



## Awareness Level of Diabetic Neuropathy and Its Complications among Bengaluru City Population

Sudhakara P M, Dr Deepak Tiwari, Dr Prem Kumar. B. N

*PhD Scholar, NIMS University Rajasthan, Jaipur*

*Professor, Department of Emergency Medicine, NIMS University*

*, Associate Professor, Kempegowda Institute of Physiotherapy*

Date of Submission: 15-11-2023

Date of Acceptance: 25-11-2023

### ABSTRACT

Diabetes mellitus (DM) has become one of the most prevalent medical conditions worldwide. Despite the fact that DM affects a substantial proportion of the Saudi population over the age of 30, the general level of awareness of diabetic neuropathy has been reported to be poor in south Indian population. To determine the level of awareness of diabetic neuropathy and its complications among the population of Bengaluru City. This cross-sectional study evaluated the level of awareness of diabetic neuropathy among the population of Bengaluru City using an online pre-designed self-administered questionnaire. Of 486 participants enrolled in the study, 57.2% were females and 42.8% were males. In addition, our study showed that awareness of diabetic neuropathy and its complications among the population of Bengaluru was almost non-existent, with 83.9% of the participants having never heard of diabetic neuropathy in their life. The level of awareness of this disorder was scored as 7.65 1.01 out of a total of 18, even though the educational level of the participants was excellent, and 61.3% of them had a university degree and above. This is the first report demonstrating the knowledge of diabetic neuropathy among residents of Bengaluru City. Regardless of educational level, the knowledge of diabetic neuropathy was poor, necessitating greater efforts to increase public awareness using different approaches and campaigns. This will help in the early detection of such complications and impact the response to different treatment modalities.

**Keywords:** diabetes mellitus, diabetic neuropathy, diabetic complications, level of awareness, Bengaluru

### I. INTRODUCTION

Diabetes mellitus (DM) is one of the most common medical conditions in the world, According to the latest facts and figure provided by International Diabetes Federation, 463 million people were living with diabetes globally and 374

million people are at an increased risk of developing type 2 diabetes mellitus (T2DM) <sup>1</sup>. In India around 77 million people are living with diabetes in 2019 and by 2045 this will rise to 134.2 million <sup>1</sup>. The prevalence of diabetes in South-East Asian Region (SEAR) is 96 million <sup>2</sup>. In India, men with high blood sugar levels are 8.8% and 7.4% in urban and rural regions. In comparison, women with high blood sugar levels are 6.9% and 5.2% in urban and rural regions, respectively Diabetes is responsible for a range of complications including microvascular and macrovascular ramifications In addition, it is associated with a plethora of medical, personal, and social problems. There are two types of DM: type 1 DM is characterized by a lack of insulin production by the pancreas, while type 2 DM (T2DM) is a long-term metabolic condition characterized by high blood sugar, insulin resistance, and insulin insufficiency.<sup>3</sup> Furthermore, diabetic complications are traditionally divided into two major categories: macrovascular complications such as cardiovascular disease, cerebral stroke, and peripheral arterial disease, and microvascular complications such as diabetic retinopathy, nephropathy, and neuropathy.<sup>4</sup> Diabetic Neuropathy is the most common complication of diabetes, which can result in weakness due to muscle atrophy.<sup>5</sup> Globally, approximately 10%-20% of diabetic patients are diagnosed with peripheral neuropathy at the time of their primary diagnosis. According to some studies, the development of diabetic neuropathy is directly proportional to the chronicity of the disease, which means that after five years of developing diabetes, approximately 26% of the patients develop diabetic neuropathy, with this percentage rising to 41% after another five years, and eventually reaching approximately 66% after further progression over the years<sup>6</sup>. In a previous study, 19.9% of diabetic patients were diagnosed with diabetic peripheral neuropathy (DPN) and these patients were older, had diabetes for a longer period, and had a higher incidence of abdominal obesity and hypertension compared to their counterparts without DPN<sup>7</sup>



## II. OBJECTIVES OF THE STUDY:

This study aimed to determine the level of awareness of diabetic neuropathy and its complications among the population of Bengaluru City.

