

STUDY OF ETIOPATHOLOGICAL FACTORS AND CLINICAL AND RADIOLOGICAL PARAMETERS OF PATIENTS SUFFERING FROM DIABETIC FOOT ULCER

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Abstract

Background: Diabetes mellitus is assuming pandemic proportions worldwide and so are its associated long-term complications. The main aim of the present study was to find out the proportion of study participants with various risk factors, clinical characteristics and radiological features of the patients. **Materials and Methods:** This is a cross-sectional study conducted at a tertiary care centre during a period of 1 year between February 2018 to January 2019. Patients with a known diagnosis of type 2 diabetes, as defined by the criteria of the American Diabetes Association (ADA) and attending the foot clinic were invited to participate in the study. Demographic data and medical histories were taken from participants, including age, sex, weight, height, duration of diabetes, smoking habit and consumption of alcohol. Biochemical investigations included the most recent HbA1c, fasting plasma glucose, lipid profile and creatinine levels. Statistical analysis was carried out using SPSS (version 16; SPSS, Chicago, IL). **Result:** Out of 50 patients in our study, majority belonged to geriatric age group with a mean age of presentation at 66.7(9.6) years. There was a male preponderance in our study with around three-fourth of the patient being male. A little less than this (40%) was seen among patients who consumed alcohol. Majority of the patients had sedentary lifestyle. The mean duration of diabetes mellitus among the study participants was 13.4 years and majority had positive family history for diabetes. All except 1 patient had BMI above the reference range. 78% of the patients were on anti-hypertensive and 66% of them had deranged lipid profile. **Conclusion:** Diabetic foot is a common complication of long-standing diabetes. Peripheral neuropathy is also an important factor in the development of foot lesions. Hence it is essential to educate all the diabetic patients at risk about good glycemic control, risk factors, proper foot care, periodic foot examination and neurological examination of lower limbs, prompt treatment of foot lesions and regular follow-up.

INTRODUCTION

Diabetes mellitus is assuming pandemic proportions worldwide and so are its associated long-term complications. In addition to the delayed complications like nephropathy, retinopathy, neuropathy, etc., diabetic foot disease is one of the most common and dreaded complication of diabetes mellitus, especially in developing countries. According to the World Health Organization (WHO) and International Working Group on the Diabetic Foot, diabetic foot is defined as the foot of diabetic patients with ulceration, infection, and/or

destruction of the deep tissues, associated with neurological abnormalities and various degrees of peripheral vascular disease in the lower limb. Diabetic foot incidence in diabetic persons increased from 0.7% in 1980 to 2.7% in 1999.^[1] Diabetic foot is a leading cause of hospital admission among people with diabetes mellitus. It is assessed that during their life time 15% of diabetic people develop foot ulcers at the most prone site of big toe and a good number of them (14–24%) land into amputation.^[2] Diabetic foot is the single-most common cause of nontraumatic lower limb amputation, accounting for almost 40 to 60% of

nontraumatic amputations.^[3] Various risk factors have been found to be associated with increased chances of developing diabetic foot disease among which appears to be the single-most important factor not only in developing diabetic foot but also in delaying the healing process. Patients having sensory loss appear to have seven times increased risk of developing foot ulcer. Origin of neuropathy remains unclear.^[4] It may be due to insufficiency of intrinsic blood supply to peripheral nerves, may be autoimmune or micro vascular ischemia caused by the accumulates of advanced glycosylated end products.^[5,6] Peripheral vascular disease is another important risk factor and is mainly due to widespread and often multi-segmental atherosclerosis of large vessels of the leg. It is often bilateral and distal involving tibial and peroneal vessels below knee due to unknown reason.^[7] Management of diabetic foot disease involves a multidisciplinary team approach involving orthopedic surgeon, diabetologist, vascular surgeon, general surgeon, pathologist, psychiatrist, occupational, and physical therapist and their approach itself can reduce the incidence of amputation by up to 85%.^[8] The main aim of the present study was to find out the proportion of study participants with various risk factors, clinical characteristics and radiological features of the patients.

