

A Cross Sectional Study of Diabetic Foot in Diabetes Mellitus Patients- Prevalence, Practice of Preventive Measures and Medico-Legal Aspects

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Abstract

Introduction and Background: Diabetes mellitus is a chronic endocrine disorder. Diabetic foot is most common complication observed in patients with diabetes mellitus which may leads to debilitating disability like gangrene, non healing sepsis and amputation. Clinically diabetic foot occurs due to diabetic neuropathy or ischchemic or combined neuro-ischemic.

Aim and Objectives: This study was conducted with aim to evaluate the problem of diabetic foot among type 1 and type 2 diabetic mellitus patients and to increase the awareness regarding practice of proper preventive measures among them. Objectives were to find out prevalence of diabetic foot among type 1 and type 2 diabetes mellitus patients and to evaluate practice of proper preventive measures to prevent diabetic foot among them.

Materials And Methods: A cross sectional study conducted among diagnosed patients of type 1 and type 2 diabetes mellitus visiting at Dhiraj Hospital, SBKSMIRC, SVDU, Vadodara between January 2017 to April 2017. Total 98 patients were studied as per inclusion and exclusion criteria. Participants were examined clinically for neuropathy and ischemic features in both feet for diagnosis of diabetic foot, while questionnaire based interview done for evaluation of practice of preventive measures among them. Data was compiled and statistically analyzed.

Observations and Results: Prevalence of diabetic foot was found 32.8% in male and 30% in female diabetic patients. Prevalence of diabetic foot was 86.4% in type 1 diabetes mellitus patients and 15.8% in type 2 diabetes mellitus patients. 58.6% of patients with diabetic foot were practicing good care and preventive measures while practice of preventive care was found irregular in 41.4% of patients with diabetic foot. Medico-legal examination for disability related to diabetic foot and neuropathy is to be done as per Government of India guidelines under the Rights of Persons with Disabilities Act and Rules.

Conclusion: Diabetic mellitus is a chronic incurable disorder till date. Common complications of diabetes mellitus like diabetic foot and diabetic foot ulcer needs proper preventive care and management. So that morbidity and disability can be prevented in patients with diabetes mellitus.

Keywords: Diabetic foot; Diabetes mellitus; Disability; Preventive care.

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Introduction and Background

Diabetes Mellitus (DM) is an endocrine disorder with defective functioning in insulin production and/or secretion or its end organ resistance. Type1 DM is an auto immune disorder of defective insulin production and secretion due to destruction of the beta cells in the pancreas which produce insulin.

Type2 DM is a multi-factorial pathology disorder having combination of defective insulin secretion and increased insulin resistance.

Diabetic foot is a very important long-term or chronic complication of diabetes mellitus. A diabetic foot is a foot condition in diabetes mellitus patient that exhibits one or more characteristics such as diabetic foot ulcer, peripheral vasculopathy, neuropathy, osteoarthropathy and infection that directly resulted from diabetes mellitus.¹ Diabetic foot ulcer (DFU) is the most common complication of DM. Along with diabetic foot, it leads to lower limb amputation in many cases. DFU has shown an increasing trend over previous decades. Around 15-34% of patients with diabetes will suffer from DFU during their lifetime. The rate of lower limb amputation in patients with diabetes is 15 times higher than non-diabetic people.^{2-5,6} After successful healing the recurrence rate of DFU is 40% within a year and 65% within 3 years.⁶ CDC, USA notes that about 60% of all non-traumatic lower-limb amputations in people aged 20 years or older are done in diabetic patients in 2010.⁷

Clinically diabetic foot is due to diabetic neuropathy or ischemic (diabetic vasculopathy) or combined neuro-ischemic. Pure ischemic foot is rare while neuropathic foot is most commonly seen, neuro-ischemic in rest. Clinical features of neuropathic foot are decreased sensations (superficial and deep), oedema, intact peripheral pulses, callus and ulcer formation over tips of toes and plantar surface of metatarsal heads, sepsis, necrosis and charcot's joints. charcot's joint is a foot condition showing features of loss of pain sensations with rarefaction of bones and edema leading to deformity and disability in chronic diabetic neuropathy. Clinical features of ischemic foot are absent or diminished peripheral pulses, cold temperature, pain, ulceration over margins of foot, toes and heel, sepsis, critical ischemia- pink, painful, pulseless, cold foot and gangrene.⁸

In view of such common complication of diabetes mellitus, we conducted a cross sectional research study among diabetes patients with following aim and objectives.

Aim

Aim of this study was to evaluate the problem of diabetic foot among type1 and type2 DM patients and to increase the awareness regarding practice of proper preventive measures among them.

Objectives

- To find out prevalence of diabetic foot among type1 and type2 DM patients visiting Dhiraj General Hospital, a tertiary hospital in Vadodara, Gujarat.
- To evaluate practice of proper preventive measures to prevent diabetic foot among them.