### Subjects and Methods

**Study design:** Cross-sectional.

**Study duration:** December 2021 to February 2022.

**Study settings:** A cross-sectional study was conducted to evaluate the level of awareness of diabetic neuropathy among the population of Bengaluru.

### Sampling and population

**Inclusion criteria:** All residents aged 20 years and above and accepted to participate by clicking (Yes) in the given questionnaire, were included in this study.

**Exclusion criteria:** all residents under the age of 20 years or who refused to participate by clicking (No) in the given questionnaire, were excluded from the analysis.

**Tools and data collection procedure:** All study participants were requested to consent to their approval prior to completing an online pre-

designed self-administered questionnaire. An explanatory statement on how the data is used in this study before their participation was provided.

**Statistical design:** Data was entered through Excel version 16.0.6742.2048 and all statistical analysis was done using Statistical Product and Service Solutions (SPSS) (IBM SPSS Statistics for Windows, Version 23.0, and Armonk, NY). P value <0.05 is considered significant.

**Expected outcomes of the study:** Low level of awareness about diabetic peripheral neuropathy and its complications among the population (including healthy people and diabetic patients) of Bengaluru City.

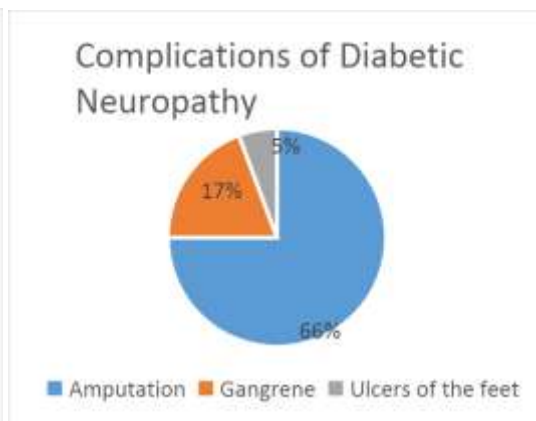
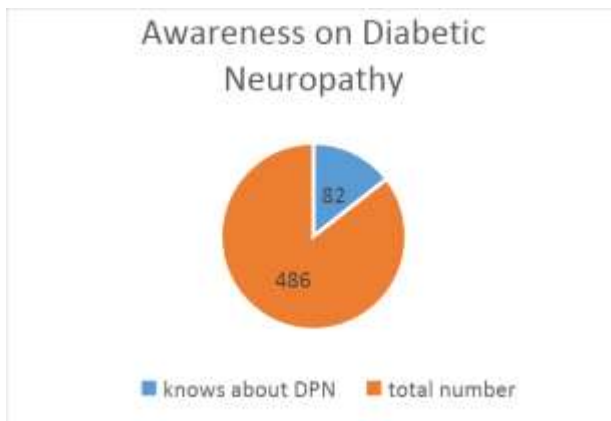
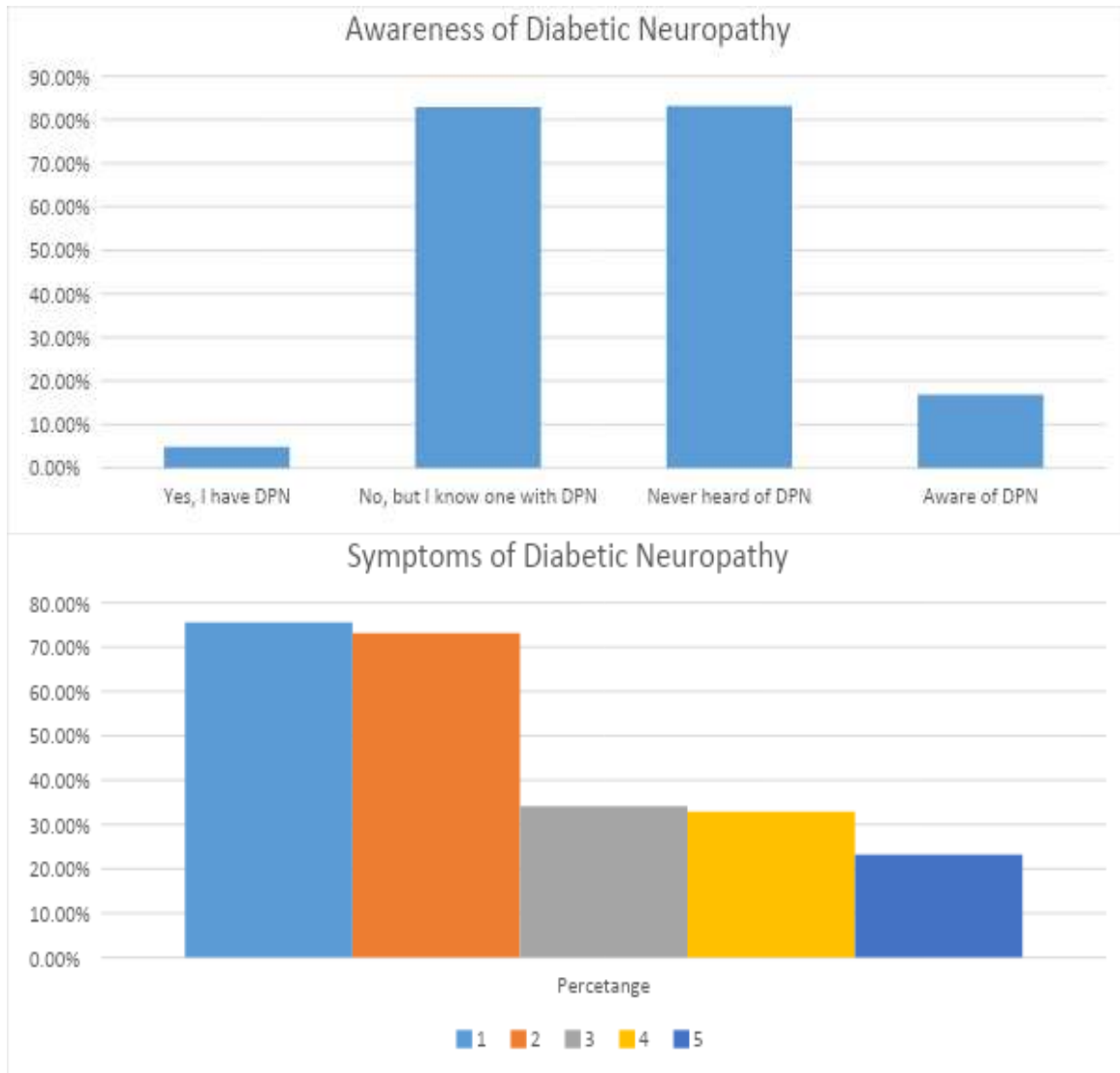
## III. RESULTS

### Characteristics of the Participants

A total of 486 participants were included in this analysis, of which 57.2% were females and 42.8% were males. More than 75% of participants were below the age of 39; specifically, 94.9% were in the age group of 15–39. And 87.9% were single. A large proportion of participants were students (73.9%), with 61.3% having a college degree or higher.

