

# Effect on NCV in Sensory Nerves of Diabetes

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## Research Article

**Abstract: Background objective:** The present study was carried out to measure NCV of sensory nerve in diabetics and non-diabetics. **Material and Method:** 100 subjects were enrolled, 90 subjects were selected as subject group, 10 were excluded due to exclusion criteria, age group of the persons selected was 20-60 yrs. NCV was carried out with evoked potential machine Nicolet. **Result:** A decrease in NCV with increase in HbA1C was observed. **Conclusion:** NCV was found highly significant in sural nerve of diabetic group of person than non-diabetic.

**Keywords:** NCV, Sensory Nerves, Diabetes.

### Introduction

The national institute of health sciences states that 95% of all diabetes in all India are type 2 diabetes due to sedentary lifestyle, obesity, lack of exercise, poor diet, family history and history of metabolic syndrome. Decrease nerve conduction velocity is seen in trauma, diabetes, rheumatoid arthritis and acromegaly. Diabetic neuropathy is nerve damage that is caused by diabetes. Contributing factors include uncontrolled glucose (blood sugar) and damage to blood vessels, which supply nutrients and oxygen to the nerves. Sensory symptoms may be negative or positive, diffuse or focal. Positive symptoms may be hypersensitivity to touch, electric shock like feelings, burning, prickling pain, tingling and negative sensory symptoms are feeling of numbness, deadness, and painless injuries due to loss of sensation.<sup>1</sup> Nerve conduction study is a test commonly used to evaluate the function, especially the ability of electrical conduction of motor and sensory nerves of the human body. Neuropathies are classified according to the nerves which are affected, neuropathy is general term used to describe damage to nervous system or individual nerves. Even though neuropathy is not related to diabetes it is a very common complication found when blood glucose is not controlled<sup>2</sup>. NCV is a common measurement made during this test along with measurement of Glycosylated hemoglobin (HbA1C). Measurement of HbA1C has been useful in assessing diabetic control.<sup>3,4</sup> Among the various proteins that are known to undergo non-enzymatic glycosylation in vivo human hemoglobin has been the most thoroughly investigated. Furthermore hemoglobin may be considered

a model protein that has provided inside into non-enzymatic glycosylation in other more complex tissues. HbA1C is the most abundant minor Hb component in human erythrocytes. According to estimates based primarily on ion-exchange chromatography, HbA1C comprises 4-6% of hemoglobin in normal erythrocytes and is elevated approximately two fold in diabetes.<sup>3,4</sup> The present study has been undertaken to study effect of HbA1C on NCV.

### Material and method

The present study was conducted in the department of physiology at MGM medical college Aurangabad, after obtaining the approval of the research and ethical committee of MGM college Aurangabad work was carried out. The present study was carried out in 100 subjects. 90 subjects, out of which 30 non-diabetic, 30 diabetic (controlled blood sugar), 30 diabetic (uncontrolled blood sugar) were enrolled, 10 were excluded due to exclusion criteria terminally ill patients, patients suffering from neurological diseases, malignancy, severe cardiac disease. Inform consent of patients was taken from subjects, procedure was explained and proper trial was given before taking the reading. In each subject's age, weight, height was recorded. The subjects were divided into three groups nerve conduction study was carried out by evoked potential machine Nicolet.<sup>5</sup> Sensory nerve conduction studies are performed by electrical stimulating of a peripheral nerve. The recording electrode is the more proximal, sensory latencies are on the scale of milliseconds. Sensory amplitudes are much smaller than the motor amplitudes, usually in microvolt. For sural nerve by applying conducting paste recording electrode is paste below lateral malleolus, ground electrode above the lateral malleolus and the stimulator is stimulated lateral to the calf muscles, and sensory nerve conduction velocity is calculated as:  $\text{Conduction Velocity (m/s)} = \frac{\text{Distance from stimulating electrodes to active electrodes (mm)}}{\text{Onset of latency (ms)}}$  Along with nerve conduction study HbA1C was estimated by Nyco-card method. Data was analyzed by Microsoft excel software for significant difference using unpaired 't' test.

## Results

Parameters studied were NCV and HbA1C

**Table 1:** Mean and SD of HbA1C in diabetic (control blood glucose), diabetic's (uncontrolled blood glucose and non diabetics.-

Sr. No.	Group	MeanHbA1C(%)	SD
1	Diabetics (control)	7.62	0.76
2	Diabetics (uncontrolled)	10.33	0.179
3	Non diabetics	5.79	0.55

**Table 2:** Comparison between diabetics (controlled blood glucose), diabetics (uncontrolled blood glucose) and non- diabetics inHbA1C-

Sr. No.	Comparison	t-value	p-value	Significance
1	Control HbA1C v/s uncontrolledHb A <sub>1</sub> C	-19.08	0.00001	Highly significant
2	Control HbA1C v/s non diabetic HbA1C	10.154	0.0001	Highly significant
3	Uncontrolled HbA1C v/s non diabetic HbA1C	44.41	0.0001	Highly significant

**Table 3:** Comparison between diabetics(control blood glucose) diabetics(uncontrolled blood glucose level) andnon diabetics in sural NCV (mt/s)-

Sr. No.	Comparison	t-value	p-value	Significance
1	Non diabetic sural v/s control sural	9.46	0.00001	Highly significant
2	Non diabetic sural v/s uncontrolled sural	19.65	0.0001	Highly significant
3	Control sural v/s uncontrolled sural	13.9	0.0001	Highly significant

## Discussion

Our study shows that NCV was significantly decreased in sural nerve of diabetics as compared to non diabetic persons. The results show that HbA1C was significantly increased in diabetics. The findings of work done by authors Pastore *et al* (1999)<sup>6</sup>, Kincaid *et al* (2008)<sup>7</sup>, J C Alezzo *et al* (2002)<sup>8</sup> match with our findings which show significant increase in HbA1C which has effect on NCV in diabetics compared to non diabetics. This indicated that axonal degeneration and re- innervation process of Neuro muscular junction in diabetic neuropathy are consistent with the metabolic control of this disease.<sup>9</sup> HbA1C comprises 4-6 % hemoglobin in normal erythrocytes and is elevated approximately twofold in diabetes.<sup>10</sup> The nerves of lower limbs are the longest in the body and often affected by neuropathy, when a diabetic patient loses sensation in feet develops sores, injuries leading to ulcers.<sup>11</sup>

## Conclusion

Diabetic neuropathy is seen in sensory nerves due to increased HbA1C which is affecting NCV. Thus Glycosylated hemoglobin estimation is superior to conventional method in assessing the risk of and monitoring diabetic neuropathy.

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