Study of prevalence of diabetic peripheral neuropathy and associated risk factors in type 2 diabetes patients attending a diabetes care centre in Maharashtra

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Abstract   **Background:** Prevalence of type 2 diabetes in south East Asia has reached epidemic proportions in last few decades. Diabetic neuropathy is the most common complication of diabetes mellitus (DM) **Aims and Objectives:** Present study was done to estimate prevalence of diabetic peripheral neuropathy and associated risk factors in patients visiting a diabetes care centre in Maharashtra. **Material and Methods:** 99 patients coming to diabetes care centre in the duration of 1 month were selected for present study. Detailed clinical examination and meticulous examination with the help of Bio-Thesiometer was performed by single observer. Diabetic peripheral neuropathy was diagnosed when VFT (vibration frequency threshold) was greater than 15mv. **Results and Conclusion:** overall prevalence of diabetic peripheral neuropathy was found to be 30.3% with no significant difference in gender and age of the patients. Significant rise in the prevalence is seen with increasing duration of diabetes.
Keywords: Bio-thesiometer, Diabetic Peripheral Neuropathy, Duration of Diabetes mellitus.

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INTRODUCTION

Prevalence of type 2 diabetes in south East Asia has reached epidemic proportions in last few decades. According to recent estimate by the International Diabetes Federation (IDF) South East-Asia is having more than 72 million adults with diabetes in 2013 and is expected to exceed 123 million in 2035. Out of 72 million diabetics 95% of people have type 2 diabetes. In India Disease currently affects 65.1 million people[1]. Diabetic neuropathy is one of the most common complications of diabetes mellitus. Diabetic neuropathy is the most common neuropathy worldwide. Most of the patients with clinical diabetic neuropathy have a distal symmetric sensory neuropathy. The disease is associated with wide range of clinical manifestations like tingling numbness, pain, trophic changes in the feet. Patients suffering from diabetic sensory neuropathy are more prone to develop ulcer in the foot due to painless trauma or burns. Accumulation of polyols, advanced glycation end products, damage to mitochondria of sensory fibers and oxidative stress is responsible for development of peripheral neuropathy[2,3,4]. The sensory action potential is altered only after involvement of larger myelinated fibers, which is often a late event. Hence early detection of neuropathy is of crucial importance in urban as well as

rural population to prevent adverse outcomes. Various studies are being performed in different regions of India but there are very few studies available to define burden of complications of diabetes in the region of Maharashtra. Present study was done to know prevalence of diabetic neuropathy and to study associated risk factors in patients visiting a diabetes care center in Maharashtra.

MATERIAL AND METHODS

The study comprised of 99 consecutive type 2 diabetes patients who voluntarily came to diabetes care center for routine visit. The study was approved by the ethical committee. Written and informed consent were taken. Detailed history and clinical examination was done. Patients were selected for Biothesiometry with following inclusion and exclusion criteria Inclusion criteria for present study: Type 2 diabetes: diagnosis was done depending on the diagnostic criteria laid down by WHO

Table 1: Criteria for the diagnosis of diabetes
A1C ≥ 6.5%. The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay.*
OR
FPG ≥ 126 mg/dl (7.0 mmol/l). Fasting is defined as no caloric intake for at least 8 h.*
OR
2-h plasma glucose ≥ 200 mg/dl (11.1 mmol/l) during an OGTT. The test should be performed as described by the World Health Organization, using a glucose load   containing the equivalent of 75 g anhydrous glucose dissolved in water.*
OR
In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥ 200 mg/dl (11.1 mmol/l)

*In the absence of unequivocal hyperglycemia, result should be confirmed by repeat testing

Exclusion criteria for present study

1. Diabetic nephropathy: all patient having serum creatinine >1.5 mg/dl and/ or proteinuria> 500mg/dl in absence of urinary tract infection were excluded from study.
2. Patients were assessed for Vitamin B12 deficiency folate deficiency and they were excluded from study
3. Poisoning: all patients with history of accidental or intentional consumption of poisonous substances were excluded from study
4. Cancer: all patient suffering from any malignancy or who received any chemotherapy or radiotherapy were excluded from present study
5. Drugs: all patient with history of drugs producing neuropathy were excluded from present study
6. Hypothyroidism: all patients with TSH>4.5 were excluded from study
7. History of injury: all patients with history of nerve injury were excluded from study.
8. All smokers and alcoholics were excluded from study.