Table 1 Demographic Data of Participants (n=486)

VARIABLE		N (%)
GENDER	Male	208 (42.8)
	Female	278 (57.2)
AGE	15-39	461 (94.9)
	40-59	25 (5.1)
	60 and above	0
SOCIAL STATUS	Single	427 (87.9)
	Married	54 (11.1)
	Divorced/widowed	5 (1)
EDUCATION	Illiterate	3 (0.6)
	Primary/Intermediate school	12 (2.5)
	High school	173 (35.6)
	College and above	298 (61.3)
JOB	Government employee	21 (4.3)
	Private sector employee	24 (4.9)
	Student	359 (73.9)
	Unemployed	62 (16.9)



### Awareness of Diabetic Neuropathy and Its Complications

Only 4.9% of participants had diabetes, while 82.9% of non-diabetics knew someone who had diabetes (Figure 1). While 83.1% of

participants had never heard of diabetic neuropathy, 16.9% were aware of it (Figure 2a). These 16.9% of participants were asked about the most commonly affected body parts by DPN, and their responses were as follows: feet (14.4%),



hands (1.4%), face (0.6%), chest (0.2%), and back (0.2%).

Numbness was the most identified (75.6%) symptom of diabetic neuropathy, followed by weakness or loss of sensation (73.2%), pain (34.1%), muscle weakness or atrophy, unsteadiness while standing or walking (32.9%), and stiff extremities (23.2%) (Figure 2b).

Out of the 82 participants who had heard about diabetic neuropathy, 77 (93.9%) thought that the regular dietary intake of a diabetic patient and

perseverance in treatment contributed to reducing the incidence of diabetic neuropathy, 80 (97.6%) said that diabetic neuropathy can lead to serious complications, and 75 (91.5%) strongly agreed that it is important to take care and protect the feet from injuries and wounds to avoid complications. Among those who had heard of diabetic neuropathy, 66% were aware that amputation is a possible complication of diabetic neuropathy, followed by gangrene (17%), and ulcers of the feet (5%) (Figure 2c).

Table 2 Level of Awareness of Diabetes and Its Complications among Who Heard About Diabetic Neuropathy

	General knowledge	Symptoms	Complications	Overall score
Total possible score	7	6	5	18
Mean $\pm$ SD	03.55 $\pm$ 1.01	02.53 $\pm$ 1.01	1.57 $\pm$ 1.01	7.65 $\pm$ 1.01
Percentage	51%	42%	32%	43%

#### IV. DISCUSSION

The current study revealed that awareness of diabetic neuropathy and its complications among the population of Bengaluru City is poor, since 83.9% of the study participants had never heard of diabetic neuropathy in their lives and only about 16.1% were aware of this condition. The level of awareness of this disorder was low, even though the educational level of the participants in this study was excellent, with 61.3% of participants having a university education or above. One of the traditionally accepted reasons for a community's lack of health awareness is the lack of education. However, despite the spread of education in Bengaluru, awareness of diabetes was low, and one of the reasons may be that people did not acquire awareness and knowledge about the disease through television, news, and media platforms to protect themselves and their families, as their focus was on health education provided by competent authorities and health awareness campaigns. This is consistent with the results of several previous studies, which have indicated that DM patients in Karnataka have poor knowledge of the disease. Shikha Sharma and his colleagues found that Knowledge and awareness about risk factor of diabetes, and its complications is very poor in north India. In a study conducted by viral n shah, 10 patients with DM in Bhavnagar received low scores for knowledge and attitude toward DM. In another survey of DM patients by Al-Maliki et al 11, 49% of the participants gave correct answers to DM-related questions, highlighting a gap in the knowledge of DM in this population.<sup>14-16</sup> On the other hand, our results contradict previous studies from other parts of the world, which have shown an association between higher education levels and increased knowledge of diabetic neuropathy.

In the present study, 42% and 32% of those who had heard of diabetic neuropathy knew its symptoms and complications, respectively. Complications related to diabetic neuropathy can negatively impact the quality of life.<sup>20</sup> "lack of knowledge of diabetic neuropathy complications in south India". This observation could be attributed to the use of open-ended questions in the aforementioned study. Furthermore, the current study revealed that, although the majority of participants had a university education or higher, there was a serious level of ignorance regarding diabetic neuropathy, with 32% of Bengaluru population unaware of its complications.<sup>21</sup> Likewise, awareness of the complications of diabetic neuropathy is low in Pakistan. Ulvi et al (2009) stated that nearly 88% of respondents in their study had no idea of diabetic complications.<sup>22</sup> The longer a person has diabetes, the more likely they are to experience psychological complications, such as depression.<sup>23</sup> Moreover, the demand for efforts to educate the general population about the complications of diabetic neuropathy has also been reported in India and Malaysia.<sup>24</sup> Increasing caregivers' knowledge about these complications is important in decreasing their incidence.<sup>25</sup>

