

A study of correlation between duration of type-2 diabetes mellitus and development of diabetic neuropathy by using thermal perception sensitometer

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Abstract

Background: Long standing Diabetes Mellitus is associated with development of diabetic neuropathy. **Objective:** to assess the diabetic neuropathy with duration of diabetes mellitus by using Thermal Perception sensitometer. **Material and Method:** All 100 patients are divided in to two groups. Group-1 include 28 patients those age less than 50 years among these 13 patients have duration of diabetes 1-3 years and 15 patient have duration of diabetes more than 3 years . Group-2 include 72 patients those age more than or equal 50 years among these 27 patients have duration of diabetes 1-3 year and 45 patients have duration of diabetes more than 3 years. In this study, thermal perception threshold (TPT) is determined by applying probe of thermal perception sensitometer on first toe, first metatarsal head (1st MTH), and 2nd MTH, 3rd MTH, 5th MTH , instep, heel. **Result:** in our study, first result shows that patients having age less than 50 years and duration of Diabetes mellitus is 2.30 ± 0.83 years have cold perception threshold is 20.74 ± 2.09 and normal grade (no neuropathy) and for hot perception threshold is 41.84 ± 2.38 and normal grade. those patient having duration of DM 6.06 ± 2.87 years have cold perception threshold is 18.95 ± 4.14 and mild grade of neuropathy and hot perception threshold is 44.39 ± 4.35 and mild grade of neuropathy. hot and cold perception threshold comparison between duration of diabetes 1-3 years and more than 3 years was not statistically significant. In second study shows that patients having age more than and equal to 50 years and duration of DM 2.03 ± 0.97 years have cold perception threshold is 17.39 ± 4.53 and mild grade of neuropathy and for hot perception threshold is 43.75 ± 3.05 and mild grade of neuropathy. those patient having duration of DM 8.27 ± 3.69 years have cold perception threshold 14.97 ± 2.33 and moderate grade of neuropathy and hot perception threshold is 46.23 ± 2.41 and moderate grade of neuropathy. hot and cold perception threshold comparison between duration of diabetes 1-3 years and more than 3 years was statistically significant ($p < 0.05$). **Conclusion:** It was found that if age of patients less than 50 years, duration of diabetes was 1-3 years, development of neuropathy with normal grade (no neuropathy) and if duration of diabetes more than 3 years, development of neuropathy with mild grade. If age of patients more than 50 years, duration of diabetes was 1-3 years, development of neuropathy with mild grade and if duration of diabetes more than 3 years, development of neuropathy with moderate grade by using thermal perception sensitometer.

Key Words: Diabetic neuropathy, Thermal perception sensitometer

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INTRODUCTION

Diabetic neuropathy is the most frequent symptomatic complication of diabetes. so early recognition and appropriate management of Diabetic neuropathy in

patient with diabetes mellitus is necessary to prevent its further progress. In the developing countries diabetes occurs at a younger age (45-65) years than in developed countries. Long standing Diabetes Mellitus is associated with an increased prevalence of micro vascular and macro vascular diseases. The prevalence of peripheral neuropathy is 25.5% in India.¹ Based on clinical criteria, the overall prevalence in NIDDM and IDDM patients is approximately 25-30%, increasing to over 40% in the elderly.² The prevalence approaches 50% among those who have had the disease for more than 25 years.² The prevalence of asymptomatic diabetic neuropathy with subtle changes detected by quantitative testing may approach 60 to even 100% depending on the definition

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and the techniques used.³ In this study, already diagnosed patients of type 2 Diabetes Mellitus were taken. From the diabetic patients, who come to Sir T. hospital, Bhavnagar, Gujarat. such 100 Patients are to be selected for study. All are tested with Thermal perception sensitometer. Assessment of Diabetic Neuropathy by this method gives us early diagnosis of Diabetic Neuropathy, so it may be helpful in treatment of Diabetes Mellitus.

