Co-relation Study of NCV and Blood Sugar in Mixed Nerve

Kirti Shinde[1*], Sangita Phatale[2#], Sudhir Choudhary[3]

[1]Assistant Professor, [2]Professor and HOD Dept. of Physiology, MGM Medical College, Aurangabad, Maharashtra, INDIA.

[3]Associate Professor, Dept. of Physiology, Govt. Medical College, Aurangabad, Maharashtra, INDIA.

Corresponding Addresses:

*dr.kirtisarkate@gmail.com, #drsangita_phatale@rediffmail.com

Research Article

***Abstract*: Background and Objective:** The present study was carried out to co-relate blood sugar and NCV in diabetic and non diabetic persons. **Material and Methods**: 100 subjects were enrolled, 90 subjects were selected as subject groups 10 were excluded due to exclusion criteria, age group of the person selected was 20-60 yrs. NCV was carried out with evoked potential machine Nicolet **Result:** A decrease in NCV withincrease in blood sugar was observed. **Conclusion:** NCV was found highly significant in diabetic group then non diabetic.

Keywords: NCV, Blood sugar, Mixed nerve, diabetes.

Introduction

Diabetes is very common endocrine disorder. The hyperglycemic conditions causes excess stimulation ofB cells, the constant and excess stimulation in turn causes burning out and degeneration of B cells. Prolonged hyperglycemia in diabetes mellitus causes dysfunction and injury of many tissues resulting in complications like vascular complication which is responsible for the development of cardiovascular complications like hypertension, myocardial infarction, degenerative changes in retina called retinopathy, degenerative changes in kidneys known as nephropathy, degenerative changes in autonomic and peripheral nerves called diabetic neuropathy. The magnitude of health care problem of type2 diabetes results not just from the disease itself but also from its association with obesity and cardiovascular risk factors particularly dyslipidaemia and hypertension. Indeed type2 diabetes has now been recognized as one manifestation of metabolic syndrome a condition characterized by insulin resistance and associated with a range of cardiovascular risk factors[1]. As per the study, diabetes is disorders affecting our body the way it uses food for energy, when food is taken it is digested and broken down into glucose. Normally, glucose then circulates in blood, insulin helps glucose to enter into the cells, pancreas produce insulin and adjust the insulin according to the blood glucose level, but in diabetes this process breaks and blood glucose level increases.[2].Neuropathy is a general term used to describe damage to the nervous system or individual nerve. Though neuropathy is not unique to diabetes, it is very common complication among those with poor blood glucose control. The present study has been undertaken to study effect of blood sugar on NCV. Nerve conduction study is a common measurement made during this test along with estimation of blood sugar.

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. Nerve conduction velocity was calculated as:[3]

Conduction velocity =Distance between two stimulated points (mm)

Proximal latency –distal latency (ms)

Blood sugar was estimated by glucose-oxidase /paraoxidasemethod. The patient was told to be nil by mouth and fasting blood sugar (mg/dl) was done in morning, as having lunch after one and half hour, againpost mealblood sugar(mg/dl) was recorded[4.] The parameters studied were blood sugar and NCV. Data was analyzed by Microsoft excelsoftware for significant difference using unpaired t test.

Results

Parameters studied were NCV and blood sugar.

Table 1: Mean and SD of fasting sugar level in diabetics (control blood glucose level), diabetics (uncontrolled blood glucose) and non-diabetics

Sr. No.	Groups	Mean fasting blood glucose(mg/dl)	SD
1	Diabetics(control)	93.30	7.13
2	Diabetics(uncontrolled)	148.73	07.9
3	Non diabetics	72.79	3.186

Table 2: Mean and SD of post meal sugar level (mg/dl) in diabetics and non diabetics-

Sr. No.	Groups	Mean Post meal	SD
1	Diabetics(control)	119.2	6.64
2	Diabetics(uncontrolled)	257.26	14.57
3	Non diabetics	108.86	5.83

Table 3: Mean and SD of diabetics (controlled blood glucose), diabetics (uncontrolled blood glucose)and non diabetics in median (motor andsensory) NCV mt/s-

Group	Motor (NCV mt/s)		Sensory (NCV mt/s)	
	Mean	SD	Mean	SD
Non diabetics	61.4	2.53	59.60	2.64
Diabetics(control)	53.42	3.64	54	3.01
Diabetics (uncontrolled)	40.93	2.42	41.2	1.37

Table no 4- Mean and SD of diabetics (control blood glucose level) diabetics (uncontrolled blood glucose and non diabetics in ulnar (motor and sensory) NCV mt/s-

Sr. No.	Groups	Motor NCV Mt/s		Sensory NCV mt/s	
		Mean	SD	Mean	SD
1	Non diabetics	61.13	3.15	58.86	3.63
2	Diabetics(control)	51.55	4.07	57.66	2.05
3	Diabetics (uncontrolled)	42.9	2.76	42.13	1.90

Table 5: Comparison between Diabetics (control blood glucose level) diabetics (uncontrolled blood glucose) and non diabetics in median motor NCV (mt/s).

Sr. No.	Comparison	t-value	p-value	Significance
1	Non diabetes median v/s control median	9.71	0.0001	Highly significant
2	Non diabetic median v/s uncontrolled median	32.0	0.0001	Highly significant
3	Controlled median v/s uncontrolled median	15.6	0.0001	Highly significant

Table 6: Comparison between diabetics (controlled blood sugar and non diabetics median (sensory) NCV.

