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Research Article

CLINICAL STUDY OF DIABETIC FOOT, ITS RISK FACTORS, CLINICOPATHOGENESIS, INVESTIGATIONS, AND MANAGEMENT

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ABSTRACT

Objectives: The objectives of the study are to study epidemiology and clinicopathogenesis of diabetic foot ulcers and (2) to study investigations that correlate with diabetic foot recurrence and its management.

Methods: This study was done among diabetic patients came to surgery outpatient department with complaints of ulcer, swelling, gangrene, over foot, toes/leg+foot/ankle and admitted in surgery ward of C.R. Gardi Hospital, Ujjain, Madhya Pradesh, in time period between October 2017 and November 2018. Detailed history and thorough clinical examination were done in all cases. A total of 85 cases of diabetic foot ulcers were analyzed.

Results: Out of 85 patients involved in study, peak incidence of diabetic foot ulcer is seen in age group of 51–60 years and the lowest, i.e., 3.5% of incidence seen in age group of <40 years. The most common cause of ulcer formation was trauma, i.e., 61.2% and rest 38.8% were spontaneous as patients were unaware of any injury that might have caused it. In this study, it is seen that patients with duration of diabetes 11–15 years were most consisting 40% of all patients and more than 15 years being the least with 7.2%.

Conclusion: On the basis of our study findings, we found out that most common mode of ulcer formation was due to injury rather than spontaneous. It can be due to the fact that majority of population is from rural areas and less educated and mostly involved and open-field work such as farming and laborer.

Keywords: Diabetic foot ulcer, Diabetic mellitus, Clinicopathogenesis, Investigations and management.

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INTRODUCTION

Diabetes mellitus is recognized to be common in Indians of Asian subcontinent. At present, 25 million Indians have diabetes. The projections indicate that India will have the largest number of diabetic patient by the year 2025. Diabetes continues to be one of the most common causes of non-traumatic lower extremity amputation. The loss of a limb or foot is one of the most feared complications of diabetes, and yet, foot problems for diabetic foot patients are to be hospitalized. Diabetic foot is often quite a dreaded disability, with long stretches of hospitalization and impossible mounting expenses, with ever dangling end results of an amputated limb. The phantom limb plays its own cruel joke on the already demoralized psyche. Diabetic foot is characterized by triad of neuropathy, ischemia, and infection. Diabetic patients particularly those with neuropathy have abnormal pressure points under the feet. In these areas, the skin gets thickened (called callus) which then becomes an ulcer. Chronic infection in ulcer ultimately leads to amputation of a toe or the whole foot. These two groups of patients are considered to have "High-Risk Feet" [1]. In India the prevalence of diabetic foot ulcers I the clinic population is 3.6% [2]. Sociocultural practices such as barefoot walking, religious practices such as walking on fire, use of improper footwear, and lack of knowledge regarding foot- care attributes toward increase in the prevalence of foot complications in India [3]. A retrospective study to evaluate the clinical profile of diabetic foot infection showed that the recurrence of foot infection was common among south Indian type 2 diabetic patients and was related to the presence of PVD and neuropathy. This study also showed a need for improvement in footwear and foot care education [4]. Problems associated with the diabetic foot are present all over the world though there may be regional variations in risk factors and clinical presentation. Pathogenesis of diabetic foot ulcer if we are to succeed in reducing the incidence of foot ulceration and amputation in diabetes, then a clear understanding of the various factors that interact resulting in ulceration is essential. It is important to understand that the diabetic neuropathic foot does not spontaneously ulcerate. Neuropathy is simply a component cause and it is the addition of trauma that results in tissue destruction and ulceration [5].

Objectives

The objectives of the study are to evaluate:

1. To study epidemiology, clinicopathogenesis of diabetic foot ulcers
2. To study investigations that correlate with diabetic foot recurrence and its management.

METHODS

A total of 85 patients with diabetic foot lesions were admitted in surgery ward of C.R. Gardi Hospital associated with RD Gardi Medical College, Ujjain, Madhya Pradesh, and treated during period between October 2017 and November 2018. Patients were observed under clinical features, clinicopathogenesis, mechanism of ulcer formation, age and sex of patient, occupation of patient, duration of diabetes and ulcer, grade of ulcer, investigations (blood, radiological etc.), footwear used, organisms cultured, and treatment given. Detailed history and thorough clinical examination were done in all cases. Documentation was done using pro forma which includes such as presenting complaints, demographic data, occupation, education, and regarding all clinical findings, investigations done and management given to the patient involved in this study, along with their written consent of willing to get involved in this study. Only those who are fulfilling the inclusion criteria, i.e., foot ulcer with diabetes are included in study. Appropriate treatment is given to the patients according to grading of ulcer and ulcer is graded according to signs and symptoms, on basis of X-ray of affected part, condition of artery of the affected limb local examination of ulcer such as location of ulcer, floor of ulcer, presence of slough, edge of ulcer, base of ulcer, involvement of surrounding, or underlying structures.

