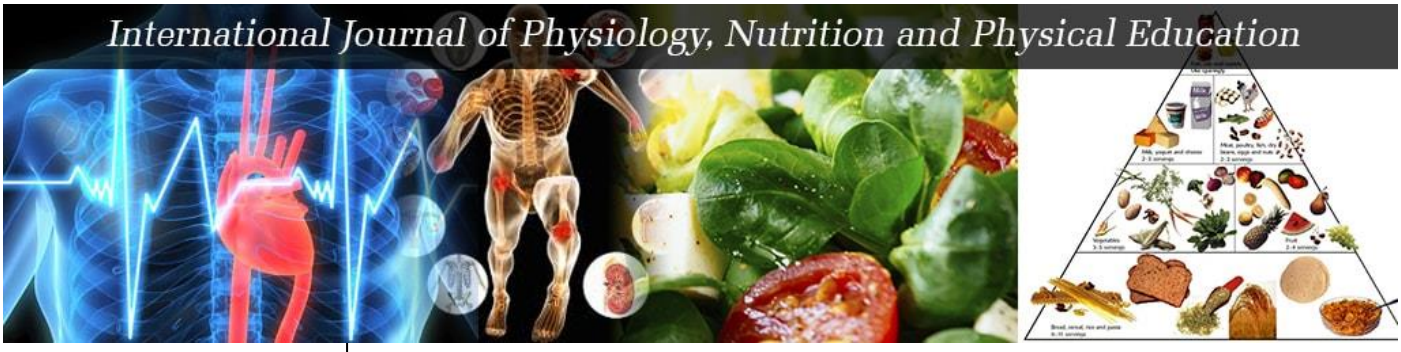

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A Study on Effect of BMI on Ulnar nerve conduction velocity in Type 2 Diabetes Mellitus

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Abstract
Introduction: Obesity is one of the commonest finding in Type 2 Diabetes mellitus (DM). For detection of neuropathy nerve conduction studies are done as electrophysiological tests. But the nerve conduction study may be affected by the fat in the epineurium.
Material and methods: A total of seventy Type 2 diabetic patients were taken with duration of diabetes 3 years or more, with a fasting blood sugar level ≥ 126 mg/dL and post prandial blood sugar level ≥ 200 mg/dL. Two groups were made Group A (n=35 with BMI 18.5 to 24.9) and Group B (n=35 with BMI >25). The entire recording of Right ulnar nerve conduction velocity was done using a four channel AD instrument and Compound Muscle Action Potential (CMAP) was recorded by using the LabChart software in both the groups.
Results: We found that there was a significant (P<0.05) decrease in the nerve conduction velocity among the Diabetic population with BMI >25 (44.34 ±13.13) compared to the Type 2 DM with BMI 18.5 to 24.9 (51.78 ± 14.29).
Conclusion: Thus from our study, we would like to conclude that there is a link between BMI and nerve conduction velocity in Type 2DM. A more detailed study involving more number of patients with Type 2DM is warranted to come to a definite conclusion.

Keywords: diabetes mellitus, nerve conduction velocity, body mass index

Introduction
Diabetes mellitus (DM), one of the most common endocrine disorder seen in the outpatient department. The prevalence of DM among the world wide projected to rise from 171 million in 2000 to 366 million in 2030 [1]. Abnormal production of insulin or insulin resistance is the major cause for development of Type 2 DM. Sedentary life style, genetic susceptibility and altered food habits are major issues for the development of insulin resistance [2].
In Type 2DM there will be impairment in the metabolism of carbohydrates, protein and fat. Either due to lack of production of insulin or lack of action a state of Type 2DM develops. Obesity is one of the commonest reason due to which insulin resistance will increase. Insulin resistance can be seen in those with central distribution of fat like in the abdomen. And also Type 2DM itself will promote dyslipidemia [3]. So, overall obesity is the common factor in Type 2 Diabetes mellitus.
Diabetic neuropathy, one of the long term complication of Type 2DM, leads to numbness in foot, ulceration in foot and amputation of foot. Nerve conduction study is very sensitive for detecting neuropathy at the earlier stages. As nerve conduction study is noninvasive procedure, it is gaining importance nowadays [4].
For detection of neuropathy nerve conduction studies are done as electrophysiological tests. But the nerve conduction study will be affected by many factors like gender, age, obesity, temperature, lower limb and upper limb [5]. As there is accumulation of fat in the epineurium that may impair the nerve conduction velocity [2]. BMI is the most sensitive indicator of obesity. So, effect of BMI on nerve conduction is very important to interpret in Type 2 DM. With this aim we took up this study to see the effect of BMI on Ulnar nerve conduction velocity in Type 2 Diabetes Mellitus.

Materials & methods
This study was undertaken in the Department of Physiology, ESIC Medical College,

Hyderabad after approval from the research and ethical committees. 70 patients of type 2 diabetes mellitus with duration of diabetes 3 years or more, with a fasting blood sugar level ≥ 126 mg/dL and post prandial blood sugar level ≥ 200 mg/dL, visiting ESIC Hospital, Hyderabad were taken for the present study. Height and weight of each subject was recorded and BMI was calculated as weight (kg) divided by height (m) squared. Two groups were made Group A (n=35 with BMI 18.5 to 24.9) and Group B(n=35 with BMI >24.9) All Type 2 diabetic patients diagnosed in such a manner, were subjected to nerve conduction study.

