ORIGINAL RESEARCH PAPER

Medicine

A STUDY OF 50 PATIENTS WITH DIABETIC NEUROPATHY WITH ITS CORRELATION TO HBA1C.

KEY WORDS:

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INTRODUCTION:

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia[1].The metabolic dysregulation associated with DM causes secondary pathophysiologic changes in multiple organ that impose a tremendous burden on the individual with diabetes and on the health care system.

Over the years the prevalence of Diabetes has been rising rapidly in middle- and low-income countries with the global prevalence among adults reaching 8.4% in 2014 from 4.7% in 1980[2].

Long term diabetes is associated with many micro and macrovascular complication. Diabetic neuropathy occurs in ~50% of individuals with long-standing type 1 and type 2 DM[3]. It may manifest as polyneuropathy, mononeuropathy, or autonomic neuropathy. It correlates with the duration of diabetes and poor glycemic control. As a result of longstanding hyperglycemia, the pathology of diabetic neuropathy involves a downstream metabolic cascade leading to peripheral nerve injury through an increased flux of polyol pathways, higher advanced glycation end-products formation, excessive release of cytokines, activation of protein kinase C and exaggerated oxidative stress, as well as other confounding factors[4]. This leads to malnutrition of extremely long axons originating in the small neuronal body which are vulnerable on the most distal end.

Nerve conduction studies [5] (NCS), primarily nerve conduction velocities (NCV), are considered one of the most sensitive indices for diagnosing the severity of distal symmetrical polyneuropathy (DSPN). Although nerve amplitudes have a higher variance than NCV, they are better indicator of the severity of DSPN, as they reflect the degree of nerve fiber loss. Many of the diabetes-related complications can be prevented or delayed with early detection, and aggressive glycemic control, and efforts to minimize the risks of complications[6].

Aim of the study is to correlate the severity of diabetic neuropathy as documented by NCS parameters with the duration of diabetes and HbA1c level.

MATERIALS AND METHODS:

This cross-sectional and observational study was conducted between January 2016 -2017 in the medicine Department of tertiary care centre in western INDIA. 50 patients with type1 and type 2 diabetes mellitus from the inpatient department of BJ medical college were recruited. Written informed consent was obtained from all the patients following comprehensive explanation of the purpose of study.

INCLUSION AND EXCLUSION CRITERIA

Patients having diabetes mellitus TYPE 1 OR TYPE 2 in the Age group of 18 to 80 years who fulfilled ADA criteria[7] and patients of diabetes mellitus presenting with various NCs (neuropathic complications) were included.

Patients with serious comorbidites, musculoskeletal disorders, diagnosed or suspected neuropathy due to any other cause and patient taking drugs that may have interfered with the study results in any way were excluded.

Detailed medical history was recorded. Subjects underwent a detailed physical and neurological examination with stress on complete laboratory profile including plasma sugar level and HbA1c were done. EMG **NCV** [8] was done by using Nicolet Viking select IV channel EMG machine.

Motor and sensory nerve conduction studies in lower extremities and one upper extremity, tibial f response and soleus conduction velocity was compared with norml value of our laboratory. (The observed values of nerve conduction studies were interpreted in relation to the reference range of the EMG NCV studies. Results were recorded .NC value of <40 m/s for lower limb and 50 m/s for upper limb were considered abnormal. Sural SNAP amplitude <9μV, median and ulnar SNAP amplitude <10μV were considered abnormal. The F wave latencies and H reflex latencies were compared with highly adjusted normal values by OH[9] EMG examination was used to diagnose and classify severity of DSPN as detailed by DYCK[10].A monofilament (semmers –weinstein sw[11]) 5.07-10gm was used to assess the sensation of touch (clinical importance deficits if less than 8(f) for 10 points)

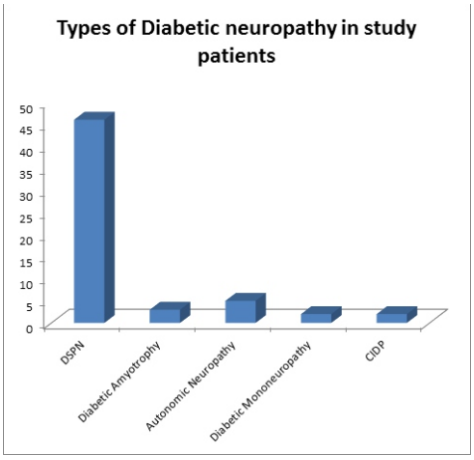
STATISTICAL ANALYSIS:

Data was collected by convenient sampling and analysed by using Pearson's correlation analysis. The Statistical software namely PRISM was used for the analysis of the data.

RESULTS

PRESENTATION SYMPTOMS OF DIABETIC NEUROPATHY

Table 1 TYPES OF DIABETIC NEUROPATHY IN ADULTS



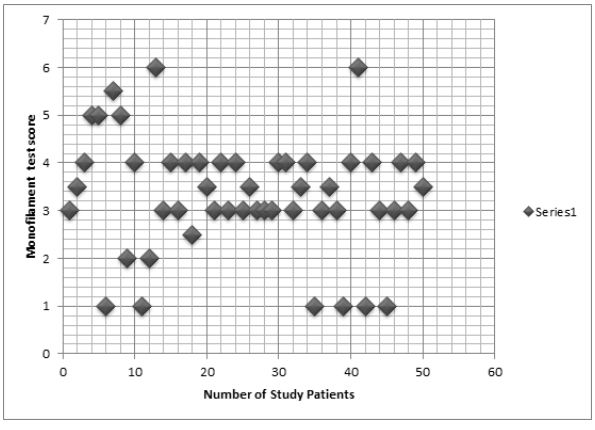
5 subtypes of Diabetic neuropathy were seen in present study of which DSPN being the most common (92%).

