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Original Article

"A cross-sectional study correlating clinical and electrophysiological findings in patients with diabetic peripheral neuropathy"

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ABSTRACT

Background: Diabetes has become a significant contributor to morbidity in the Indian population. One of the most prevalent long-term effects of diabetes is peripheral neuropathy, which has a high risk of morbidity and mortality. Study aimed to correlate clinical and electrophysiological findings in patients with Type 2 diabetes with clinical symptomatology and signs of peripheral neuropathy

Material & Method: Present cross-sectional study was conducted among patients attending to general medicine OPD and IPD during the period of Jan 2023 to July 2023. All the type 2 diabetes mellitus patients with less than 5yr duration with symptoms and signs of diabetic peripheral neuropathy were included. Patients with more than 5yr of duration of diabetes, chronic renal failure, HIV, pregnancy, malignancy, drug induced alcohol consumption, nutritional deficiency, hypothyroidism and any known collagen vascular disorders were excluded. The blood investigation such as complete blood count and picture, iron profile, HbA1c, blood glucose levels (fasting and post-prandial) were analysed. Nerve conduction test was performed in all the patients and neuropathy severity scale and neuropathy disability score was given to each patient included in the study

Result: A total of 90 patients fulfilling inclusion criteria are included in present study with mean age of 46.52yrs. Among them 68.9% were female patients and 31.1% were male. On assessment of NCS and neuro subdivision, study found a significant higher incidence of abnormal results in patients with neuropathy compared to patients without neuropathy. ($p<0.05$)

Conclusion: There is significant relation of presence of neuropathy in patients newly diagnosed with type 2 diabetes mellitus. Hence there is requirement of screening of neuropathy signs and symptoms among type 2 diabetes mellitus, to manage the patients at early to avoid any complications related to neuropathy in near future.

Keywords: Diabetes Mellitus, Neuropathy, Glycated Hemoglobin, Complications.

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Introduction:

Diabetes has become a significant contributor to morbidity in the Indian population.[1,2] "The presence of symptoms and signs of peripheral nerve dysfunction in individuals with diabetes mellitus after the exclusion of other causes" is the definition of diabetic neuropathy.[3,4]

One of the most prevalent long-term effects of diabetes is peripheral neuropathy, which has a high risk of morbidity and death. It is the cause of 50% to 75% of non-traumatic amputations and more hospitalisations than all other diabetes complications taken together.[5] In typical symmetrical diabetic distal sensory polyneuropathy, loss of myelinated nerve fibers is the most prominent finding.[6,7] Both endocrinologists and non-endocrinologists grossly underdiagnosed neuropathy, despite the serious side effects and expensive treatment involved.[6–8] The purpose of this study is to correlate clinical and electrophysiological findings in patients with Type 2 diabetes with clinical symptomatology and signs of peripheral neuropathy.

Material & Method:

Present cross-sectional study was conducted among patients attending to general medicine OPD and IPD during the period of Jan 2023 to July 2023 at Shri B.M. Patil Medical College and Research Centre, Vijayapur, India.. All the type 2 diabetes mellitus patients with less than 5yr duration with symptoms and signs of diabetic peripheral neuropathy were included. Patients with more than 5yr of duration of diabetes, chronic renal failure, HIV, pregnancy, malignancy, drug induced alcohol consumption, nutritional deficiency, hypothyroidism and any known collagen vascular disorders were excluded from the study.

Study obtained the institutional ethics clearance and obtained the informed consent from all the participants enrolled in present study. Detailed history of patients was obtained and clinical examination was performed. The blood investigation such as complete blood count and picture, iron profile, HbA1c, blood glucose levels (fasting and post-prandial) were analysed. Nerve conduction test was performed in all the patients and neuropathy severity scale and neuropathy disability score was given to each patient included in the study.

Statistical Analysis: all the data were entered in excel and analysed using SPSS v26.0 operating on windows 10. The data are summarised as mean, standard deviation, frequency and percentage. The summarised data were represented using tables, figures, bar diagram and pie chart. The mean difference between continuous data was analysed using unpaired t-test and categorical data using chi-square test. For all statistical purpose, a p-value of <0.05 was considered statistically significant.

Result:

A total of 90 patients fulfilling inclusion criteria are included in present study with mean age of 46.52yrs. Among them 68.9% were female patients and 31.1% were male with female preponderance in the present study.