Sr. No.	Comparison	t-value	p-value	Significance
1	Non diabetics median v/s control median	8.89	0.00001	Highlysignificant
2	Non diabetics median v/s uncontrolled median	21.0	0.0001	Highly significant
3	Control median v/s uncontrolled median	30.0	0.0001	Highly significant

Table 7: Comparison between diabetics (control blood glucose) diabetics(uncontrolled blood glucose) non diabetics in ulnar motor NCV mt/s.

Sr. No.	Comparison	t-value	p-value	Significance
1	Non diabetics ulnar v/s control ulnar	10.1	0.00001	Highly significant
2	Non diabetics ulnar v/s uncontrolled ulnar	12.0	0.0001	Highly significant
3	Control ulnar v/s uncontrolled ulnar	16.6	0.0001	Highly significant

Table 8: Comparison between diabetic (control blood glucose), diabetics(uncontrolled blood glucose) andnon diabetics in ulnar sensory NCV mt/s.

Sr. No.	Comparison	t-value	p-value	Significance
1	Non diabetics ulnar v/s control ulnar	6.67	0.00001	Highly significant
2	Non diabetics ulnar v/s uncontrolled ulnar	18.6	0.0001	Highly significant
3	Control ulnar v/s uncontrolled ulnar	20.1	0.0001	Highly significant

Discussion

The mean and SD of fasting and post meal blood sugar was found increased in diabetics compared to non diabetics. NCV of medianand ulnar nerves was decreased in diabetics than non diabetics. The findings of work done by authors ChangeMH , LeeYC Hsieh PF[5], Buschbacher R.M.[6] (1998), Rota[7] *et al* (2006), match with our findings, Thus it has been found that high blood sugar levels affect the amount of nitric oxide in blood. Nitric oxide helps to dilate the small blood vessels carrying oxygen to the nerves, low levels of nitric oxide causes constriction of blood vessels supplying to the nerve contributing to nerve damage[8.]So, automated nerve conduction study can provide nerve conduction confirmation of sensory- motor polyneuropathy in primary care settings[9]. The longer latency differences in median radial comparative studies where associated with smaller persistent sodium currents suggesting that intra-axonal sodium accumulation mediated by hyperglycemia enhances nerve compression and slows nerve conduction[10.] As per study it is seen that

there are four factors found to be involved in the development of diabetic neuropathy. Vascular and neural diseases are closely related to each other, blood vessels depend on normal nerve function, and nerves depend on adequate blood flow, vasoconstriction is the firstpathological change seen in micro vasculature, as the disease progresses, neuronal dysfunction, development of vascular abnormalities, thickening of capillary basement membrane and endothelial hyperplasia, which contribute to diminished oxygen tension, hypoxia and neuronal ischemia causing structural, functional and clinical changes in diabetic neuropathy[11].Nowadays it is seen that diabetic peripheral neuropathy is a common disabling complications of diabetes mellitus. Even though there are many methods for detecting and monitoring diabetic polyneuropathy, nerve conduction studies are considered to be most sensitive and reproducible[12].

Conclusion

Diabetic neuropathy is seen in persons with increased blood sugar.

References

1. Jonathan E shaw and DonaldJ Chisholm. World health organization study group on epidemiology and prevention of diabetes and metabolic syndrome .MJA 2003 179(7);379-383.
2. Debra Manzella R.N, former about.com guidewhat is diabetes, Updatedjul.24,2007 about.com Health's Disease and condition content is received by medical review board.
3. Wekipedia,the free encyclopedia nerve conduction study http://en.wekipedia.org.wiki/nerve_conduction_study
4. Brownlee M and A ceramiThe biochemistry of the complications of diabetes mellitus. Annu Rev Biochem 1981;50:385-432
5. ChangeMH ,LeeYC Hsieh PF, The role of Forearm mixed nerve conduction study in the evaluation of proximal conduction slowing in carpel tunnel syndrome . clinical neurophysiological, 2008 Dec.; 119(112): 2800-3 Epub 2008 Oct 30.
6. R.M. Baschbacher. Body mass index effecton common nerve conduction study measurements muscle and nerve. 1998;221(11):1398-404.
7. Eugenia Rota, Roberto Quadri, EdoardoFantiet at Electrophysiological findings of peripheral neuropathy in newly diagnosed type II diabetes mellitus. Journal of peripheral nervous system. 2006;10*(4): 348-53.
8. 1DFDiabetesAtlas 4th edition Diabetic Neuropathy Oct 25 2009-0: PDT http://www.medical news.today.com/articles/168553.php
9. Aaron I Vinik, Xuan Kong, J.Thomasmegerian Diabetic nerve conduction abnormalities in the primary care setting. Diabetes technol ther.2006 dec; 8(6) :654-62.
10. ImadaM , Misawa S. Median Radial sensory nerve comparative studies in the detection of median neuropathy at the wrist in diabetic patients. Clinneurophysiological. 2007jun;118(6):1405-9.
11. Diabetes and micro vascular diseaseBr J diabetes vascul Disc .2008;april2(4):304 .
12. Aaaron I Vinik, mark S, Emley, J Thomas Megerian Median and ulnar nerve conduction measurements in patients with symptoms of diabetic peripheral neuropathy. Diabetic technology and therapeutics. December 2005;6(6): 816-824.