#### V. CONCLUSIONS

This is the first study to evaluate the knowledge of diabetic neuropathy among residents of Bengaluru, a city in south India. Irrespective of educational level, the general knowledge of diabetic neuropathy among participants was poor, necessitating enhanced efforts through widespread campaigns and health awareness programs to increase diabetic neuropathy awareness among residents of Bengaluru. This will help in the early



detection of such complications and impact the response to different treatment modalities.

### REFERENCES

- [1]. Diabetes Facts and Figures. International Diabetes Federation. Available at: <https://www.idf.org/aboutdiabetes/what-is-diabetes/facts-figures.html>. Accessed on 20th April 2020.
- [2]. Patterson CC, Guariguata L, Dahlquist G, Soltesz G, Ogle GD, Silink M. Diabetes in the young – a global view and worldwide estimates of numbers of children with type 1 diabetes. *Diabetes Res Clin Pract* 2014;103(2):161–75.
- [3]. Rujaswini T, Praveen D, Chowdary PR, Aanandhi MV, Shanmugasundaram P. A review on association of serum homocysteine in diabetic neuropathy. *Drug Invention Today*. 2018;10(2):154–156.
- [4]. Callaghan BC, Cheng HT, Stables CL, Smith AL, Feldman EL. Diabetic neuropathy: clinical manifestations and current treatments. *Lancet Neurol*. 2012;11(6):521–534. doi:10.1016/S1474-4422(12)70065-0
- [5]. Azhary H, Farooq MU, Bhanushali M, Majid A, Kassab MY. Peripheral neuropathy: differential diagnosis and management. *Am Fam Physician*. 2010;81(7):887–892.
- [6]. Dyck PJ, Kratz KM, Karnes JL, et al. The prevalence by staged severity of various types of diabetic neuropathy, retinopathy, and nephropathy in a population-based cohort: the Rochester Diabetic Neuropathy Study. *Neurology*. 1993;43(4):817. doi:10.1212/WNL.43.4.817
- [7]. Alwin Robert A, Al Dawish MA. Microvascular complications among patients with diabetes: an emerging health problem in Saudi Arabia. *Diab Vasc Dis Res*. 2019;16(3):227–235. doi:10.1177/1479164118820714
- [8]. Jatooi NA, Alsulaiman ASA, Alromaih NJ, et al. Prevalence of diabetic peripheral neuropathy among type II diabetic patients in King Fahd University Hospital, Khobar, Kingdom of Saudi Arabia. *Hosp Pract*. 2021;49(2):63–70. doi:10.1080/21548331.2020.1853995
- [9]. AlOwais MM, Shido OA. Knowledge and practice of foot care in patients with diabetes mellitus attending primary care center at Security Forces Hospital, Riyadh, Saudi Arabia: a cross-sectional study. *J Family Med Prim Care*. 2020;9(12):5954. doi:10.4103/jfmprc.jfmprc\_943\_20
- [10]. Alhashim BN, Zaher A, Albujaays DS, Alhashim J, Ali SI. Study of the level of awareness of diabetic neuropathy among diabetic patients in Al-Ahsa region, Kingdom of Saudi Arabia: a cross-sectional study. *Int J Sci Study*. 2018;5(1):1–6.
- [11]. Al Amri AM, Shahrani IM, Almaker YA, et al. Knowledge, Attitude, and Practice Regarding Risk of Diabetic Foot Among Diabetic Patients in Aseer Region, Saudi Arabia. *Cureus*. 2021;13(10). doi:10.7759/cureus.18791
- [12]. Cardoso NA, Cisneros de L, Machado CJ, Procópio RJ, Navarro TP. Risk factors for mortality among patients undergoing major amputations due to infected diabetic feet. *J Vasc Bras*. 2018;17(4):296–302. doi:10.1590/1677-5449.010717
- [13]. Pemayun TGD, Naibaho RM, Novitasari D, Amin N, Minuljo TT. Risk factors for lower extremity amputation in patients with diabetic foot ulcers: a hospital-based case-control study. *Diabet Foot Ankle*. 2015;6(1):29629. doi:10.3402/dfa.v6.29629
- [14]. Al-Aboudi IS, Hassali MA, Shafie AA. Knowledge, attitudes, and quality of life of type 2 diabetes patients in Riyadh, Saudi Arabia. *J Pharm Bioallied Sci*. 2016;8(3):195. doi:10.4103/0975-7406.171683
- [15]. Binhemd TA. Diabetes mellitus: knowledge, attitude, practice and their relation to diabetes control in female diabetics. *Ann Saudi Med*. 1992;12(3):247–251. doi:10.5144/0256-4947.1992.247
- [16]. Almalki TM, Almalki NR, Balbaid K, Alswat K. Assessment of diabetes knowledge using the Michigan brief diabetes knowledge test among patients with type 2 diabetes mellitus. *J Endocrinol Metab*. 2018;7(6):185–189. doi:10.14740/jem473w
- [17]. Al Shafae MA, Al-Shukaili S, Rizvi SGA, et al. Knowledge and perceptions of diabetes in a semi-urban Omani population. *BMC Public Health*. 2008;8(1):1–8. doi:10.1186/1471-2458-8-249