Table 1: Age-Wise distribution of patients

		Frequency	Percent
Age (yrs)	30-39	16	17.8
	40-49	53	58.9
	50-59	21	23.3

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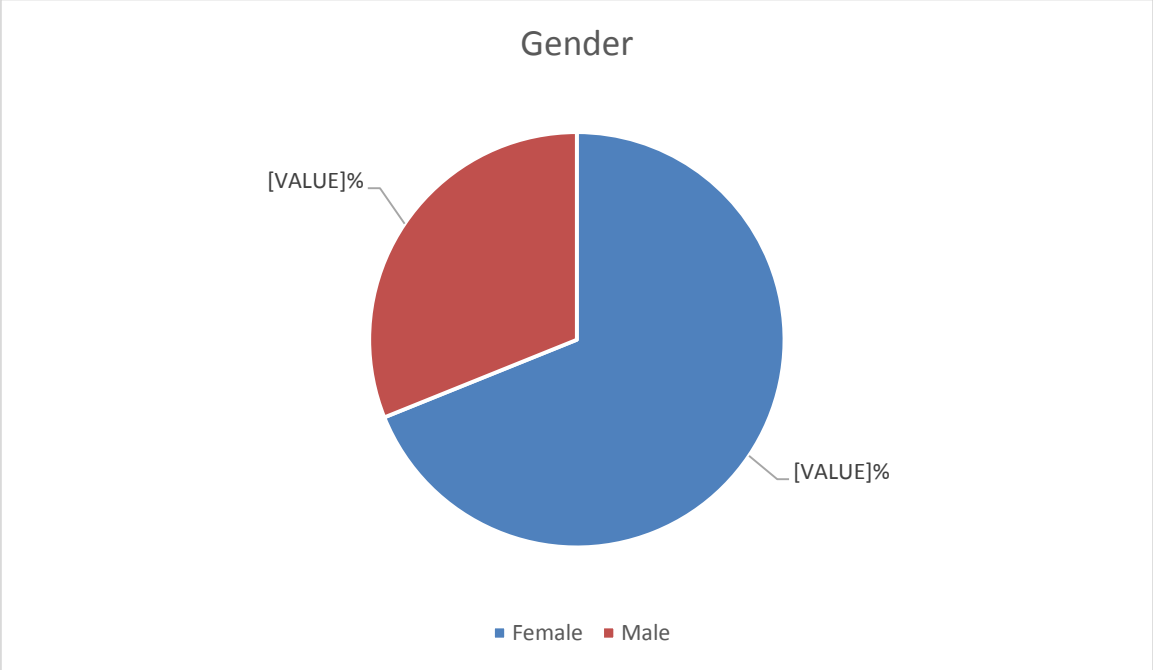

Figure 1: Gender distribution of patients

Table 2: Demographic details of included patients compared between the groups						
		With neuropathy		Without neuropathy		Chi-square test (p-value)
		Count	%	Count	%	
Age (yrs)	30-39	10	16.6	6	20.1	0.166 (0.91)
	40-49	36	60.0	17	56.6	
	50-59	14	23.4	7	23.3	
Gender	Female	39	65.0	23	76.6	1.22 (0.24)
	Male	21	35.0	7	23.4	
STH	Absent	19	31.8	24	80.0	18.72 (0.01)*
	Present	41	68.2	6	20.0	
BMI	Obese	5	8.4	0	0.0	17.99 (0.01)*
	Overweight	54	90.0	21	70.0	
	Normal	1	1.6	9	30.0	
Symptoms	Tingling and numbness	45	75.0	22	73.4	1.1 (0.55)
	Lower limb weakness	6	10.0	5	16.6	
	Decrease in sensation of feet	9	15.0	3	10.0	
Sign	Knee jerk	3	5.0	1	3.4	10.84 (0.05)*
	Ankle reflex	13	21.7	1	3.3	
	Touch impairment	11	18.3	2	6.8	
	Vibration impairment	25	41.8	21	70.0	

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	Temporary impairment	4	6.7	1	3.3	
	No sensation on pin prick	4	6.7	4	13.3	
p-value <0.05 was considered statistically significant						

Study documented with significant difference in the distribution of the signs, BMI and STH between the groups.($p<0.05$).

