



CROSS SECTIONAL OBSERVATIONAL STUDY ON PREVALENCE OF DIABETIC NEUROPATHY AMONG TYPE 2 DIABETIC PATIENTS

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ABSTRACT

Diabetic peripheral neuropathy (DPN) is the most common cause of neuropathy worldwide. It is estimated to be present in approximately half of those with diabetes, and 10% to 20% have symptoms that are severe enough to warrant treatment. Currently there is no effective treatment available at a global level, except for tight control of blood glucose. This might be as a result, at least in part, of insufficient clarification of the pathogenesis of diabetic neuropathy, complicated clinical pictures that do not necessarily reflect proper progression of the disease, or inadequate design of clinical trials. Hence it's become highly essential to minimize the occurrence and also to upsurge the proper knowledge on various triggering factors that aggravate the condition of DPN. The main aim of the present observation study is to enumerate the prevalence of diabetic neuropathy among Type 2 diabetes patients and also influence of other co-morbid factors in diabetic patients. Cross sectional observational study conducted on 200 participants (age above 30 years) inclusive of both the genders for 3 months by using questionnaire to collect required data. It was observed from the present study that DPN prevails more on population aged 50-59 years with higher BMI (over weight). Symptoms of diabetic neuropathy such as numbness present in 147 patients among them 41 cases were males (20.5%) and 106 cases were females (53%), Tingling, pins and needle sensation present in 165 patients among them 37 cases were males (17.5%) and 128 cases were females(64%), Burning sensation present in 132 patients among them 34 cases were males (17%) and 98 cases were females(49%).In this study 73 patients(36.5%) experienced pain same as right as well as left, 90 patients (45%) experienced pain worse at night, 97 patients (48.5%) experienced pain kept awake at night, 75 patients (37.5%) experienced unable to feel feet during walking, 66 patients (33%) experienced unable to feel hot or cold with hands or feet, 101 patients (50.5%) had constipation, 74 patients (37%) experienced difficulty in walking. From the study it was concluded that advancing age, increased duration of diabetes, smoking, alcohol intake, physical inactivity, dietary intake of high glycemic index foods and co-existing hypertension and hypothyroidism were found to be significantly associated with development of DPN among Type 2 Diabetic patients.

KEY WORDS: *Diabetic peripheral neuropathy, Burning sensation, Type 2 diabetes patients, Co-morbid factors, Overweight, Hypertension*

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1. Introduction

Peripheral neuropathy is the most common and intractable complication of diabetes [1,2]. It involves somatic sensory and motor nerves, as well as autonomic nerves. In fact, the prevalence of diabetic neuropathy ranges from 7% within 1 year of diagnosis to 50% for those with diabetes for >25years [3]. According to the International Diabetes Federation, 382 million people worldwide are currently affected by diabetes [4], one of the leading causes of neuropathy [5]. The distal symmetrical polyneuropathy is the commonest clinical form of diabetic neuropathy, affecting more than 90% of the patients [6]. Generally, it affects the toes and distal foot, but slowly progresses proximally to involve the feet and legs in a stocking distribution. It is also characterized by a progressive loss of nerve fibers affecting both the autonomic and somatic divisions, thereby diabetic retinopathy and nephropathy can occur [7]. Foot ulceration and painful neuropathy are the main clinical consequences of DPN, linked with higher morbidity and mortality. Frequently, patients look for medical help only when pain appears [8], a symptom that affects 10% to 26% of this population [9].

Diabetic neuropathic pain (DNP) is characterized by tingling, burning, sharp, shooting, and lancinating or even as electric shock sensations [10,11]. It is usually considered moderate to severe and often worse at night, causing sleeping disturbs. The pain can be constant and accompanied of cutaneous allodynia, which can substantially affect the quality of life of patients, impacting the ability to perform daily activities and having a negative influence on mood. The pain may also be a reason of withdrawal of recreational and social activities and may be associated with depression [12,13].

Neuropathic pain scales have been devised to aid diagnosis and these may also provide insight into the severity of the patient's symptoms [14]. The Michigan Neuropathy Screening Instrument (MNSI) and Neuropathy Disability Score (NDS) are designed to assess neuropathic impairment and can act as screening tools for DSPN [15]. The severity of pain in PDN can be assessed through pain scores such as the Brief Pain Inventory and the Neuropathic Pain Questionnaire (NPQ) [16]. The NPQ can also be used

to follow up patients along with the Neuropathic Pain Symptom Inventory, a 10-item questionnaire to quantify and evaluate symptoms of neuropathic pain [17]. In addition, the quality of life can be assessed through neuropathy-specific quality of life scores such as the Neuro-QoL. In recent years, considerable progress has been made toward understanding the biochemical mechanisms leading to diabetic neuropathy, and as a result, new treatment modalities are being explored. The main aim of the present observation study is to enumerate the prevalence of diabetic neuropathy among Type 2 diabetes patients and also influence of other co-morbid factors in diabetic patients.