METHODOLOGY

The study was conducted on 100 diagnosed patients of Type 2 Diabetes Mellitus above age of 25 years in Sir. T. Hospital, Bhavnagar, Gujarat. Patients were coming in diabetic clinic OPD were taken for study. The research protocol was approved by institutional ethical committee of govt. medical college Bhavnagar.

Inclusion criteria: (1) Age of patients should be more than 25 years (2) diagnosed patients of type 2 diabetes mellitus with duration of diabetes not less than 1 year.

Exclusion criteria: (1) evidence of amputation of foot (2) patients with neurological disorders (3) patients with trauma to limbs (4) patients with peripheral edema (5) patients taking psychotropic or sedative drugs.

All patients are divided in to two groups. Group-1 includes 28 patients those age less than 50 years among these-13-patient have duration of diabetes 1-3 years and 15 patients have duration of diabetes more than 3 years. Group-2 includes 72 patients those age more than or equal 50 years among these 27 patients have duration of diabetes 1-3 year and 45 patients have duration of diabetes more than 3 years. In this study, We had to determine thermal perception threshold (for cold and hot) on first toe, first metatarsal head (1st MTH), and 2nd MTH, 3rd MTH, 5th MTH , instep, heel , and three readings were taken and then average was taken by using Thermal perception sensitometer. The room temperature was maintained between 28 C° and 32 C° for accurate result. it gives early diagnosis and accurate assessment of Diabetic Neuropathy. Data was collected and analysed by SPSS software and reported as mean±SD. It is non-invasive procedure. Written consent from patients were taken. The level of significance between group 1 and 2 were taken. p value was less than 0.05 for group which includes patient's age more than 50 years.

Normal values and interpretation⁴

Grade of Neuropathy	Cold Perception threshold	Hot perception Threshold
Normal	>20	<42
Mild	19-15	43-45
Moderate	15-10	45-48
Severe	<9	>49

RESULT

Table 1: Showing parameter of patients of type 2 diabetes mellitus having age less than 50 years

Age of patients	Duration of Diabetes Mellitus	Number of patients	Cold perception threshold	Grading of neuropathy	Hot perception threshold	Grading of neuropathy	P Value
42.07±6.19	2.30±0.83	13	20.74±2.09	normal	41.84±2.38	Normal	>0.05
40.33±6.04	6.06±2.87	15	18.95±4.14	mild	44.39±4.35	mild	

(all values in mean±SD)

The table 1 shows patients having age less than 50 years and duration of DM 2.30±0.83 years have cold perception threshold 20.74±2.09 and normal grade and for hot perception threshold is 41.84±2.38 and normal grade . those patient having duration of DM 6.06±2.87 years have cold perception threshold 18.95±4.14 and mild grade and hot perception threshold is 44.39±4.35 and mild grade . hot and cold perception threshold comparison between duration of diabetes 1-3 years and more than 3 years was not statistically significant.

Table 2: Showing parameter of patients of type 2 diabetes mellitus having age more than 50 years

Age of patients	Duration of Diabetes Mellitus	Number of patients	Cold perception threshold	Grading of neuropathy	Hot perception threshold	Grading of neuropathy	P Value
56.85±5.68	2.03±0.97	27	17.39±4.53	mild	43.75±3.05	mild	<0.05
59.13±6.94	8.27±3.69	45	14.97±2.33	moderate	46.23±2.41	moderate	

(all values in mean±SD)

The table 2 shows patients having age more than and equal to 50 years and duration of DM 2.03±0.97 years have cold perception threshold 17.39±4.53 and mild grade and for hot perception threshold is 43.75±3.05 and mild grade. those patient having duration of DM 8.27±3.69 years have cold perception threshold 14.97±2.33 and moderate grade and hot perception threshold is 46.23±2.41 and moderate grade. hot and cold perception threshold comparison between duration of diabetes 1-3 years and more than 3 years was statistically significant (p<0.05)