All patients were assessed by Bio-Thesiometer (Dhansai laboratory Goregaon East Mumbai, Maharashtra, India.) It is essentially an "electrical tuning fork" whose amplitude can be set to any predetermined level or whose amplitude may be gradually increased until the threshold of vibratory sensation is reached. All subjects were asked to remove shoes and socks and lie down on couch for 5min in supine position. Temperature in the room was kept constant at 25 C^0 with the help of air conditioner .the biothesiometer factor which vibrates at 100Hz with an

amplitude proportional to square of the applied voltage was applied perpendicular to the test site with constant and firm pressure subjects were initially familiarized with the sensation by holding tactor against the palmar surface.VPT was then estimated at distal plantar surface of right great toe voltage was slowly increased at the rate of 1v/s and VPT was defined at the moment when subject first felt the vibration the voltage at which this occurred was recorded. Three further reading at each sites were recorded neuropathy was diagnosed when the VPT at great toe exceeded >15 v.

STATISTICAL ANALYSIS AND RESULT

Data obtained was codified and entered into a computer and analyzed using SPSS software. Appropriate statistical test were applied like Chi square test were used to compare frequencies and t test were used to compare means Chi-square for trend is used to study association between two variables. Out of 99 Type 2 diabetes patients 30 patients had evidence of diabetic neuropathy (Neuropathy group n=30) and 69 patients had no evidence of neuropathy (Non Neuropathy group n =69) overall prevalence of diabetic neuropathy in study population was 30.3%.

Comparison between Duration of diabetes and Diabetic Neuropathy

Mean duration of diabetes in Non-neuropathy group patients and Neuropathy group patients were 8.37±2.16 and 3.55±2.13 respectively. Prevalence of neuropathy was more in patients with longer duration of diabetes and the difference was statistically significant (p<0.00001). Fig.1 and table 3 shows prevalence of neuropathy in relation to duration of diabetes. 1.96% of patients with

duration of diabetes $\leq$ 4 years had neuropathy which increased to 44.82% in those with duration of diabetes 5 to 8 years which. Even higher prevalence (84.21%0 was found in those with duration of diabetes $\geq$ 9 years (trend Chi-square, 46, p< 0.00001)

Table 2: Comparison between Neuropathy & Duration of Diabetes (in Years)

Neuropathy	Mean±Sd	T-Value	P-Value
Yes	8.37±2.16	10.3158	0.0000 Hs
No	3.55±2.13		

Table 3: Association between duration of diabetes and Neuropathy

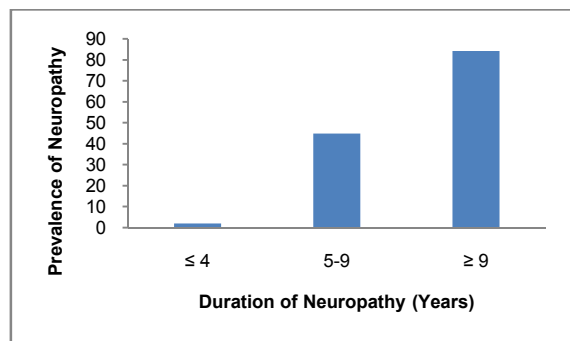| Duration of DM (Yrs)	Neuropathy group	Non-neuropathy group	Chi-Square test for trend	P-Value
$\leq$ 4	1(1.96)	50(98.04)	46.00	0.0000 HS
5-8	13(44.82)	16(55.18)		
$\geq$ 9	16(84.21)	3(15.79)		

Figure 1: Prevalance of neuropathy according to duration of diabetes,trend Chi-square= 46 , p<0.0001

Comparison between diabetic Neuropathy and Age of patients

Mean age of patient in Neuropathy group and Non-neuropathy group were 52.13±9.83 and 52.8±9.55 respectively. No correlation was found between age of the patients and development of Diabetic neuropathy. 23.52% of patient with age $\leq$ 40 years had neuropathy prevalence increased to 43.47% in those in the age group of 41 to 50 years and 20 % in patients with age >60 no association was found between age of the patients and development of neuropathy (p=0.5227).