2. Materials and Methods

2.1. Study design

Cross- Sectional study conducted in patients visiting siddha outpatient department (OPD) of Arignar Anna Government Hospital of Indian Medicine, Arumbakkam, Chennai, Tamil Nadu, India. Sample size of 200 patients were analyzed for the period of 3 months.

2.2. Study Approval

This study was approved by institutional ethical committee (IEC NO: GSMC-CH-ME-2/029/2019) and registered in Clinical Trial Registry India (CTRI/2019/07/020138).

2.3. Sampling procedures

Sample size for this study was 200 patients of which 101 cases (50.5%) were males and 99 cases (49.5%) were females with the diagnosis of Type 2 Diabetes. All the participants were comprehensively explained about the objectives of this study before requesting them for their voluntary participation. Participants were also explained that completion and submission of the questionnaire would be taken as consent to participate in this study. Data were dealt with the high level of anonymity and confidentiality.

2.4. Questioner Pattern

The questionnaire was divided into fundamental sections that includes age, marital status, occupation, educational qualification, BMI, duration of the disease, symptoms of neuropathy and its severity, region and frequency of occurrence, co-morbid conditions etc.

2.2. Statistical Analysis

All these data entered in Microsoft excel and analysis was done by SPSS statistics version 26. Percentage, Chi-square test and logistic regression were used in final analysis.

3.Results

3.1. Result analysis on general demography of the patients under study

The current study shows that among 200 Type 2 Diabetes patients 101 cases (50.5%) were males and 99 cases (49.5%) were females and patients under the age group 50-59 (33.5%) were mostly affected in Diabetic neuropathy. 10% patients were affected in the age group of 30-39 years. 30% patients were affected in the age group of 40-49 years. 24% patients were affected in the age group of 60-69 years. 2.5% patients were affected in the age group of 70-79 years. The study showed that 96% were married and 4% were unmarried. According to the study, 10% were Illiterate, 5.5% were Primary, 14.5% were High school, 23% were Diploma, 31% were Degree holders, 16% were Post graduates. In current study, it showed that males with weight in normal (33.67%), overweight (65.34%), obese (0.99%) and females with weight in normal (27.27%), overweight (69.69%), obese (3.04%). As shown in Table 1.

3.2. Significance of duration and symptoms of diabetes in study population

According to the study, duration of Diabetes patients among males more than 5 years (15.5%) and among females more than 5 years (18.5%) are mostly affected. The study showed that among males, 6.5% were affected for one year, 8.5% were affected for two years, 7.5% were affected for three years, 7% were affected for four years, 5.5% were affected for five years. Among females, 7.5% were affected from one year, 3% were affected for two years, 7.5% were affected for three years, 3% were affected for four years, 10% were affected for five years. In this study, patients experienced excessive thirst (37%), increased appetite (54%), nocturia (34%), tiredness (77.5%), weight loss (29.5%), coated tongue (17.5%), itching present in the body (73.5%). Patients who had the habit of doing exercise (83.5%).

3.3. Significance of Symptoms of Diabetic Neuropathy and its associated Co-morbid conditions

It was observed from the study that symptoms of diabetic neuropathy such as Numbness present in 147

patients among them 41 cases were males (20.5%) and 106 cases were females (53%), Tingling, pins and needle sensation present in 165 patients among them 37 cases were males (17.5%) and 128 cases were females (64%), Burning sensation present in 132 patients among them 34 cases were males (17%) and 98 cases were females (49%). In this study 73 patients (36.5%) experienced pain same as right as well as left, 90 patients (45%) experienced pain worse at night, 97 patients (48.5%) experienced pain kept awake at night, 75 patients (37.5%) experienced unable to feel feet during walking, 66 patients (33%) experienced unable to feel hot or cold with hands or feet, 101 patients (50.5%) had constipation, 74 patients (37%) experienced difficulty in walking. As shown in table 3.

In the present study, 139 patients (69.5%) had the complaints of diabetes in which deep vein thrombosis was more prevalent than foot ulcer (11%), Renal problems (9%), Low HDL/High LDL (12%). 46 females (23%) experienced deep vein thrombosis and 29 males (14.5%) experienced deep vein thrombosis. Habits present in male cases such as cigarette smoking (10%), drinking alcohol (10%), chewing tobacco (1%) and 79% had no habits. Co-morbidities such as Hypothyroidism (21%) in females and (6%) in males, Hypertension (16%) in males and (13%) in females, Liver diseases (3.5%) in males and (1.5%) in females, Cardiovascular diseases (1.5%) in males only and (38%) had no co-morbidities of diabetic neuropathy. Patients who were taking Siddha Medicine under the study were 61 (30.5%) and both Siddha and Allopathy medicine were 139 (69.5%). As shown in table 3.

