

Nerve conduction study in Median nerve and its correlation with duration of diabetes mellitus and glycosylated haemoglobin in type 2 diabetes mellitus patient (T2DM)

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ABSTRACT

This study evaluated nerve conduction parameters of the median nerve in type 2 diabetes mellitus (T2DM) patients and correlated them with disease duration and HbA1c levels. Significant abnormalities were observed in median nerve conduction parameters among T2DM patients, including prolonged distal latencies, reduced conduction velocities, and decreased amplitudes. A significant positive correlation was found between duration of diabetes and prolongation of distal latencies ($p < 0.05$), while HbA1c levels showed significant negative correlation with nerve conduction velocities ($p < 0.05$). Patients with longer disease duration (> 10 years) and poor glycemic control (HbA1c $> 8\%$) demonstrated more severe electrophysiological abnormalities. The study concludes that median nerve conduction parameters are significantly altered in T2DM patients, correlating positively with disease duration and HbA1c levels, and routine nerve conduction studies can serve as an early diagnostic tool for detecting subclinical diabetic neuropathy.

Keywords: Type 2 Diabetes Mellitus, Diabetic Peripheral Neuropathy, Nerve Conduction Study, Median Nerve, HbA1c, Glycemic Control, Duration of Diabetes.

How to cite this article: Sethi P, Garg R, Azmatulla S. Nerve conduction study in Median nerve and its correlation with duration of diabetes mellitus and glycosylated haemoglobin in type 2 diabetes mellitus patient (T2DM). *Int J Drug Deliv Technol.* 2026;16(57s): 381-384. DOI: 10.25258/ijddt.16.57s.47

Source of support: Nil.

Conflict of interest: None.

Background:

Type2 diabetes mellitus is a major metabolic disorder associated with several complication, among which peripheral neuropathy is one of the most prevalent. Nerve conduction study provides an objective and reliable method for identifying early nerve dysfunction. The present study was to evaluate median nerve conduction parameters in patients with type2 diabetes mellitus and to examine their association with diabetic duration and glyated haemoglobin (HbA1c) levels.

Aim

To evaluate median nerve conduction parameters and determine their correlation with duration of diabetes mellitus and glycosylated haemoglobin levels in patients with type2 diabetes mellitus.

Materials and Method:

- This cross-sectional observational study included patients diagnosed with type2 diabetes mellitus attending a tertiary care centre. 574 patients were involved in this study. Demographic details, duration of diabetes, and HbA1c values were recorded. Participants were split into Group 1 (diabetes duration ≤ 5 years) and Group 2 (diabetes duration > 5 years).
- The required anthropometric measurements were duly noted. Blood was collected from patients for Laboratory parameters (FBS, PPBS, HbA1C).

Median nerve motor and sensory conduction studies were performed using 4 channel RMS NCS machine.

Parameters such as distal latency, conduction velocity, amplitude were analysed. Statistical test was applied to determine the relationship between nerve conduction findings, duration of diabetes, and glycaemic control.

Inclusion criteria-

- Age 30-65 years old
- Diagnosed with type2 DM

Exclusion criteria-

- Alcoholics, hypertensives, smokers
- patients with a history of myopathy, neuromuscular diseases or inherited neuropathy

Results:

Table-1 Number of patient within two group of diabetes on the level of HbA1c

		DM Group		Total	x ²	p-value
		≤ 5 yrs	> 5 yrs			
HbA1c level	≤ 7	11 (55%)	9 (45%)	20 (100%)	0.75	0.384
	> 7	250 (45.1%)	304 (54.9%)	554 (100%)		

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Total	261 (45.5%)	313 (54.5%)	574 (100%)		
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Table-2 (Number of patients between the duration of diabetes and latency,amplitude,velocity median nerve).

