International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 05, 2020
ISSN: 1475-7192

Prevalence of Diabetic Peripheral Neuropathy among Type I Diabetes – An Observational Study

C.V. Senthilnathan*, Jibi Paul, M. Manoj Abraham and
M. Sasirekha

Abstract---

Objective:

The objective of this study is to find out the prevalance of diabetic peripheral neuropathy (DPN) among diabetics in Chennai.

Background of the Study: *DPN is the most common chronic and long term complications of diabetes mellitus and is considered as leading cause of mortality and morbidity rate, causing huge economic burden to the government. It is one of the serious microvascular complications of DM which has been diagnosed in 20-50% of diabetic population.*

Methodology: *This is an cross sectional study with 100 patients selected by simple random sampling method. Those who were aged more than 30 years and diagnosed positive for type I diabetes atleast 1year duration with random blood sugar >200 mg/dl as per Indian council of medical research guidelines 2005. Those who are willing to participate, who had regular follow up visits for atleast 6 months were included in this study. The exclusion criteria are who have type 1 diabetes, gestational DM and maturity onset diabetes of the young, significant musculoskeletal disorder in lower limb, who underwent amputation of whole foot, below knee and above knee amputation, peripheral neuropathy due to any other cause. The prevalance of DPN among diabetics in chennai will be found out. Pre and post test done using DN4, S-LAANS, MNSI questionnaire.*

Result: *The study was conducted in type 1 diabetes patient following results were obtained The prevalence was found using DN4, MNSI and S-LANSS questionnaire. The mean of DN4 was found to be 4.0800 and its significant with $p<0.05$. The mean of MNSI is about 7.62000 with significance $p<0.05$ and mean value of S-LANSS is 9.0600 with significance of $p<0.05$. The overall prevalance of diabetic peripheral nueropathy was found to be 30%.*

Keywords--- *Diabetes, Peripheral Neuropathy, DN4, S-LAANS, MNSI.*

I. INTRODUCTION

Diabetes Mellitus is a metabolic disorder of multiple aetiology. It is characterized by chronic hyperglycemia with disturbance of carbohydrates, fat and protein metabolism which results from defects in insulin secretion, insulin action or both. The effects leads to long term damage, dysfunction and failure of various organs[1]. The international diabetes federation has prescribed that the number of people with diabetes in southeast Asia region which was 71.4 million in 2011 and will increase 12.9 million by 2030[2] and 60% of the world's are diabetic population resides in

C.V. Senthilnathan, Professor, Faculty of Physiotherapy, Dr. M.G.R. Educational & Research Institute University, Chennai, Tamil Nadu, India.*

Jibi Paul, Professor, Faculty of Physiotherapy, Dr. M.G.R. Educational & Research Institute University, Chennai, Tamil Nadu, India.

M. Manoj Abraham, Principal, KG College of Physiotherapy (Affiliated to The Tamil Nadu Dr. MGR Medical University), Tamil Nadu, India

M. Sasirekha, Professor, HOD Anatomy, ACS Medical College, and Hospital, Chennai, Tamil Nadu, India.

DOI: 10.37200/IJPR/V24I5/PR2020650
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

Asia[3]. India has one of the highest prevalence of type 2 diabetes Mellitus in the world[4]. Diabetes is the 5th leading cause for mortality which accounts for 3.8 million deaths annually[5]. In 2030 diabetes will be 7th leading cause for death as predicted by world health organization[6]. Long term elevation in blood glucose level leads to micro and macro vascular complications such as heart disease, stroke, blindness and kidney disease[7].The microvascular complications includes diabetic retinopathy, diabetic nephropathy and diabetic neuropathy. The macro vascular complications includes stroke, transient ischemic attack, coronary heart disease and peripheral vascular disease[8]. By far, the most common is Diabetic Peripheral Neuropathy(DPN),which accounts for 75% of diabetic neuropathy[9]. DPN is the most common chronic and long term complications of diabetes mellitus and which is considered as leading huge economic burden to the government[10]. DPN is one of the serious micro vascular complications of both type 1 and type 2 diabetes mellitus which has been diagnosed in 20-50% of diabetic population[9].

