

## Diabetic Foot: Clinical Study and Their Surgical Management in Tertiary Care Hospital

Dr. Amitabh Singhal<sup>1</sup>, Dr. Mohsin Ali<sup>2</sup>, Dr. Shaurya Bhatnagar<sup>3</sup>

<sup>1</sup> Associate Professor, Department of General Surgery, Muzaffarnagar Medical College, Muzaffarnagar, UP, India

<sup>2</sup> Associate Professor, Department of Medicine, Muzaffarnagar Medical College, Muzaffarnagar, UP, India

<sup>3</sup> Junior Resident, Department of General Surgery, Muzaffarnagar Medical College, Muzaffarnagar, UP, India

### Corresponding Author:

Dr. Shaurya Bhatnagar

Junior Resident - III

Department of General Surgery Muzaffarnagar

Medical College, Muzaffarnagar

Email: [bhatnagarshaurya10@gmail.com](mailto:bhatnagarshaurya10@gmail.com)

### ABSTRACT:

#### Background:

Diabetic foot may be a genuine and weakening complication of diabetes that affects millions of people around the world. It could be a constant condition that requires nonstop administration to anticipate dreariness and mortality.

**Aims and Objective:** The present study was aimed to clinical study and management of diabetic foot.

**Material and Methods:** This study was carried in Department of surgery and Department of Medicine, Muzaffarnagar medical college, Muzaffarnagar from June 2022 to February 2023. This study includes 380 diabetic patients who came in diabetic follow-up clinic.

#### Results:

This study was enrolled 380 patients with diabetes who came for follow-up. In this study, the prevalence of diabetic foot ulcer patients among diabetes was 14.21%. The mean age of the studied participants were 53 with 62.96% male and 37.04% female. 57.41% patient had diabetic retinopathy changes, 37.08% had the history of HTN, 20.37% patients had vascular disease, 59.26% had smoking history, 27.78% subjects on insulin, 46.30% on oral hypoglycemic drug and 25.92% patients were on both insulin and oral hypoglycemic drug. 50 (92.59%) patient had single ulcer and 04 (7.41%) patients multiple ulcer. The most common site of involvement was toe (62.97%) followed by dorsum of foot (12.96% cases).

#### Conclusion:

The prevalence of diabetic foot ulcer among diabetic patients is 14.21% Subjects. Proper education at high risk group like self-inspection, foot hygiene, use of suitable footwear, good sugar control, surveillance early recognition and prompt professional treatment are important.

**Keywords:** Diabetic Foot Ulcer, Biochemical Profile, Diabetes, Diabetic Nephropathy,

**Introduction:**

Diabetes is the leading cause of disease-related death worldwide. According to the international Diabetes Federation, 8.8 percent of the world's adults, or 425 million people, suffer from diabetes. About 72.9 million people in India suffer from diabetes and this number is expected to increase to 134.3 million by 2045.[1]

Diabetes causes three of the four most serious consequences of foot ulcers: diabetic foot ulceration, diabetic foot inflammation, and diabetic foot ischemia. Diabetic foot inflammation is the most common complication of diabetes requiring hospitalization. DFI is inflammation of the soft tissue or bone immediately below the impact. It is also the most common non-traumatic cause of non-traumatic lower limb amputation.[2]

Diabetic foot is one of the most common complications of diabetes, which can cause significant morbidity and mortality. The lifetime risk of a diabetic foot ulcer is 19-34%. The condition is caused by a combination of factors, including hyperglycemia, neuropathy, and peripheral vascular disease. Despite advances in the treatment of diabetes, the diabetic foot remains a major challenge for healthcare providers worldwide.[3]

Successful treatment of diabetic foot ulcers consists of basic things such as debridement, dressing and infection control. The main goal of treatment is to make the wound close as quickly as possible.[4] After cleaning, the wound should be washed with saline or a cleanser and a bandage should be applied. Bandages must prevent the drying of the tissues, absorb excess fluid and protect the wound from contamination.[5] Based on the finding of the wound, a wound cleaning plan is developed. The goal is physical excision of dead and diseased tissue and removal of the reservoir of potential pathogens. [6]

Other adjunctive therapies for wound care include vacuum irrigation, combined growth factors, skin substitutes, antimicrobial dressings, and deworming. osteomyelitis is the most difficult and controversial aspect. In addition, its presence increases the likelihood of surgical procedures, including amputations, and increased antibiotic therapy.[7] In this present study we sought to record the clinical profile and outcome of diabetic foot ulcer in a mixed population as it implies disability and economic burden.

