

**Original article:**

**Study of assessment of Nerve conduction velocity in diabetic patients:  
Cross sectional study**

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**Abstract**

**Introduction:** Diabetes mellitus is one of the most commonly known chronic diseases in the world. Today, in many countries, diabetes has become an epidemic disease. Neuropathy is one of the most common complications of diabetes mellitus.

**Material and methods:** The present study was cross sectional study, conducted in Department of Physiology for one year duration. The sample size was included 34 patients with diabetics history of more than 5 years , less than 65 year old , without any neurological disease were included in present study. The patients with more than 65 years , any history of neurological diseases were excluded from present study. The patients were included the only who voluntarily participated with written informed consent.

**Results:** After applying ‘Z’ test of difference between two sample means there is a highly significant difference between mean values of sensory nerve conduction velocity in the diabetics as compared to non-diabetics group (i.e.  $p < 0.01$ ) while there is no significant difference in the motor nerve conduction velocity in diabetics as compared to no diabetics.

**Conclusion:** From present study, we may conclude that increase in age, increase in the duration of diabetes, and male gender predominance can significantly make the nerve conduction velocity abnormal in diabetic patients. Sensory nerves are affected early than motor nerves.

**Keywords:** Nerve conduction velocity, Diabetic neuropathy

**Introduction:**

Diabetes mellitus is one of the most commonly known chronic diseases in the world. Today, in many countries, diabetes has become an epidemic disease [1]. Neuropathy is one of the most common complications of diabetes mellitus. Neuropathy can cause the sensory deficit, neurological disorder, limb ulcers, osteomyelitis, and amputation. Therefore, neurological examinations, determining the nerve conduction velocity and performing sensory and motor tests are important for timely diagnosis and treatment. [ 2] Nerve damages caused by diabetes can be categorized into two groups; myelin and axonal damages categories. The nerve conduction velocity mainly reflects the myelin changes, while the action potential amplitude indicates the axonal changes and the state of the nerve fibers.

**Material and methods:**

The present study was cross sectional study, conducted in Department of Physiology for one year duration. The sample size was included 34 patients with diabetics history of more than 5 years , less than 65 year old , without any neurological disease were included in present study. The patients with more than 65 years , any history of neurological diseases were excluded from present study. The patients were included the only who voluntarily participated with written informed consent. (Case Group)

In control group, we included same age group healthy non diabetic 34 patients. (Control Group)

NCV was carried out both for Motor and sensory system with the help of EMG – NCV machine available in Department.

In the present study we recorded sensory and motor nerve conduction velocities using surface electrodes which require less precision in placement and are therefore quicker to use.

**A. Motor nerve conduction velocity:**

1. For motor nerve conduction velocity, median nerve was stimulated supramaximally at two points along its course respectively at wrist and antecubital fossa (elbow).
2. The stimulating electrodes were placed with anode 3 centimeters proximal to cathode.
3. Recording and reference electrodes were placed over abductor pollicis brevis along thenar muscle border.
4. Ground electrode was placed over forearm.

**B. Sensory nerve conduction velocity:**

1. For sensory nerve conduction velocity, ring electrodes were placed at the index finger.
2. The cathode is placed at proximal interphalangeal joint and anode 3 cm distal.
3. Ground electrode was placed over the palm.
4. With the help of stimulating electrodes a sub-maximal stimulation is given at wrist and conduction velocity was recorded.

**Results:**

**Table No. 1: Comparison of mean values of Nerve conduction velocity in diabetics and non-diabetic patients:**

Nerve conduction velocity	diabetics (n=34)	non-diabetic patients (n=34)	Z test value	'p' value	Significance
	Mean ± SD	Mean ± SD			
Motor NCV (mt/sec)	57.42± 4.71	57.05 ± 4.51	0.18	p>0.05	Not significant
Sensory NCV (mt/sec)	50.76 ± 4.70	53.48 ± 3.90	4.52	p<0.01	Highly significant

It shows mean and SD values of motor NCV and sensory NCV in diabetics and non-diabetic patients.

After applying 'Z' test of difference between two sample means there is a highly significant difference between mean values of sensory nerve conduction velocity in the diabetics as compared to non-diabetics group (i.e. p<0.01) while there is no significant difference in the motor nerve conduction velocity in diabetics as compared to no diabetics.

**Discussion:**

In our present study there were 25 male patients while only 9 female patients . Mean age was 58±4.5 .

Studies have shown that the diabetes is the main cause of blindness and amputation in some countries [3]. One of the most important complications of diabetes is neuropathy or neurological disorder.

There are different types of diabetic neuropathy: polyneuropathy, diabetic amyotrophy, autonomic neuropathy, mononeuropathy multiplex, mononeuropathy, and diabetic ophthalmoplegia.

Diabetic neuropathy is observed in different forms in patients and corneal sensorimotor neuropathy (about 75%) can be mentioned as its common form [4]. In various studies, the prevalence of neuropathy was reported to be between 1.5% and 100% [65]. Neuropathy has a high prevalence in both IDDM and NIDDM forms [6].

According to the studies in this field, one of three diabetic patients has diabetic neuropathy [7]. Diabetic neuropathy is diagnosed in 10% of diabetic patients at the time of diagnosis of diabetes, and rest of the patients would suffer neuropathy some years after onset of the diabetes [8]. Some complications of diabetic neuropathy are severe pain, reduced sensation, increased diabetic foot ulcers and amputation [9].

One of the main problems of diabetic neuropathy is the lack of a reliable and agreed clinical scale for grading the severity of neuropathy, so that it can be used in clinical trials to examine the effect of different therapeutic approaches among patients [10]. The most important diagnostic criteria for diabetic neuropathy, which are confirmed by experts, are disturbances in nerve conduction velocity, increased threshold of sensory nerves, and

disturbances in autonomic system function tests. One of the diagnostic methods for diabetic neuropathy is to conduct electro-diagnostic tests (nerve conduction velocity determination).

According to a study by Dyck, Nerve Conduction Velocity (NCV) determination is not only the most sensitive test for the diagnosis of diabetic neuropathy, but also has some features such as being repeatable. Moreover, it is considered as a specific test for neurological disorder. According to him, the disadvantage of this test is that it does not provide direct information on signs and symptoms of neuropathy [2].

Nerve damages caused by diabetes can be categorized into two groups; myelin and axonal damages categories. The nerve conduction velocity mainly reflects the myelin changes, while the action potential amplitude indicates the axonal changes and the state of the nerve fibers.

The action potential amplitude is an estimate of the number of neural fibers activated by electrical stimulation, and its reduction implies an axonal damage. According to studies conducted in this field by researchers and experts, it was found that the nerve conduction velocity is more variable than the action potential amplitude and is more affected by interventions [10].

#### **Conclusion:**

From present study, we may conclude that increase in age, increase in the duration of diabetes, and male gender predominance can significantly make the nerve conduction velocity abnormal in diabetic patients. Sensory nerves are affected early than motor nerves.

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