Approximately 15% of people with diabetes develop foot ulcers once in their lifetimes in which 60-70% are neuropathic in origin[11]. This increase is due to chronicity of disease and poor glycemic control/. 15-25% of diabetic neuropathy are painful[12]. A significant proportion of patients with peripheral neuropathy have no underlying cause. Multiple studies have implicated the metabolic syndrome as a potential cause[13]. DPN is a progressive degeneration of peripheral nerves from distal to proximal leads to wide range of neuropathic symptoms such as numbness, burning, prickling, tingling, sharp pain or cramps, extreme sensitivity to touch, allodynia and loss of balance and coordination[14]. The primary symptoms of diabetic peripheral neuropathy is abnormal or loss of sensation in toes, which extends to involve feet and legs in stocking distribution[15].The patient with DPN has limitations in activity of daily living. Because of;’] decreased sensation or weakness and pain particularly in hands and feet[16].

High risk individual are those above 45 years, hypertensive people, obesity, family history of diabetes, dislipidemia. Adverse effects of peripheral neuropathy are due to poor foot hygiene, improper foot wear and frequent barefoot walking. In such circumstance, complications of foot infection and gangrene are common cause of hospital admission[].

Painful diabetic peripheral neuropathy has a significant impact on patient's quality of life, as it is accompanied by depression, anxiety and sleep disturbance[17]. On the other hand this increase morbidity and mortality, where society undergoes extreme burden due to health care cost[18]. After macro vascular disease and diabetic neuropathy, DPN is ranked third among the complications of DM which cause great life time expenditure of resources. But early detection and efficient glucose control leads to prevention of clinical neuropathy and its associated complications[19].

The findings of S-LANSS score confirmed that S-LANSS scale as a valid and reliable self – report instrument for identifying neuropathic pain and is also acceptable for use in postal survey research[20]. An analysis for MNSI confirm that MNSI is a simple, non-invasive and valid measure of distal symmetrical peripheral neuropathy when compared with gold standard diagnostic testing[21]. A research on DN4 questionnaire concludes Turkish version of DN4 is reliable, valid, short and quick screening tool in identification of neuropathic pain patients[22].

DOI: 10.37200/IJPR/V24I5/PR2020650
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

II. METHODOLOGY

This cross sectional study was carried out in ACS medical college -velapanchavadi over the period of 3 months using simple random sampling method. A total of 100 patients were randomly selected. Those who were aged more than 30 years,diagnosed positive for type I diabetes atleast 1 year duration with random blood sugar more than 200 mg/dl or fasting blood sugar more than 126 mg/dl as per Indian Council of medical research guidelines 2005,those who had regular follow up visits for atleast 6 months and who are willing to participate are included in this study.The exclusion criteria are those who having type 1 diabetes, gestational DM, maturity onset diabetes of the young, significant musculoskeletal disorder in lower limb,who underwent amputation of whole foot,below knee, above knee, peripheral neuropathy due to any other known cause.

The samples were fully explained about the study and the questionnaire to be filled. they were asked to fill the consent form in acceptance of participation in the study,which is duly signed by the samples.

III. PROCEDURE

Written informed consent was obtained from all study participants. Information regarding anthropometric measurement, blood pressure was collected. Additional details about investigations, complications was obtained from patients records. Data was collected from 100 study subjects. Peripheral neuropathy was assessed using LANSS, MNSI and DN4 questionnaire.