- [18]. Caliskan D, Ozdemir O, Ocaktan E, Idil A. Evaluation of awareness of diabetes mellitus and associated factors in four health center areas. *Patient Educ Couns.* 2006;62(1):142–147. doi:10.1016/j.pec.2005.06.018
- [19]. Kamel NM, Badawy YA, El Zeiny NA, Merdan IA. Sociodemographic determinants of management behaviour of diabetic patients. Part II. Diabetics' knowledge of the disease and their management behaviour. *EMHJ-Eastern Mediterranean Health J.* 1999;5(5):974–983. doi:10.26719/1999.5.5.974
- [20]. Alhajji AM, Alkhlaif ZK, Bukhamsin SA, Alkhars FS, Al-Hussaini H. Diabetic Neuropathy: prevalence and Impact on Quality of Life in Al-Ahsa, Saudi Arabia. *Cureus.* 2022. doi:10.7759/cureus.33176
- [21]. Murugesan N, Snehalatha C, Shobhana R, Roglic G, Ramachandran A. Awareness about diabetes and its complications in the general and diabetic population in a city in southern India. *Diabetes Res Clin Pract.* 2007; 77 (3):433–437. doi:10.1016/j.diabres.2007.01.004
- [22]. Aljoudi AS, Taha AZA. Knowledge of diabetes risk factors and preventive measures among attendees of a primary care center in eastern Saudi Arabia. *Ann Saudi Med.* 2009; 29 (1):15–19. doi:10.4103/0256-4947.51813
- [23]. Alosaimi A, Alsulaimani N, Alotaibi W. Depressive symptoms in diabetic patients; prevalence, correlates, and moderating effect in Taif, Saudi Arabia. *J Family Med Prim Care.* 2022; 11 (12):23.
- [24]. Ulvi OS, Chaudhary RY, Ali T, et al. Investigating the awareness level about diabetes mellitus and associated factors in Tarlai (rural Islamabad). *J Pak Med Assoc.* 2009; 59 (11):798–801.
- [25]. AlZubaidi HAA, Alfaqih ANO, Alothayqi MHA, et al. Knowledge and Practice of the Preventive and Care Methods for Diabetic Foot Among the Caregivers of Diabetic Patients in Saudi Arabia. *Cureus.* 2023. doi:10.7759/cureus.37887