On arrival of the patients the details of study were explained and written informed consent was obtained. The entire recording was done using a four channel AD instrument. The patient was asked to be seated comfortably and the recording electrodes were placed on the hypothenar eminence of the palm. The bar stimulus electrode was positioned on the medial aspect of the forearm near the wrist joint, and stimulated with the current strength of 8 mA. The Compound Muscle Action Potential (CMAP) was recorded by using the LabChart software. Then the bar electrode was placed on the back of the elbow, above the ulnar groove. The orientation of the electrode was the same as that of wrist stimulation, with the red dot positioned closest to the elbow. The difference between the onset latencies was noted.

Distance was measured between the two stimulation points and the velocity was calculated using the formula: Distance travelled / time taken.

The data was summarized to test the difference in the mean values between the two groups by using the Student's 't' test; p values < 0.05 were taken as the level of significance.

Results

The study included total of 70 subjects, with duration of diabetes 3 years or more, with a fasting blood sugar level ≥ 126 mg/dL and post prandial blood sugar level ≥ 200 mg/dL. Two groups were made Group A (n=35 with BMI 18.5 to 24.9) and Group B (n=35 with BMI >25). Both the groups were aged between 40 to 70 years [Table 1]. We found that there was a significant (P<0.05) decrease in the nerve conduction velocity among the Diabetic population with BMI >25 (44.34 ±13.13) compared to the Type 2 DM with BMI 18.5 to 24.9 (51.78 ± 14.29) [Table 2/Chart 1].

Table 1: Age (in years) comparison between study group and control group.

Group	N	Mean	Std. Deviation	
Type 2 DM with BMI 18.5 to 24.9	35	53.74	9.00	P = 0.11
Type 2 DM with BMI >25	35	50.6	7.57	

Unpaired t test, p > 0.05

Table 2: Comparison of Right Ulnar nerve conduction velocity between two groups.

Variable	Type 2 DM with BMI 18.5 to 24.9		Type 2 DM with BMI >25		P value
	Mean	SD	Mean	SD	
Nerve conduction velocity(m/s)	51.78	14.29	44.34	13.13	0.02*

Unpaired t test *significant

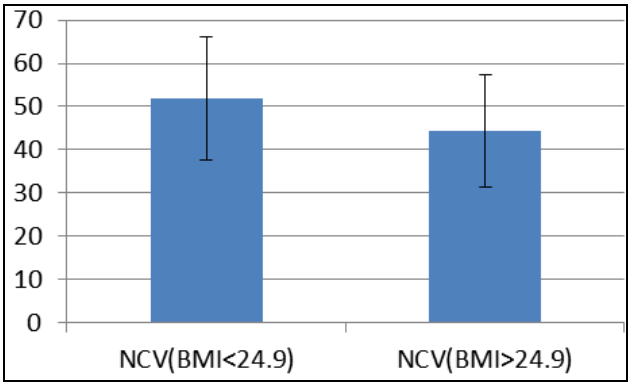

Chart 1: Comparison of Right Ulnar nerve conduction velocity between two groups.

Discussion

In this study we studied the nerve conduction velocities of seventy Type 2 diabetic patients with duration of diabetes 3 years or more, with a fasting blood sugar level ≥ 126 mg/dL and post prandial blood sugar level ≥ 200 mg/dL. Two groups were made Group A (n=35 with BMI 18.5 to 24.9) with the mean age 53.74± 9.00 years and Group B (n=35 with BMI >25) with the mean age 50.6 ± 7.57years.

In our study, we found there was a significant (P<0.02) decrease in Right ulnar nerve conduction velocity in Type 2 diabetic patients with BMI >25 patients compared to Type 2 DM with BMI 18.5 to 24.9. The decrease in the ulnar conduction velocity is in accordance with the study done by Chandrasekhar A *et al*. [6] In their study they found a decrease in the mean sensory nerve conduction velocity in the type II diabetes median nerve, ulnar nerve, sural nerve and posterior tibial nerve which correlated with the BMI.

Yet, another study also correlates with our findings which implies there will be a decrease in median nerve conduction velocity among obese Type II diabetes mellitus subjects [2].

Likewise in a study done by Bennal AS *et al*, nerve conduction velocity decreases as the BMI increases in healthy subjects [5]. In a study done by Naik BM *et al*, they found decrease in motor nerve conduction velocity among obese healthy individuals compared to the control group [7].

According to a study done by Jena SK *et al*, they found a decrease in median nerve conduction velocity among obese individuals [8]. Likewise in a study done by Chadha V *et al*, they found that sensory nerve conduction amplitude decreases significantly with increase in BMI [9].

Conclusions

The study was conducted on 70 subjects, among which 35 were Type 2 diabetic with BMI 18.5 to 24.9 and the rest 35 were Type 2 diabetic with BMI >25. There was a comparatively significant decrease in ulnar nerve conduction velocity among the Type 2 diabetic with BMI >25. So, from our study it is clear that there is a link between BMI and nerve conduction velocity in Type 2DM. The limitation of the present study was that small number of diabetic patients was covered. So, in future studies large number of diabetic population can be included with other parameters to observe the effects on nerve conduction velocity.

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