MNSI (michigan neuropathy screening instrument) has two components. First component is subjective and consist of peripheral neuropathy symptoms rated 15 self- administered questions. A higher score (total score 13) indicates higher neuropathic symptoms. The second component of the MNSI is a brief physical examination involving a) inspection of the feet b) semi- quantitative assessment of vibration sensation at the dorsum of great toe c) grading of ankle reflexes and d) semmes-weinstein monofilament testing. Patients are considered neuropathic if they screen positive (>_ 2.5 on a 10 point scale) on the second component of MNSI.

LANSS (the leeds assessment of neuropathic symptoms and signs) pain scale used to determine whether the nerves carrying pain signals are working or not. This also determines quality of pain, skin appearance, temperaturw and sensitivity. It also includes test for examining allodynia and pin prick threshold. Total score ranges from o to 24 where a score >_12 indicated presence of neuropathic pain.

DN4 (neuropathic pain diagnostic questionnaire) consist of four question 1 and 2 which were based on the interview of the patient, 3 and 4 based on standardized clinical examination. Question 1 have five Items related to pain, question 2 have four items related to parasthesia or dysesthesia, question 3 has four items related to sensory deficit and question 4 has four items related to evoked pain

IV. DATA ANALYSIS

DN4 (DouleurNeuropathique – 4):

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
DN4	100	4.0800	2.40236	.24024

DOI: 10.37200/IJPR/V24I5/PR2020650
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
DN4	16.983	99	.000	4.08000	3.6033	4.5567

Test Distribution is Normal ($p<0.05$)

MNSI (Michigan Neuropathy Screening Instrumentation):

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
MNSI	100	7.6200	4.64938	.46494

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
MNSI	16.389	99	.000	7.62000	6.6975	8.5425

Test Distribution is Normal ($p<0.05$)

S-LANSS (Leeds Assessment of Neuropathic Symptoms and Signs):

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
LANSS	100	9.0600	6.53633	.65363

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
LANSS	13.861	99	.000	9.06000	7.7630	10.3570

Test Distribution is Normal ($p<0.05$)

V. RESULT

The study was conducted in type 1 diabetes patient following results were obtained: The prevalence was found using DN4, MNSI and S-LANSS questionnaire. The mean of DN4 was found to be 4.0800 and its significant with $p<0.05$. The mean of MNSI is about 7.62000 with significance $p<0.05$ and mean value of S-LANSS is 9.0600 with significance of $p<0.05$. The overall prevalance of diabetic peripheralnueropathy was found to be 30%.

VI. CONCLUSION

This study concluded that prevalance of DPN among diabetic population is about 30%. This study also highlighted severity of pain and difficulties in ADL in diabetic patients. This study formed basis for future reasearches

VII. DISCUSSION

Maryam khan Kundi et al., reported that the study showed the severity of DPN to be mild with a frequency of 11.1 % moderate with a frequency of 22.0% and senesce with a frequency of 6.5 % respectively and diabetic

DOI: 10.37200/IJPR/V24I5/PR2020650
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

peripheral neuropathy is present in majority of the diabetic population of Hayatabad Peshawar [23]. Ahlam A. Amour et al reported that DPN is widely prevalent in our setting occurring in more than hay of the patients attending the diabetic clinic with more than a half experiencing the severe from[24]. Department of non-communicable diseases et al., reported that DPN was present among 21.1 % of T2 Dm subjects in Bangladesh both men & women irrespective of unborn or rural origin suffer from neuropathy which is almost similar to a study conducted among urban diabetic population by kjersti M or kridi in Bangladesh women are more suffering from DPN compare to men for their working pattern like almost all the women respondent were housemate[25]. Twanakisozi et al., reported that 29.4% of recently diagnosed patient with diabetes had DPN and there is an urgent need to routinely screen for diabetes among the elderly population and examine newly diagnosed diabetic patients irrespective of their clinical symptoms[26].