According to the above-mentioned features, treatment is given which includes antibiotics according pus culture and sensitivity, debridement of slough and pus, incision and drainage, fasciotomy, debridement followed by split-skin grafting, below-knee amputation, above-knee amputation, above-ankle amputation, below-ankle amputation, and toe disarticulation. Patients are advised for follow-up of 1 week after being discharged, they are also taught about foot care to prevent ulcer on foot and post-operative care of graft or wound. Patient requiring prosthesis after amputation is advised prosthesis according to need of patient and is given physiotherapy of involved limb and also taught use of crutches and artificial limb.

OBSERVATION AND RESULTS

Above table shows that out of 85 patients involved in study, peak incidence of diabetic foot ulcer is seen in age group of 51–60 years wand the lowest, i.e., 3.5% of incidence seen in age group of <40 years. The prevalence of diabetic foot is highest among males than females; among the patients included in study, it was 82.3% in males and 17.6% in females possibly due to males being involved in outdoor work more in comparison to females.

Table 1: Distribution of the patients according to age groups

Age groups (year)	Frequency, n (%)
≤40	3 (3.5)
41–50	17 (20.0)
51–60	49 (57.6)
61–70	13 (15.3)
>70	3 (3.5)
Total	85 (100.0)

Table 2: Distribution of the patients according to mechanism of ulcer

MECH of ulcer	Frequency, n (%)
Injury	52 (61.2)
Spontaneous	33 (38.8)
Total	85 (100.0)

Table 3: Distribution of the patients according to presenting as complaints

Presenting as	Frequency, n (%)
Abscess	3 (3.5)
Cellulitis	18 (21.2)
Cellulitis with ulcer	1 (1.2)
Gangrene	2 (2.4)
Ulcer	58 (68.2)
Ulcer with gangrene	3 (3.5)
Total	85 (100.0)

Table 4: Distribution of the patients according to treatment given

Treatment given	Frequency, n (%)
Amputation	3 (3.5)
Antibiotics	10 (11.8)
Below-ankle amputation	7 (8.2)
Debridement	42 (49.4)
Debridement+SSG	11 (12.9)
Fasciotomy+debridement	1 (1.2)
Fasciotomy	7 (8.2)
I and D	2 (2.4)
Ray amputation	1 (1.2)
Total	85 (100.0)

Above table shows that among the study group, the most common mechanism of ulcer formation was some sort of injury as injury as the mechanism has share of 61.2% and spontaneous ulcer has that of 38.8% among patients in study group.

Among these patients, ulcer was the most common mode of presentation of diabetic foot constituting 68.2% of all the mode of presentation and abscess and ulcer with cellulitis with ulcer being least common, constituting 1.2%.

Above table shows that among the patients in the study, most common (50%) treatment received by the patients is debridement of ulcer, and treatment is given according to grading of ulcer. Amputation is done in 11% people with below-ankle amputation being most common.

According to above table, it is concluded that as duration of diabetes increases, people tend to have more spontaneous mechanism of occurrence of diabetic foot ulcer, it may be because with increasing diabetes duration, sensations become weak mostly due to neuropathy which is one of the complications of diabetes.

Above table shows that grade 2 ulcer according to the Wagner classification is most common among the patient's and on basis of grading, the type of treatment given to the patient was decided.

DISCUSSION

This study is conducted in R.D Gardi Medical College, Ujjain, Madhya Pradesh. Patients in this region mostly hail from rural background. In our study, we have included 85 patients who are having foot ulcers along with diabetes. In the process, patients were admitted to surgery ward and a detailed history of all patient is obtained and clinical examination and patients were subjected all the necessary investigations and according to those investigations, history and examination appropriate treatment is provided. All these findings are recorded in a pro forma and a master chart is made for analysis and following results and observations were founded.