Materials and Methods

We conducted a Cross sectional study among patients of type1 and type2 DM visiting at Dhiraj Hospital between January 2017 to April 2017. Dhiraj Hospital is a tertiary superspeciality hospital affiliated to SBKSMIRC, Sumandeep Vidyapeeth Deemed University which serves medical services to rural as well as urban population of Vadodara and surrounding districts of central Gujarat state and adjacent regions of Madhya Pradesh state in India.

Inclusion Criteria:

- Patients with confirmed diagnosis of type1 and type2 DM.
- Participants who gave written informed consent for the study.

Exclusion Criteria:

- Patients who denied to consent for the study.

According to above mentioned inclusion and exclusion criteria total 98 patients of type1 and type2 DM patients were enrolled. The diagnosis of diabetic foot was done by taking clinical history and clinic based physical examination for neuropathy and ischemic features, while questionnaire based interview done for evaluation of practice of preventive measures among them. To increase awareness, after completion of clinical examination and data collection, each participant was counseled regarding how to practice preventive measures properly at home.

Collected data compiled in MS office Excel sheet. Data processed using Epi info statistical software. Descriptive and analytical statistical methods used for the preparation of results.

Ethical Considerations:

Approval from the Sumandeep Vidyapeeth Institutional Ethical Committee obtained prior to the study.

Observations and Results

Table 1: depicts sample distribution in regard to sex and type of DM.

	Type1 DM n	Type2 DM n	Total n
Male	14	44	58
Female	8	32	40
Total	22	76	98

(Table 1). shows distribution of samples in relation to sex and type of DM.

Table 2: Prevalence of signs and symptoms of Diabetic foot in patients of DM.

Clinical findings	Present in either or both foot n(%)	Not present in any foot n(%)
Past history of ulcer/ nail infections/ amputation or confirm diagnosis of diabetic foot	26 (26.5)	72 (73.5)
Tingling/ numbness/ burning sensations over foot or slippage of footwear without knowledge	88 (89.8)	10 (10.2)
Nail infection or infective cracks in any toe or sole	22 (22.4)	76 (77.6)
Ulcer or hard callus	14 (14.3)	84 (85.7)
Recurrent pedal Edema	80 (81.6)	18 (18.4)
Absent/ feeble pulse of dorsalis pedis artery	24 (24.5)	74 (75.5)
Absent/ feeble pulse of posterior tibial artery	23 (23.5)	75 (76.5)
Absent/ decreased superficial touch sensations over sole, dorsum and all toes (monofilament examination)	68 (69.4)	30 (30.6)
Absent/ decreased superficial pain sensations over sole, dorsum and all toes (pin prick examination)	67 (68.4)	31 (31.6)

Depicts sample distribution in regard to sex and type of DM (Table 1). From observations of Table 2, we could segregate three groups of patients for further analysis as

No Diabetic foot: patients having no past history of any signs-symptoms of neuropathy, vasculopathy, nail infections and ulcer.

Pre diabetic foot: patients having one or more signs-symptoms of neuropathy and vasculopathy but no ulcer, nail infections or such past history. These patients have high probability to develop diabetic foot.

Diabetic foot: patients with definitive diagnosis of diabetic foot, ulcers, nail infections or past history of it.

So, they are tabulated in Table 3 and 4 with reference to sex and type of DM.

Table 3: Sexwise prevalence of diabetic foot.

	No Diabetic Foot n(%)	Pre diabetic foot n(%)	Diabetic Foot n(%)	Total n(%)
Male	0	39 (67.2)	19 (32.8)	58 (59.2)
Female	2	28 (70)	10 (30)	40 (40.8)
Total	2 (2)	67 (68.4)	29 (29.6)	98 (100)

Table 4: Type of DM wise prevalence of diabetic foot.

	No Diabetic Foot n(%)	Pre diabetic foot n(%)	Diabetic Foot n(%)	Total n(%)
Type1 DM	0	3 (13.6)	19 (86.4)	22 (22.4)
Type2 DM	2	64 (84.2)	10 (15.8)	76 (77.6)
Total	2 (2)	67 (68.4)	29 (29.6)	98 (100)

Table 5: Practice of preventive measures for Diabetic foot in patients.

Sr. No.	Questions	Yes n(%)	No/don't care n(%)
1	Do you wear proper size footwear and socks?	83 (84.7)	15 (15.3)
2	Do you apply heat/ oil massage your feet regularly?	69 (70.4)	29 (29.6)
3	Do you take proper care for nail hygienes (regular cutting and trimming)?	81 (82.7)	17 (17.3)
4	Do you check your feet for any cracks, ulcers, minor trauma or infections regularly?	82 (83.7)	16 (16.3)
5	Do you regularly check your blood sugar level at home or with any doctor/laboratory?	91 (92.8)	7 (7.2)
6	Do you take your antidiabetic medicines regularly (as per prescribed by physician)?	98 (100)	0 (0)
7	Do you take proper antidiabetic diet (less sugar and fat, more proteins and fibres)?	95 (96.9)	3 (3.1)

From observations of Table 5, we could segregate two groups of patients for further analysis as

Good care: patients with answers 'yes' to all questions.