Nahlakhawaja et al reported that the overall prevalence of DPN based on MNSI was 39.5% and peripheral neuropathy is highly prevalent among Jordanian patients with type 2 diabetes mellitus[27].Gill HK et al., reported that the prevalence of DPN was 29.2% and detected a high frequency of DPN in newly diagnosed patients with T2DM[28]. Javadkiani MD et al., reported that the prevalence of DPN in our studied

population was relatively high prevalence (45.7%)[29].MamtaJaiswal et al., reported that the prevalence of DPN was 79 in youth with 71D and 22% in youth with T2D[30].S jambart et al ; reported that the current study was desigrad to evaluate the prevalence of painful DPN among patients with type 1 or type 2 diabetes attending outpatient clinic in the middle east region in this seething,53.7% of diabetic patient met the criteria for painful DPN[31].Prasad katulanda et al., reported that the prevalence of DPN acceding to the DNS and the TCSS scores was 48.1 % and 24.0% respectively[32]

Aktarreyhanoghi D et al., reported that the MNA1 – TR is a valid and reliable method for evaluating peripheral neuropathy in Turkish speaking societies [33]. Yuka matsuki et al., reported that the reliability and validation testing revealed that the Japanese version of questionnaire for discriminating between neuropathic and nociceptive pain in a Japanese sample[34].Rabiakoc et al., reported that the Turkish version of S – LANSS is a reliable and valid differential diagnostic measure of neuropathic pain in chronic pain patients[35].

DPN is a common complication of DM. It is about prevalancr of DPN among chennai in A.C.S medical college. The prevalance of DPN by DN4, S-LANSS, and MNSI is about 30%. Descriptive statistics were calculated and its presented as mean and standard deviatiob. The scale shows a good significance of <p0.05. The study is among referral hospital setting so the results are not generalized to the whole chennai. The other limitations of study are small sample and study duration. Further researches were required for better knowing the influence of DPN in diabetic population.

REFERENCES

[1] WHO Expert committee on diabetes mellitus. *Second reprt. Geneva: who, 1980. Technical report series* 646.

[2] Hamad Almuhannad Et Al. Diabetic Neuropathy and Painful Diabetic Neuropathy: Cinderella Complications *in South East Asia.* - Vol.68, No.1, January2018

[3] Irshad Ahmad Et Al. Balance Training In Diabetic Peripheral Neuropathy. *JSM Diabetol Manag* 2(1): 1002 (2017)

DOI: 10.37200/IJPR/V24I5/PR2020650
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

[4] Surendra Darivemula Et Al. Prevalence and its Associated Determinants of Diabetic Peripheral Neuropathy (DPN) In Individuals Having Type-2 Diabetes Mellitus In Rural South India. *Indian J Community Med.* 2019 Apr-Jun; 44(2): 88–91.

[5] Ranjit Mohan Anjana Et Al.Causes And Predictors Of Mortality In Asian Indians With And Without Diabetes–10 Year Follow-Up of the Chennai Urban Rural Epidemiology Study (CURES - 150). *Plos One.* 2018; 13(7): E0197376

[6] Iftikhar Haider Naqvi Et Al Peripheral Neuropathy and Vasculopathy; Frequency and Associated Risk Factors In Newly Diagnosed Treatment Naive Type 2 Diabetes. Vol.08 No.05(2018), Article ID:87389

[7] AsmatUllah Et Al Diabetes Mellitus and Oxidative Stress—A Concise Review.

[8] Meenakshisundarisubramaniyan. Natarajan et al awareness of diabetes and its complications among diabetes patients and their care takers attending a tertiary care hospital in chennai suburban area. *J. Evolution med. Dent. Sci./eissn-* 2278-4802, pissn- 2278-4748/ vol. 8/ issue 23/ june 10, 2019.

[9] Kelsey Juster-Switlyk and A. Gordon Smith. Updates in Diabetic Peripheral Neuropathy. *Version 1. F1000Res.* 2016; 5: F1000 Faculty Rev-738.

