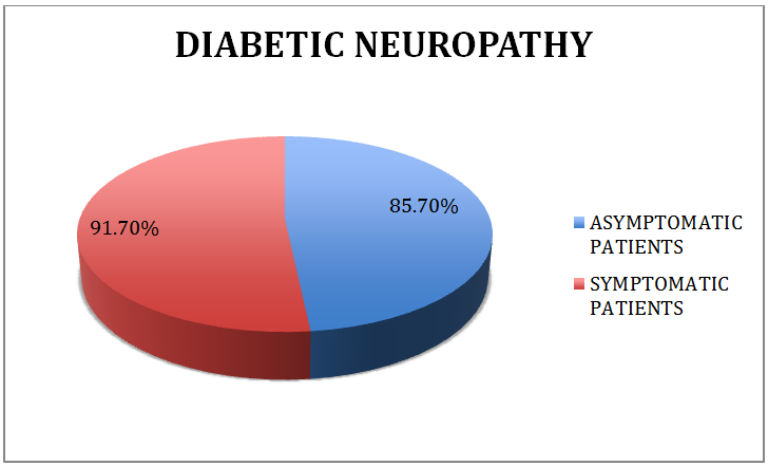

FIGURE 3

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FINANCIAL OR OTHER COMPETING INTERESTS: None

Date of Submission: 06/02/2015.
Date of Peer Review: 09/02/2015.
Date of Acceptance: 27/02/2015.
Date of Publishing: 06/03/2015.