Table 2 SEVERITY OF NEUROPATHY IN STUDY POPULATION

STAGES	MALE	FEMALE
Grade 1 a	1%	0%
Grade 1b	0%	7.1%
Grade 2a	80.6%	71.4%
Grade 2 b	8.3%	14%
NA	8.3%	7.1%

Neuropathy with stage 1a compromising only NCS abnormalities and stage 1b comprising NCS abnormalities plus signs of neuropathy was seen in 1 patients each (1%).

Maximum number of patients(78%) presented with stage 2a i.e. NCS abnormalities plus neurologic signs plus neuropathic symptoms.



Fi.1. 10g SW MONOFILAMENT TEST SCORES OF STUDY PATIENTS USING 10 SITES

The distribution of results of 10g SW monofilament test using 10 sites showed a mean score of 3.34± 1.2

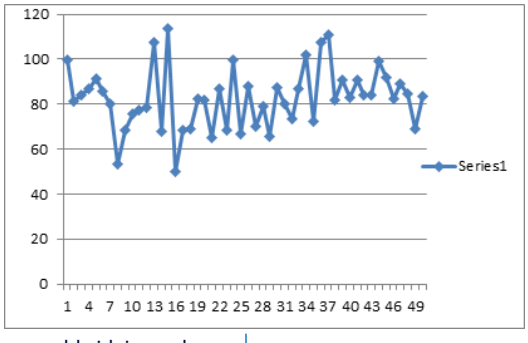


Fig 2. DISTRIBUTION OF SNCV FINDINGS IN STUDY POPULATION

The SNCV in present study was calculated by summation of motor nerve conduction velocities (MNCVs) of left median and left peroneal nerves.

The mean SNCV of the study was 82.55±13.63m/s.

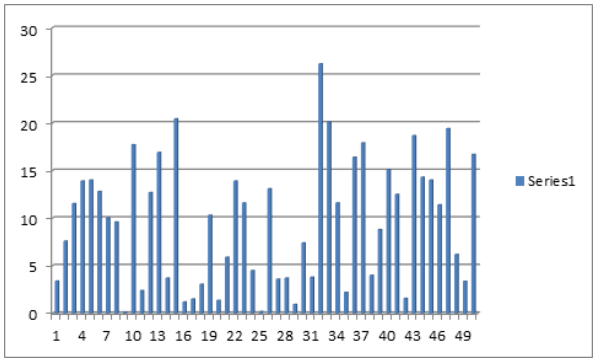


Fig 3. DISTRIBUTION OF SAMP IN STUDY PATIENTS.

The SAMP in this study was calculated by summation of CMAP of left peroneal nerves with SAMP of left sural and left median nerves. The mean SAMP in present study was 9.66±6.59 mv.

DISCUSSION

Diabetes is a common cause of neuropathy[12] in developing countries with incidence of diabetic neuropathy as high as as 84.8% .The mean age of study population was 54.3 ± 13.6

and Male /female ratio (72%/28%) which was comparable with TKAC et al[13]. Neuropathy increases the risk of amputation 1.7 fold overall, 12 fold if there is deformity (itself a consequence of neuropathy), and 36 fold if there is a history of ulceration[14].

Nerve conduction study was mainstay of investigation for diabetes neuropathy but 10 % patient also presented with autonomic symptoms. This indicates that detailed physical and neurological examination is as important as EMG studies. DSPN was the commonest subtype of diabetic neuropathy in present study.

Poor glycemic control and duration of diabetes has a major role in development of the complications of DM. The severity of DSP is strongly linked to glycemic control in DM. HbA1c levels above 8% correlates with increase risk of neuropathy. Our study demonstrated strong relation between Electromyography supported neuropathy [15] (ESN), frequency of symptoms, level of HbA1c and duration of diabetes as seen in previous studies.

Most patient in the study belonged to Dyck[10] stage 2a (78%). Stage 1a and 1b had 2% each and 2b had 10% patients.

Wan jae lee et AL reported in 2015 reported a direct relationship between HbA1c test values and risk of polyneuropathy in both type1 & type 2 diabetics. Their result showed HbA1c is a measurable indicator of the severity of polyneuropathy and poor glycemic control > 6.5% could increase the risk for the polyneuropathy in DM patients. In our study also increased Hb1Ac levels (9%) is associated with severe polyneuropathy.

Other goals of the study was to evaluate the relation of long term diabetes with functional status of median nerve, peroneal nerve and both sural nerves. In this present study we found a significant inverse correlation ($p<0.05$) between HbA1c levels and duration of DM with NCs parameters like SNCV and SAMP respectively [16]. So as HBA1c and duration of diabetes [17] increase, the severity of neuropathy increases.

There is similar inverse correlation (P=0.0046) between monofilament test score and duration of diabetes mellitus suggesting that as duration of diabetes increases severity of

neuropathy increases. Monofilament testing is a feasible bedside tool for detection of diabetic neuropathy[18].

The positive correlation (P=0.025) between monofilament test score and SAMP proves that the validation of monofilament test score as predictor of neuropathy severity.

CONCLUSION

Thus we establish that as levels of HbA1C and duration of diabetes increases, there is parallel increase severity of diabetes neuropathy. The 10g SW [16] monofilament score correlates positively with SAMP and inversely with duration of diabetes mellitus, hence is a good clinical predictor of neuropathic severity. Hence intensive therapy aiming at optimal glycemic control should be instituted with the goal of ameliorating symptoms preventing progress of neuropathy.

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