[10] Maryam Khan Kundi Et Al Prevalence and Severity of Diabetic Peripheral Neuropathy & Its Impact On Quality Of Life Of Diabetics In Hayatabad. *Int. J. Pathol.* 2018;16(4):160-164

[11] Shrestha HK, Katwal PC. Prevalence and Risk Factors of Diabetic Peripheral Neuropathy in T2DM Patient Presenting To Community Hospital In Nepal. VOL. 15 | NO. 2 | ISSUE 58 | APRIL-JUNE 2017

[12] Casandra J Rosenberg Et Al (2014) Treatment of Painful Diabetic Peripheral Nueropathy.

[13] Brian C. Callaghan Et Al Diabetes And Obesity Are The Main Metabolic Drivers of Peripheral Neuropathy. *Annals of Clinical And Translational Neurology* 2018; 5(4): 397–405

[14] Qi Pan Et Al Prevalence of and Risk Factors For Peripheral Neuropathy In Chinese Patients With Diabetes: A Multicenter Cross-Sectional Study. *Front. Endocrinol.,* 05 November 2018 |

[15] TwahaKisozi Et Al Prevalence, Severity And Factors Associated With Peripheral Neuropathy Among Newly Diagnosed Diabetic Patients Attending Mulago Hospital: A Cross-Sectional Study. *African Health Sciences* Vol 17 Issue 2, June, 2017.

[16] MiMiThet Mon Win Et Al. Prevalence of Peripheral Neuropathy and its Impact on Activities of Daily Living In People With Type 2 Diabetes.

[17] Georgios Ponirakis Et Al. Prevalence and Risk Factors for Painful Diabetic Neuropathy in Secondary Healthcare In Qatar. *J Diabetes Investig* Vol. 10 No. 6 November 2019.

[18] Sinan ma al-mahmood et al. Factors influencing the severity of pain in patients with peripheral diabetic neuropathy. Vol 10, issue 10, 2017.

[19] Maryam Khan Kundi Et Al Prevalence and Severity of Diabetic Peripheral Neuropathy & Its Impact On Quality Of Life Of Diabetics In Hayatabad, Peshawar. *Int. J. Pathol.* 2018; 16(4):160-164.

[20] Singh, Shilpi, et al. "Hypoglycemic Profile of Gymnemic Acid and Glycyrrhizic Acid on High Fructose Diet Related Obesity Induced Diabetes." *International Journal of Medicine and Pharmaceutical Science (IJMPS) ISSN (P)* (2016): 2250-0049.

[21] Michael I. Bennett et al., the S-LANSS score for identifying pain of predominantly neuropathic origin:validation for use in clinical and postal research. *The journal of pain*, vol 6, No 3(march),2005:pp 149-158.

[22] Akinsola, V. O., and T. O. Oluyo. "A note on the divergence of the numerical solution of the mathematical model for the burden of diabetes and its complications using euler method." *Int J Math ComputAppl Res* 5.3 (2015): 93-100.

[23] W.H.Herman et al., Use of the Michigan neuropathy screening instrument as a measure of distal symmetrical peripheral neuropathy in type 1 diabetes: results from the diabetes control and complications trial. Epidermiology of diabetes interventions and complications. *diabet med.,* 2012 jul;29(7):937-944.

[24] Rao, T. INDIRA, and HONGSANDRA RAMARAO Nagendra. "The effect of active and silent music interventions on patients with type 2 diabetes measured with electron photonic imaging technique." *Int J Humanit Soc Sci* 3 (2014): 7-14.

[25] Isin Unal -Cevik et al., A comparison of the DN4 and LANSS questionnaires in the assessment of neuropathic pain: validity and reliability of the Turkish version of DN4. *The journal of pain,* vol 11, No 11 (November), 2010: pp 1129-1135.

[26] Akinsola, V. O., and T. O. Oluyo."Mathematical model of the complications and control of diabetes mellitus." *Int J Math Comput Appl Res* 4.5 (2014): 1-14.