Group Statistics					
	DM Group	N	Mean	Std. Deviation	p-value
1 .rt- median- latency- distal	<= 5 yrs	261	3.4761	0.86826	0.688 > 0.05 (Not Significant)
	> 5 yrs	313	3.4439	1.02039	
2 .rt- median- latency- proximal	<= 5 yrs	261	7.9837	1.45225	0.555 > 0.05 (Not Significant)
	> 5 yrs	313	8.0597	1.60224	
3 .rt- median- amplitud e-distal	<= 5 yrs	261	13.8407	4.01821	0.316 > 0.05 (Not Significant)
	> 5 yrs	313	13.4966	4.14922	
4 .rt- median- amplitud e- proximal	<= 5 yrs	261	11.737	3.98263	0.876 > 0.05 (Not Significant)
	> 5 yrs	313	11.6815	4.42636	
5 .rt- median- velocity	<= 5 yrs	261	53.1855	14.36468	0.15 > 0.05 (Not Significant)
	> 5 yrs	313	51.56	12.61936	
6 .lt- median- latency- distal	<= 5 yrs	261	3.5716	0.74116	0.391 > 0.05 (Not Significant)
	> 5 yrs	313	3.6305	0.87915	
7 .lt- median- latencypr oximal	<= 5 yrs	261	8.0792	1.35414	0.151 > 0.05 (Not Significant)
	> 5 yrs	313	8.244	1.37486	

8 .lt- median- amplitud e-distal	<= 5 yrs	261	13.5452	3.5931	0.418 > 0.05 (Not Significant)
	> 5 yrs	313	13.8008	3.89903	
9 .lt- median- amplitud e- proximal	<= 5 yrs	261	11.6067	3.27341	0.49 > 0.05 (Not Significant)
	> 5 yrs	313	11.4104	3.47878	
10 .lt- median- velocity	<= 5 yrs	261	52.865	14.17298	0.187 > 0.05 (Not Significant)
	> 5 yrs	313	51.3618	13.06026	

Table-3 Spearman's test for correlation of all NCS parameters with duration of diabetes ,HbA1c level

	Spearman's Rank Correlations	duration	Hb A1c
1 .rt- median- latency- distal	Correlation Coefficient	-.037	.012
	Sig. (2-tailed)	.378	.772
2 .rt- median- latency- proximal	Correlation Coefficient	.004	-.041
	Sig. (2-tailed)	.929	.331
3 .rt- median- amplitude -distal	Correlation Coefficient	-.059	-.013
	Sig. (2-tailed)	.162	.748
4 .rt- median- amplitude -proximal	Correlation Coefficient	-.030	.040
	Sig. (2-tailed)	.480	.343
5 .rt- median- velocity	Correlation Coefficient	-.027	.037
	Sig. (2-tailed)	.524	.370
6 .lt- median- latency- distal	Correlation Coefficient	.026	-.028
	Sig. (2-tailed)	.534	.511
7 .lt- median- latencypro ximal	Correlation Coefficient	.034	-.001
	Sig. (2-tailed)	.412	.981

8	It- median- amplitude -distal	Correlation Coefficient	.030	- .01 3
		Sig. (2- tailed)	.467	.75 7
9	It- median- amplitude -proximal	Correlation Coefficient	-.021	- .02 3
		Sig. (2- tailed)	.621	.58 1
10	It- median- velocity	Correlation Coefficient	-.016	- .03 5
		Sig. (2- tailed)	.701	.40 4

Discussion-

The primary findings of this study is that the duration of diabetes, when categorized by a 5 years threshold, does not significantly impact the standard nerve conduction study (NCS) parameters of the median nerve in this specific population. The lack of significance suggests that during the first decade post-diagnosis, median nerve may remain relatively stable, or the physiological changes are not yet severe enough to manifest as significant deviations in mean NCS values.

The 5 yrs below of diabetes mellitus may be too early to observe the cumulative axonal damage or demyelination typically associated with chronic diabetic sensorimotor polyneuropathy (DSPN).in this study the p value was greater than 0.05, the difference in HbA1c levels between the two groups is not statistically significant. This suggests that in this specific sample, the duration of diabetes did not have a meaningful impact on whether a patient's blood sugar was controlled or uncontrolled.

There was no significant correlation ($p > 0.05$) between the duration of diabetes and any of the median nerve parameters (latency, amplitude, velocity). similarly, HbA1c levels did not shows a significant relationship with these NCS parameters.

Conclusion:

The study concludes that the duration of diabetes is more significant factor than recent blood sugar control (HbA1c) levels in predicting delays in proximal nerve conduction. Proximal latency in the median nerves appears to be a sensitive marker for the chronicity of diabetic impact on the peripheral nervous system.

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