Table 4: Comparison between diabetic Neuropathy and Age of patients

Age (Yrs)	Neuropathy Group	Non-neuropathy group	Chi-Square test for trend	P-Value
$\leq$ 40	4(23.52)	13(76.48)	0.41	0.5227 NS
41-50	10(43.47)	13(56.53)		
51-60	13(29.54)	31(70.46)		
>60	3(20)	12(80)		

Comparison between Neuropathy and Gender of patients

Study population comprised of 63 females and 36 males percentage prevalence of Neuropathy in female gender was 23.80% and for male gender was 41.67%. No correlation was found between occurrence of Neuropathy and gender of patient. Difference in prevalence was statistically insignificant (p=0.062).

Table 5: Comparison between Neuropathy and Gender of patients

Sex	Neuropathy		Total	CHI-square-Value	P-Value
	Yes	NO			
Female	15(23.80%)	48(76.20%)	63	3.4589	0.0629NS
Male	15(41.67%)	21(58.33%)	36		
Total	**30(30.30)**	**69(69.70%)**	**99**		

DISCUSSION

Very few cross-sectional studies are done to know prevalence and associated risk factors of diabetic peripheral neuropathy in the region of Maharashtra this study is one of them. The prevalence of diabetic peripheral neuropathy was found to be 30.3% in the present study. The estimates of diabetic peripheral neuropathy prevalence vary widely from 13% to29.1% in different populations[5-7]. This could be due to differences in genetic predisposition, health care facilities available, age at the time of diagnosis, level of diabetes control. Prevalence of diabetic peripheral neuropathy in present study was 30.1% which is higher than studies previously done[6]. The higher prevalence could be due to inadequate health care facilities available, poor health education and awareness regarding dietary habits and exercise. The study confirms duration of diabetes as risk factor for development of diabetic peripheral neuropathy. In contradiction to study done by Pradeep R et al[6] which showed statistically significant association between age of the patient and development of diabetic peripheral neuropathy (p<0.0001) present study has shown no association between age of the patient and development of diabetic peripheral neuropathy (p= 0.75). No association was found between gender of patients and development of diabetic peripheral neuropathy which is comparable to other studies[6,7]

CONCLUSION

Prevalence of diabetic peripheral neuropathy was 30.3% with no significant difference in gender and age of the patients. Significant rise in the prevalence is seen with increasing duration of diabetes. This necessitates

intensification of preventive and therapeutic interventions to prevent diabetic neuropathy related complications in the study population.

REFERENCES
1. Guariguata, L., Whiting, D.R., Beagley, J., Linnenkamp, U., Hambleton, I., Cho, N.H. et al.Global estimates of diabetes prevalence for 2013 and projections for 2035. Diabetes Res Clin Pract. 2014; 103: 137–149
2. Llewelyn JG et al. (2005) Diabetic neuropathies. In Peripheral Neuropathy, vol 2, 1951-1991 (Eds Dyck PJ and Thomas PK) Philadelphia: Elsevier Saunders
3. Leinninger GM et al. (2006) Mechanisms of disease: mitochondria as new therapeutic targets in diabetic neuropathy. Nat Clin Pract Neurol 2: 620-628
4. King RH (2001) The role of glycation in the pathogenesis of diabetic polyneuropathy. Mol Pathol 54: 400-408
5. Rani PK, Raman R, Rachapalli SR, et al. Prevalence and risk factors for severity of diabetic neuropathy in type 2 diabetes mellitus. Indian J Med Sci. 2010; 64:51–57.
6. Pradeepa R, Rema M, Vignesh J, et al. Prevalence and risk factors for diabetic neuropathy in an urban south Indian population: the Chennai Urban Rural Epidemiology Study (CURES-55) Diabet Med. 2008;25:407–412.
7. Dipika Bansal,1, Kapil Gudala,1 Harini Muthyala,1 Hari Prasad Esam,1 Ramya Nayakallu,1 andAnil Bhansali2 Prevalence and risk factors of development of peripheral diabetic neuropathy in type 2 diabetes mellitus in a tertiary care setting J Diabetes Investig. 2014 Nov; 5(6): 714–721.