The peak incidence of diabetic foot ulcer is found in the age group of 51–60 years of around 57.6% and lowest among age group <40 years of 3.5% in our study, while according to study in University Teaching Hospital in Ajman, UAE, Manda *et al.* [6]. More than 75% of cases and controls were in age group 30–60 years. In our study, we also found that the prevalence of diabetic foot ulcer is more among males in compare,

Table 5: Association between MECH of ulcer and duration of diabetes

Duration of diabetes (years)	MECH of ulcer		Total, n (%)
	Injury, n (%)	Spontaneous, n (%)	
1–5	15 (78.9)	4 (21.1)	19 (100.0)
6–10	19 (73.1)	7 (26.9)	26 (100.0)
11–15	16 (47.1)	18 (52.9)	34 (100.0)
>15	2 (40.0)	3 (60.0)	5 (100.0)
Total	52 (61.9)	32 (38.1)	84 (100.0)

χ^2=7.911, p=0.048

Table 6: Distribution of the patients according to Wagner grade

Wagner grade	Frequency, n (%)
Grade 1	14 (16.5)
Grade 2	59 (69.4)
Grade 3	3 (3.5)
Grade 4	8 (9.4)
Grade 5	1 (1.2)
Total	85 (100.0)

in which males comprising about 82.3% and females only 17.6%. In comparison to a study by Mariam *et al*. [7] in a general hospital in Ethiopia where 55.2% were males and 44.8% were females, it may be due to the fact that in rural settings in India, majority of outdoor work is done by males.

In this study, it is found that most common cause of ulcer formation was trauma, i.e., 61.2% and rest 38.8% were spontaneous as patients were unaware of any injury that might have caused it. In Nigeria, the available hospital studies have variously shown that trauma and complications from diabetes are most common causes [8]. In our study, it is also observed that highest incidence of diabetic foot ulcer is among chappal users, i.e., 42.4% and around 27% among users of ill-fitting shoes. In a study conducted in Ethiopian hospital by Mariam *et al*., the incidence of diabetic foot ulcer is found most commonly in shoe users [7]. In Wagner's grade 2 through 5, the overall chance of local or major amputation is estimated to be around 60%. In this study, the presentation of diabetic foot was mostly in the form of an ulcer which is accounting for around 68.2% and cellulitis with ulcer being the least form of presentation accounting only 1.2%. In our study, the most common grade of lesion which presents among the patients is Wagner's grade 2 at around 69.5% in a study conducted by Ogbera *et al*. [9] in 2008 published in Int J Low Extrem Wounds 2008 Grade 2 and Grade 3 lesions of Wagner's classification were most common type of lesions which present among the studied population.

The general management and treatment of diabetic foot ulcers are multidisciplinary. Foot ulceration is a complication caused by diabetes and is invariably infected. The diabetic state, therefore, needs to be well controlled and infection should be treated effectively. Hence, infection control with appropriate antibiotics becomes a priority. Ulcer care and ulcer surgery are to be considered depending on the clinical situation and the status of diabetic control. Although a multitude approach of factors affects the healing of chronic diabetic foot ulcers, daily or more frequent cleaning and dressing are necessary requirements. Regular daily bathing in saline or dilute antiseptic solution offers a better chance of cleaning the ulcers, compared with dressing alone. There are changing perspectives in the local management of diabetic ulcers which include, apart from new dressings, skin substitutes, growth factors, and stem cells. Despite much efforts toward the treatment of diabetic foot ulcers, the incidence of lower extremity amputation rate remains about the same. Amputation is a costly outcome and should be preserved as far as possible until otherwise unavoidable. In a study conducted by Aymen *et al*., 65% of patients received debridement and primary healing 13.33% had to undergo amputation and 21.67% have skin grafting. In our study, 12.8% patients undergone amputation, 49.4% received debridement and primary healing, 13% had split-skin grafting, and 11.8% antibiotics according to organism cultured and its sensitivity.

CONCLUSION

In our study, males were more commonly affected than females, it could be due to the reason that males more involved in outdoor works than females, so they more prone for injury during work. We found out that most common mode of ulcer formation was due to injury rather than spontaneous. Ulcer due to injury consisted 61.2% of all cases while spontaneous were only 38.8%. It can be due to the fact that majority of population is from rural areas and less educated and mostly involved and open-field work such as farming and laborer. Most common mode of presentation of diabetic foot was that in form of ulcer followed by cellulitis and least common form was that of cellulitis with ulcer only about 1.2%.

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CONFLICT OF INTEREST

None declared.

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