DISCUSSION

In present study, it was found that if patient's age was more than 50 years, and duration of diabetes mellitus more than 3 years then there was moderate grade of neuropathy was found in those patients. While patient's age was less than 50 years, duration of diabetes mellitus more than 3 years then there was mild grade of neuropathy in those patients. So, duration of diabetes is very important factor for damage of nerve fibers which leads to neuropathy. This type of peripheral neuropathy is one of the microvascular complication of diabetes, responsible for amputations in future. Instrument like thermal perception sensitometer detect sensory neuropathy even if the patient does not have any symptoms of neuropathy. In our study with patient's age less than 50 years and duration of diabetes mellitus 6.06 ± 2.87 years have cold perception threshold 18.95 ± 4.14 and mild grade of neuropathy and hot perception threshold 44.39 ± 4.35 and mild grade of neuropathy was found. And patient's age more than and equal 50 years and duration of DM 8.27 ± 3.69 years have cold perception threshold 14.97 ± 2.33 and moderate grade of neuropathy and hot perception threshold is 46.23 ± 2.41 and moderate grade neuropathy was found. A similar finding were observed by G. Ponirakis *et al*⁵ by using device called nerve check quantitate sensory testing for thermal perception, neuropathy was detected in those patients who had longer duration of diabetes mellitus. Another study done by Vinik Al *et al*⁶. they have studied cutaneous perception at the dominant hallux of 113 subjects (32 normal healthy controls and 81 diabetic subjects). The cutaneous sensory perception tests included warm and cold thermal perception, vibration, touch-pressure sensation, and current perception testing (CPT). The sensitivity of each modality when specificity is held greater than 90% was as follows: warm = 78%, cold = 77%, which was highly specific for detection of peripheral neuropathy by assessing thermal perception threshold. Another study done by V Viswanathan *et al*⁷, suggest that Tip-therm appears to be an ideal device for temperature testing with a high sensitivity and specificity and ideal for early detection of peripheral neuropathy. Another study by Bertelsmann *et al*⁸ used thermo stimulator to assess cutaneous thermal perception at the

foot dorsum and hand dorsum suggestive of early detection and effect of longer duration of diabetes which increases risk of developing peripheral neuropathy.

CONCLUSION

In our study, it was found that if duration of diabetes was 1-3 years, and patient's age less than 50 years, development of neuropathy with mild grade according to cold and hot perception threshold value by thermal perception sensitometer and if duration of diabetes more than 3 years and patient's age is more than 50 years then development of neuropathy with moderate grade according to cold and hot perception threshold value by thermal perception sensitometer. Assessment of Diabetic Neuropathy by these method gives us early diagnosis of Diabetic Neuropathy so it may be helpful in treatment of Diabetes Mellitus, as well as Complication related with Diabetes Mellitus are to be prevented.

REFERENCES

1. Moses manual on Diabetes Mellitus, Editors: Prof. Sidhartha Das and CR Anand Moses page no. 36 to 43
2. Textbook of Diabetes Vol- 2, edited by John pick up and Gareth Williams. Chapter no. 50, Clinical features of diabetic neuropathy, Page no. 50.3
3. Thomas PK, Tomlinson DR. Diabetic and hypoglycemic neuropathy. In: Dyck PJ, Thomas PK, Griffin JW, Low PA, Podulso (Eds.), Peripheral neuropathy. WB Saunders, Philadelphia 1993; 1219-1250.
4. Digital Thermal perception sensitometer, user manual, Diabetic Foot Care India. Page no. 2-7
5. G. Ponirakis *et al* Nerve Check: An Inexpensive Quantitative Sensory Testing Device for Patients with Diabetic Neuropathy, PMC 2017 Mar 1, online journal.
6. Vinik Al *et al*, Maser RE, Mitchell BD, diabetic autonomic neuropathy (technical review). Diabetes care 2003;26:1553-1579.
7. V Viswanathan *et al*, early recognition of diabetic neuropathy: Evaluation of a simple outpatient procedure using thermal perception, Postgrad. Med. J. 2002;78;541-5
8. Bertelsmann FW, Heismann JJ, Weber EJ, Van der Veen EA, Schouten JA. Thermal discrimination thresholds in normal subjects and in patients with diabetic neuropathy. J Neurol Neurosurg Psychiatr 1985;48:686-90

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