MATERIALS AND METHODS

This is a cross-sectional study conducted at a tertiary care centre during a period of 1 year between February 2018 to January 2019. Patients with a known diagnosis of type 2 diabetes, as defined by the criteria of the American Diabetes Association (ADA) and attending the foot clinic were invited to participate in the study. Demographic data and medical histories were taken from participants, including age, sex, weight, height, duration of diabetes, smoking habit and consumption of alcohol. Biochemical investigations included the most recent HbA1c, fasting plasma glucose, lipid profile and creatinine levels. Radiological evidence of Charcot foot was based on findings of plain x-ray film, verified by two radiology consultants. Radiological findings were categorised according to the Sanders and Mrdjencovic classification system. A diagnosis of

nephropathy was made in the presence of proteinuria of greater than 150mg/24hrs) or microalbuminuria of greater than 30mg in 24 hours. Retinopathy was considered to be present if any typical diabetes related changes were seen on fundoscopy. Peripheral vascular disease was diagnosed if peripheral pulses (dorsalis pedis and posterior tibial) were absent and ankle brachial pressure index was less than 0.9. Disease specific data including foot ulceration, location of ulcers and recommended off-loading treatment were also documented. Neurological assessment of the feet was sought to detect the loss of protective sensation (10 g monofilament) and vibratory sensation (128 hz tuning fork and more than 25 V on biothesiometry). The presence of painful neuropathy was determined by an interview. Clinical assessment was conducted to detect the presence of callus, anhidrosis (dry skin), fissures, tinea pedis, active ulceration, corns, dermatopathy, cellulites, oedema or amputation at enrolment.

Statistical analysis was carried out using SPSS (version 16; SPSS, Chicago, IL). Bivariate analysis was carried out using the paired t-test for continuous variables and Chi-squared tests for categorical variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Out of 50 patients in our study, majority belonged to geriatric age group with a mean age of presentation at 66.7(9.6) years. There was a male preponderance in our study with around three-fourth of the patient being male. Use of tobacco in any form was profoundly seen among the study subjects, as 48% of the patients either smoked or chewed tobacco. A little less than this (40%) was seen among patients who consumed alcohol. Majority of the patients had sedentary lifestyle. The mean duration of diabetes mellitus among the study participants was 13.4 years and majority had positive family history for diabetes. All except 1 patient had BMI above the reference range. 78% of the patients were on anti-hypertensive and 66% of them had deranged lipid profile. Laboratory parameters have been detailed in [Table 1]. Clinical features of the patients at the time of presentation have been shown in details in [Table 2].

Table 1: Laboratory parameters of the study population

Biochemical index (unit)	Mean (SD)
HbA1c (%)	10.1 (4.2)
Fasting plasma glucose (mg/dl)	191 (44.3)
LDL cholesterol (mg/dl)	122 (25.3)
Triglyceride (mg/dl)	173 (48.8)
Creatinine (mg/dl)	1.2 (1.1)

Table 2: Distribution of patients based on risk factors and clinical characteristics

Clinical characteristics	N (%)
Site of lesion Toes	31 (62%)

Plantar surface	8 (16%)
Dorsum of foot	6 (12%)
Lateral aspect	1 (2%)
Multiple	4 (8%)
Skin changes	50 (100%)
Gangrene	14 (28%)
Discharge with foul smell	45 (90%)
Ulcer category (Wagner's classification)	
Grade 0	1 (2%)
Grade 1	7 (14%)
Grade 2	9 (18%)
Grade 3	12 (24%)
Grade 4	18 (36%)
Grade 5	3 (6%)
Positive history of trauma	43 (86%)
Retinopathy	23 (46%)
Neuropathy	45 (90%)
Nephropathy	19 (38%)
Peripheral vascular disease	12 (24%)
Neuropathic pain	26 (52%)
Presence of callus	35 (70%)
Presence of anhidrosis	40 (80%)
Presence of skin fissures	34 (68%)
Presence of corn	6 (12%)
Presence of cellulitis	8 (16%)
Loss of vibration	46 (92%)
Loss of 10g monofilament test	46 (92%)