Table 3: Comparison of NCS and neuro subdivision between the groups

		With neuropathy		Without neuropathy		Chi-square test (p-value)
		Count	%	Count	%	
NCS Etiology	Normal	0	0.0	30	100.0	90.3 (0.01)*
	Axonal	13	21.8	0	0.0	
	Demyelinating	1	1.7	0	0.0	
	Mixed	46	76.5	0	0.0	
Neuro subdivision	Confirmed DSPN	29	48.4	0	0.0	52.94 (0.01)*
	Possible DSPN	1	1.6	20	66.8	
	Probable DSPN	30	50.0	10	33.2	
p-value <0.05 was considered statistically significant						

On assessment of NCS and neuro subdivision, study found a significant higher incidence of abnormal results in patients with neuropathy compared to patients without neuropathy. ($p<0.05$)

Table 4: Comparison of the variables between the groups

	With neuropathy		Without neuropathy		Unpaired t-test p-value
	Mean	SD	Mean	SD	
FBS	238.2	26.35	160.54	15.13	0.01*
PPBS	355.04	21.34	218.94	27.55	0.01*
HbA1c	9.44	0.38	6.93	0.74	0.01*
S. Creatinine	0.81	0.12	0.65	0.07	0.01*
eGFR	94.52	10.92	108.33	12.22	0.01*
p-value <0.05 was considered statistically significant					

Among the patients with neuropathy, there was significant higher mean level of fasting blood glucose, post-prandial blood glucose, and glycated hemoglobin level. Showing the risk of neuropathy in patients with uncontrolled status of diabetes mellitus.

Discussion:

Diagnosis of Type 2 Diabetes Mellitus is delayed due to its subtle start and asymptomatic preclinical period, which can lead to microvascular and macrovascular problems. According to NSS/NDS/NCS, the current study's findings indicate a significant incidence of peripheral neuropathy in newly diagnosed type 2 Diabetes mellitus (66.75%). Present study documented

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with presence of neuropathy in 55% by NCS. Among them 48.4% were confirmed DSPN, 50% were probable DSPN and 1.6% with possible DSPN.

Due to varying diagnostic criteria, various sample sizes, differences in mean age at diagnosis, and ethnicity, several studies conducted in India have revealed varying prevalence rates of peripheral neuropathy in newly diagnosed Type 2 Diabetes mellitus. According to a research by A. Dutta et al., peripheral neuropathy was prevalent in newly diagnosed cases of diabetes mellitus (29%), with abnormalities seen in two or more of the NSS, NDS, and NCS.[10] Based on the presence of abnormalities in both NSS and NDS, H K Gill et al. reported a prevalence of 30%, while different Indian research reported a lower frequency of peripheral neuropathy, at just 13.15 percent.[11]

Also study documented that in patients with neuropathy; there was significant higher mean level of fasting blood glucose, post-prandial blood glucose, and glycated hemoglobin level. Showing the risk of neuropathy in patients with uncontrolled status of diabetes mellitus.

The reason for this discrepancy in the prevalence of peripheral diabetic neuropathy between our study used clinical and electrophysiological studies (Neuropathy Symptom Score, Neuropathy Disability Score, and Nerve Conduction Studies) and Ashok et al. used a biothesiometer a method that is relatively less sensitive—to assess neuropathy. Another reason could be that, due to lower illness knowledge, our patients visit the Diabetes Clinic somewhat later than those of Ashok et al.[12] Stud by Rota et al., documented that there is higher prevalence of neuropathy in upper limb nerve sensory NCS is more sensitive than detecting the lower limb NCS.[13]

There is significant higher incidence of the peripheral neuropathy in patients with diabetes mellitus, hence special attention is needed to be given to the patients and if not it may contribute to define the quality of life and morbidity associated with disorder.

Conclusion:

There is significant relation of presence of neuropathy in patients newly diagnosed with type 2 diabetes mellitus. Hence there is requirement of screening of neuropathy signs and symptoms among type 2 diabetes mellitus, to manage the patients at early to avoid any complications related to neuropathy in near future. Also, study showed significant higher incidence of neuropathy in patients with uncontrolled diabetes mellitus compared to on controlled glycemic status.

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Conflict of interest: Nil

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