[27] Maryam khan kundi et al., prevalence and severity of diabetic peripheral neuropathy and its impact on quality of life of diabetics in Hayatabad, Peshawar, *Int. j. patjol.* 2018; 16(4):160-164.

DOI: 10.37200/IJPR/V24I5/PR2020650
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020

[28] Ahlam. A. Amour et al., prevalence, pattern and factors associated with peripheral neuropathies among diabetic patient at teritary hospital in the Kilimanjaro region: descriptive cross sectional study from North eastern tanzania. Volume 2019, article ID 5404781.

[29] Ajani, A. K. I. N. L. O. L. U., and BAKARE OLALEKAN Olanrewaju. "Avocado pear fruits and leaves aqueous extracts inhibit α-amylase, α-glucosidase and snp induced lipid peroxidation–an insight into mechanisms involve in management of type 2 diabetes." *Int J Appl Nat Sci, 3, 21* 34 (2014).

[30] Department of non-communicable diseases et al., prevalence and determinants of pheripheral neuropathy among urban and rural Bangladeshi type 2 diabetic subjects. *Annals of neurology* 82, s72-s72, 2017.

[31] Twahakisozi et al., prevalence,severity and factors associated with peripheral Neuropathy among newly diagnosed diabetic patients attending Mulagohospital:a cross sectional study. *African health sciences* vol 17 issue 2, june, 2017.

[32] Rao, YELURI SESHAGIRI, and VANAMALI DHARMA RAO."Prevalence of Periodontitis among patients with Type-2 Diabetes Mellitus." *Int J Gen Med Phrar, 5 (2), 15* 22 (2016).

[33] Nahlakhawaja et al., The prevalence and risk factors of peripheral neuropathy among patients with type 2 diabetes mellitus; the case of jordan. ISSN: 1758-5996.

[34] Gill HK et al., A prospective study of prevalence and association of pheripheral neuropathy in Indian patients with newly diagnosed type 2 diabetes mellitus. *Journal of post graduate medicine* july 2014 vol 60 issue 3.

[35] Javadkiani MD et al., The prevalence and assocaiated risk factors of peripheral diabetic neuropathy in Hamedan, Iran. *Arch Iran med.* 2013;16(1):17-19.

[36] Mamta Jaiswal et al., prevalence of and risk factors for diabetic peripheral neuropathy in youth with type 1 and type 2 diabetes: SEARCH for diabetes in youth study. *Diabetes care* 2017; 40: 1226-1232.

[37] S Jambart et al., prevalence of painful peripheral neuropathy among patients with diabetes mellitus in the middle east region. *The journal of international medical research* 2011; 39: 366-377.

[38] EBRAHIM, SAMIRA MUHAMMED, UTOOR TALIB JASSIM, and DOAA MOHAMMED BAJI. "A study to assess the attitude and practice of diabetic patient towards self-administration of insulin in basra city, Iraq." *International Journal of General Medicine and Pharmacy (IJGMP)* 3.4 (2014): 65-74.

[39] Prasad katulanda et al., The prevalence, patterns and predictors of diabetic peripheral neuropathy in a developing country. doi:1186/1758-5996-4-21.

[40] AktarReyhanioglu D et al., Turkish validity and reliability of the michigan neuropathy screening instruments. *Turk J med sci.*, 2020 mar 17.doi:10.3906/sag-1906-63.

[41] Yuka Matsuki et al., Reliability and validity of the Japanese translation of the DN4 diagnostic questionnaire in patients with neuropathic pain. https://doi.org/10.1007/S00540-018-2495-7.

[42] Rabiakoc et al., validity and reliability of the Turkish self-administered leeds assessment of neuropathic symptoms and signs (SLAANS) \questionnaire. https://doi.org/ 10.1016/ j.nrleng. 2016.10.003.

DOI: 10.37200/IJPR/V24I5/PR2020650
Received: 14 Apr 2020 | Revised: 22 Apr 2020 | Accepted: 12 May 2020