4.Discussion

Diabetic neuropathy (DN) is a common disorder and is defined as signs and symptoms of peripheral nerve dysfunction in a patient with diabetes mellitus (DM) in whom other causes of peripheral nerve dysfunction have been excluded. There is a higher prevalence of DM in India (4.3%)¹ compared with the West (1%–2%) [18]. Probably Asian Indians are more prone for insulin resistance and cardiovascular mortality [19]. The incidence of DN in India is not well known but in a study from South India 19.1% type II diabetic patients had peripheral neuropathy [20]. DN is one of the commonest causes of peripheral neuropathy. It accounts for hospitalisation more frequently than other

complications of diabetes and also is the most frequent cause of non-traumatic amputation. Diabetic autonomic neuropathy accounts for silent myocardial infarction and shortens the lifespan resulting in death in 25%–50% patients within 5–10 years of autonomic diabetic neuropathy [21,22]. Current studies suggest that risk factors for diabetic peripheral neuropathy include the duration of diabetes [23], age [24], HbA1c[25], smoking[26], and BMI, fasting plasma glucose (FPG), blood urea nitrogen(BUN) [27], diastolic blood pressure(DBP) [28] amongst others.

Several groups have shown that age exerts an independent effect on DSPN, leading to a progressive increase in its prevalence for approximately every decade of life [29]. The independent effect of age has also been shown for prediabetes in epidemiological surveys [30]. The current study shows that among 200 Type 2 Diabetes patients 101 cases (50.5%) were males and 99 cases (49.5%) were females and patients under the age group 50-59 (33.5%) were mostly affected in Diabetic neuropathy. 10% patients were affected in the age group of 30-39 years. 30% patients were affected in the age group of 40-49 years. 24% patients were affected in the age group of 60-69 years. 2.5% patients were affected in the age group of 70-79 years.

BMI contributes more on the aggravation of symptoms associated with T2DM. In current study, it showed that males with overweight (65.34%) and females with overweight (69.69%), obese (3.04%) has the occurrence of diabetes. Diabetes can injure peripheral nerves in a variety of distributions. The most common pattern is characterized by numbness, tingling, pain, and/or weakness that affect the nerves in a “stocking and glove” pattern beginning in the distal extremities. It was observed from the present investigation that symptoms of diabetic neuropathy such as Numbness present in 147 patients among them 41 cases were males (20.5%) and 106 cases were females (53%) , Tingling, pins and needle sensation present in 165 patients among them 37 cases were males (17.5%) and 128 cases were females(64%), Burning sensation present in 132 patients among them 34 cases were males (17%) and 98 cases were females(49%). In this study 73 patients(36.5%) experienced pain same as right as well as left , 90 patients (45%) experienced pain worse at night, 97 patients (48.5%) experienced pain kept awake at night, 75 patients (37.5%)

experienced unable to feel feet during walking, 66 patients (33%) experienced unable to feel hot or cold with hands or feet, 101 patients (50.5%) had constipation, 74 patients (37%) experienced difficulty in walking.

The major risk factors of DPN include diabetes duration, hyperglycemia, and age, followed by hypertension, dyslipidemia, obesity, and metabolic syndrome [31]. Additional risk factors include height, smoking, insulin resistance, hypoinsulinemia, prediabetes, and several others [32]. Of these, hyperglycemia, hypertension, dyslipidemia, obesity, prediabetes, and metabolic syndrome are modifiable, providing some opportunity to prevent and/or reduce the progression of DPN.

In the present study, 139 patients (69.5%) had the complaints of diabetes in which deep vein thrombosis was more prevalent than foot ulcer (11%), Renal problems (9%), Low HDL/High LDL (12%). 46 females (23%) experienced deep vein thrombosis and 29 males (14.5%) experienced deep vein thrombosis. Habits present in male cases such as cigarette smoking (10%), drinking alcohol (10%), chewing tobacco (1%) and 79% had no habits. Co-morbidities such as Hypothyroidism (21%) in females and (6%) in males, Hypertension (16%) in males and (13%) in females, Liver diseases (3.5%) in males and (1.5%) in females, Cardiovascular diseases (1.5%) in males only and (38%) had no co-morbidities of diabetic neuropathy. A wide variety of drugs, used alone or in combination, has been shown to significantly reduce neuropathic pain compared with placebo in randomized controlled trials, but pain relief remains inadequate for most patients [33]. It was observed from the present study that patients who were taking Siddha Medicine were 61 (30.5%) and both Siddha and Allopathy medicine were 139 (69.5%).