Less/no care: patients with 'no/ don't care' answers to one or more questions.

The relation to the above two groups with diabetic foot status was observed as Table 6.

Table 6: Relation of practice of foot care in patients and Diabetic foot status.

Practice of Foot care \ Diabetic foot status	Good care n(%)	Less/ no care n(%)	Total n(%)
No Diabetic Foot	2 (100)	0	2(2)
Pre diabetic foot	38 (56.7)	29 (43.3)	67 (68.4)
Diabetic Foot	17 (58.6)	12 (41.4)	29 (29.6)
Total	57 (58.2)	41 (41.8)	98 (100)

Discussion

The global prevalence of Diabetes Mellitus is 8.5% in adult population. The majority among them are affected by Type 2 DM. There is significant rise of diabetes cases in children and young adults now which was earlier used to occur in middle age adults and elderly in common.⁹ A study by Whiting DR et. al. shows that in 2011 there are 366 million people with diabetes worldwide and it is expected to rise to more than 550 million by 2030.¹⁰ In India, the prevalence of DM is 7.9% and 7.5% in male and female adult population respectively.¹¹

Though the pathogenesis of type 1 and 2 DM are different, many long time complications of them are overlapping. A very important one among it is Diabetic Foot. The risk factors for diabetic foot are as follows: male gender, duration of diabetes longer than 10 years, advanced age, high body-mass index and other co-morbidities such as diabetic peripheral neuropathy, peripheral vascular disease, glycated hemoglobin level (HbA1c), foot deformity, high plantar pressure, infections and inappropriate footcare habits.⁵

In present study, we found that prevalence of diabetic foot among diabetes patients is 29.6%, which is almost double to the findings of Yazdanpanah L et. al.⁵ It means that 1/3rd of DM patients are likely to develop diabetic foot. And as per Table 3, this rate is same for male and female. But prevalence of diabetic foot is very high in type 1 DM (86.4%). These findings are similar to the findings in studies of Kumar S et. al. and Daneman D.^{12,13} Study by Kumar S et. al. found prevalence of neuropathy in 41.6%, vasculopathy (Peripheral Vascular Disease) in 11% and foot ulcers in 5.3% patients of type 2 DM.¹²

Regarding the infectious agent, a north India study on 80 patients of diabetic foot infections showed that gram negative aerobic microbes were most common (51.4%) followed by gram positive (33.3%), but strikingly 72% patients among all were having multi drug resistant organisms (MDRO) which is a very serious issue in management of these patients.¹⁴ A study by Visvanathan V et. al. in south Indian type 2 DM patients showed that the healing time of wound infected with anaerobic pathogens was higher than aerobic while most of cases were having polymicrobial in nature and presence of neuropathy increased the risk of foot infection.¹⁵

Preventive measures are very important to stop development of diabetic foot. But surprisingly

when we evaluated the prevalence of practice of preventive measures, we found that more than 1/3rd of patients (41.8%) of DM were not practicing one or more preventive measures regularly. These findings need further evaluation of reasons for that and resolve them. A study by Sekhar MS et. al. in 400 diabetic patients (including 200 DFU patients) showed that patients with DFU have very poor HRQoL (Health related quality of life) scores in both physical and mental health aspects.¹⁶

Medico-legal Aspects

Diabetes is a non communicable disorder and a chronic debilitating illness. As per current laws in India, DM comes under physical 'impairment' which may cause functional limitations and disability. Legally 'disability' is a permanent injury (damage) to body for which a person should or should not be compensated.¹⁷

Chronic DM may cause many serious disabilities in long term which includes diabetic foot, amputations due to diabetic neuropathy and vasculopathy, vascular complications like angina pectoris, myocardial ischemia and cerebrovascular stroke, visual disabilities due to diabetic retinopathy, renal failure due to diabetic nephropathy. These are to be evaluated for permanent physical impairment (PPI) according to guidelines mentioned under the Rights of Persons with Disabilities Act and Rules for various civil rights of disabled or differently abled persons, i.e. travel concessions, tax-deduction benefits, admission to various academic courses and institutes, employment, retirement etc.^{18,19} It might be extremely rare that diabetes mellitus would be an effect of any occupational, work related hazard or any vehicle accidents. So, disability due to DM would rarely come in purview of Workmen's Compensation Act, ESI act or any other accident compensation legal cases under Motor Vehicle Accident Act, Railways Act etc.

Conclusion

Diabetes mellitus is a non-communicable chronic disorders which have no definitive cure available till date and complications like diabetic foot is responsible for emotional and physical distress with productivity and financial loss that lower the quality of life. To check this, it demands great adherence from the patients towards regular treatment and lifestyle modifications. These not only needs proper awareness, instructions, demonstration of care

practices and constant motivation from physician and healthcare staff, but also requires efforts and strong adherence to preventive measures from patients.

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