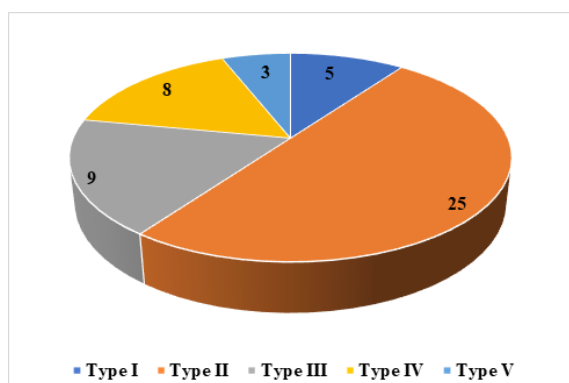


Figure 1: Pie diagram showing radiological characteristics of the study population

DISCUSSION

The current study was a hospital-based study conducted on a total of 50 diabetic foot patients. In our study, majority of participants were in the geriatric age group. This observation is similar to the findings of study by Al-Mahroos et al.^[9] Vibha et al.^[10] and Khan et al.^[11] Advancing age was significantly associated with diabetic foot in various studies.^[12,13] There was a male preponderance in our study, similar to the observation by Navarro-peternella et al.^[13] Female preponderance among diabetic patients was reported by Vibha et al.^[10] The behavioural factors associated with diabetic foot in the present study were tobacco use, alcohol consumption and lack of physical activity. Similar findings were observed by Navarro-peternella et al.^[13] Tobacco use and sedentary life style have been identified as a risk factor for diabetic foot in various studies.^[13,14] All study participants had long duration of type II diabetes (>10 years) and family history of diabetes was present in majority of them. Longer duration of diabetes was reported as a risk factor for

diabetic foot by Shahi et al.^[14] Majority of participants were overweight and obese in our study. Elevated BMI was associated with higher risk of developing diabetic foot in studies by Zantour et al and Sohn et al.^[15,16] However, Malgrange et al did not found this association.^[17]

The commonest presentation of diabetic foot in the present study was skin changes showing discolouration on the foot and ulcer which was seen in all participants (100%). Gangrenous change was seen in 42% and foulsmelling discharge from ulcer was seen in 84% of them. This is similar to the study of Apelquist et al.^[18] In the present study, the commonest site of lesion were toes involved in 62% of study participants followed by plantar aspect in 16%. The least involved sites were whole foot and lateral aspect of foot (2% each) similar to study of Apelquist et al.^[18] Ulcer categorisation was done by Wagner's classification. Grade 4 ulcer was the commonly observed ulcer in our study seen in 42% of participants and grade 5 ulcer was the least common (4%) which was similar to the study by Mehraj et al.^[19] History of trauma was present in 80% of study participants which is comparable to the findings of study by Reiber et al.^[20] In this study, neuropathy was seen in 80% of study participants, peripheral vascular disease in 40% while 20% had both these phenomena. Similar findings were reported by Khan et al.^[11] Radiographs are the primary initial imaging method for evaluation of the foot in patients with diabetes. Their easy availability and relative lack of expense makes it an easy tool to provide information on the structural deformities in Charcot's foot.^[21] While subtle fractures and dislocations are common in early stages, the reduction in the calcaneal inclination and disruption of the talo-first metatarsal angle has been well documented.^[22]

CONCLUSION

Diabetic foot is a common complication of long-standing diabetes. Several socio-demographic factors like advancing age, low socio-economic status, lack of family support, occupations involving risk of trauma to foot contribute to the risk of developing diabetic foot in diabetics. Tobacco use, sedentary life style, longer duration of diabetes, family history of diabetes, higher body mass index and uncontrolled diabetes are the behavioural and clinical risk factors for diabetic foot. Peripheral neuropathy is also an important factor in the development of foot lesions. Hence it is essential to educate all the diabetic patients at risk about good glycemic control, risk factors, proper foot care, periodic foot examination and neurological examination of lower limbs, prompt treatment of foot lesions and regular follow-up.

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