5. Conclusion

Present study report provides a scientific basis for a greater understanding of the causes of type 2 diabetes complicated with peripheral neuropathy and preventive strategies. From the study it was concluded that advancing age, increased duration of diabetes, smoking, alcohol intake, physical inactivity, dietary intake of high glycemic index foods and co-existing hypertension and hypothyroidism were found to be

significantly associated with development of DPN among Type 2 Diabetic patients.

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Table 1: Frequencies and Percentage of demographic characteristics of studied sample (n=200)

Variables	Groups	Frequency	Percentage
Gender	Male	101	50.5
	Female	99	49.5
Age Group	30-39	20	10
	40-49	60	30
	50-59	67	33.5
	60-69	48	24
	70-79	5	2.5
Occupation	Driver	38	19
	Farmer	25	12.5
	Govt.Employee	23	11.5
	Housewife	65	32.5
	Plumber	8	4
	Retired Employee	12	6
	Shopper	21	10.5
	Others	8	4
Marital status	Married	192	96
	Unmarried	8	4
Educational Qualifications	Illiterate	20	10
	Primary	11	5.5
	High school	29	14.5
	Diploma	46	23
	Degree	62	31
	Post Graduate	32	16
BMI-Males	Normal	34	33.67
	Overweight	66	65.34
	Obese	1	0.99
BMI-Females	Normal	27	27.27
	Overweight	69	69.69
	Obese	3	3.04

Table 2 : Duration &Symptoms of diabetes and Habits of studied sample (n=200)

Variables	Groups	Frequency	Percentage
Duration of Diabetes			
One year	Male	13	6.5
	Female	15	7.5
Two years	Male	17	8.5
	Female	6	3
Three years	Male	15	7.5
	Female	15	7.5
Four years	Male	14	7
	Female	6	3
Five years	Male	11	5.5
	Female	20	10
More than five years	Male	31	15.5
	Female	37	18.5
Symptoms of Diabetes			
Excessive thirst	Yes	74	37
	No	126	63
Increased appetite	Yes	108	54
	No	92	46
Nocturia	Yes	68	34
	No	132	66
Tiredness	Yes	155	77.5
	No	45	22.5
Weight loss	Yes	59	29.5
	No	141	70.5
Coated Tongue	Yes	35	17.5
	No	165	82.5
Itching present in body	Yes	147	73.5
	No	53	26.5
Habits of doing exercise	Yes	167	83.5
	No	33	16.5

Table 3: Symptoms of Diabetic Neuropathy and its Co-morbidities of studied sample (n=200)

Variables	Groups	Frequency	Percentage
Numbness	Yes	147	73.5
	No	53	26.5
If yes, over the Feet	Male	21	10.5
	Female	47	23.5
Legs	Male	10	5
	Female	34	17
Hands	Male	6	3
	Female	20	10
Arms	Male	4	2
	Female	5	2.5
Tingling, pins and needle sensation	Yes	165	82.5
	No	35	17.5
If yes, over the Feet	Male	18	9
	Female	54	27
Legs	Male	7	3.5
	Female	42	21
Hands	Male	8	4
	Female	20	10
Arms	Male	4	2
	Female	12	6
Burning sensation	Yes	132	66
	No	68	34
If yes, over the Sole of feet	Male	18	9
	Female	51	25.5
Toes	Male	10	5
	Female	33	16.5
Heel	Male	6	3
	Female	14	7
None	Male	42	21
	Female	26	13
Pain same as right as the left	Yes	73	36.5
	No	127	63.5

Pain worse at night	Yes	90	45
	No	110	55
Pain kept awake at night	Yes	97	48.5
	No	103	51.5
Unable to feel feet during walking	Yes	75	37.5
	No	125	62.5
Unable to feel hot or cold with hands or feet	Yes	66	33
	No	134	67
Constipation	Yes	101	50.5
	No	99	49.5
Difficulty in walking	Yes	74	37
	No	126	63
Complaints			
Foot ulcer	Male	10	5
	Female	12	6
Deepvein thrombosis	Male	29	14.5
	Female	46	23
Renal problems	Male	7	3.5
	Female	11	5.5
Low HDL/High LDL	Male	7	3.5
	Female	17	8.5
None	Male	25	12.5
	Female	36	18
Habits			
Cigarette smoking	Male	20	10
	Female	0	0
Drinking alcohol	Male	20	10
	Female	0	0
Chewing tobacco	Male	2	1
	Female	0	0
None	Male	59	29.5
	Female	99	49.5
Diseases			
	Male	12	6

Hypothyroidism	Female	42	21
	Male	7	3.5
Liver disease	Female	3	1.5
	Male	32	16
Hypertension	Female	26	13
	Male	3	1.5
Cardiovascular diseases	Female	0	0
	Male	37	18.5
None	Female	39	19.5
	Male	37	18.5
Medicine taken for diabetes	Siddha medicine alone	61	30.5
	Both Siddha and allopathy medicine	139	69.5