**MATERIAL AND METHODS:**

The present study was carried out in the department of surgery and department of Medicine, Muzaffarnagar Medical College and Associated hospital, Muzaffarnagar from June 2022 to February 2023. All patients were examined and detailed clinical history and informed consent was taken prior to the study.

**Inclusion and Exclusion Criteria:**

All diabetic patients who came to the diabetes clinic for follow-up were included in this study. Patients with other chronic diseases such as CPOD, arthritis, liver disease, all types of cancer and patients who did not give consent were excluded from the study.

**Diagnosis of Diabetic Foot:** Diagnosing diabetic foot requires a thorough clinical examination that includes a visual inspection of the feet, evaluation of sensation and circulation, and evaluation of injuries or infections. Additional tests such as X-rays or an MRI scan may be needed to assess the extent of bone, joint or soft tissue damage.

**Anthropometric measurement:**

Age, Sex, Height, Weight, Body Mass Index, duration of diabetes, treatment history and history regarding smoking were recorded. Weight was measured in Kilogram by an electronic weighing machine (Commercial scale). Height was recorded in centimeter using a height scale.

Abdominal girth was measured using a measuring tape and was recorded in centimeter. The level of measurement was midway between lower costal margin and iliac crest which approximately correspond to mid umbilicus level. The tape was held in parallel to the floor and without compression of the skin at normal expiration.

**Blood Pressure:** The measurement of blood pressure is taken in sitting posture after resting for minimum of 10-15 minutes. Three consecutive reading were recorded at an interval 2-5 minutes on the same day or in subsequent OPDs before final conclusion of high blood pressure.

Diabetic patients with an active foot ulcer were referred to the surgical operating room for appropriate surgical treatment. Use definitions for Diabetic Foot Ulcers included hardening, ulceration, discoloration, or lesions of the normal skin of the leg lasting at least 02 weeks.

A detailed history and physical examination was performed, including duration of diabetes, type of diabetes (type I or II), duration and awareness of foot ulcers, treatment received, previous knowledge of foot care, previous healing of foot ulcers.

**Statistical Analysis:** The data were expressed in mean and standard deviation and SPSS version 21 was used. A p-value less than 0.05 were considered as statistically significant.

**Results:**

This study was enrolled 380 patients with diabetic who came to diabetic clinic for follow-up. In this study, the prevalence of diabetic foot ulcer patients among diabetes was 14.21%. The mean age of the studied participants were 53 with 62.96% male and 37.04% female. 57.41% patient had diabetic retinopathy changes, 37.08% had the history of HTN, 20.37% patients had vascular disease, 59.26% had smoking history, 27.78% subjects on insulin, 46.30% on oral hypoglycemic drug and 25.92% patients were on both insulin and oral hypoglycemic drug. (Table:-1). All the quantitative parameters are depicted in table 2.

**Table 1:- Basic characteristic of studied subject**

Parameter	Number (54)	Percentage
<b>Diabetic Nephropathy</b>		
Yes	31	57.41
No	23	42.59
<b>History of smoking</b>		
Yes	32	59.26
No	22	40.74
<b>History of Hypertension</b>		
Yes	20	37.04
No	34	62.96
<b>Presence of CVD</b>		
Yes	11	20.37
No	33	79.63
<b>Treatment history</b>		
Insulin	15	27.78
OHA	25	46.30
Both	14	25.92

**Table 2: Distribution of gender and age**

Age (Years)	Male	Female	Total
<b>41-50</b>	15	08	23
<b>51-60</b>	20	06	26
<b>61-70</b>	04	01	05
<b>Total</b>	34	20	54

**Table 3: Duration of diabetes**

<b>Duration of Diabetes (in years)</b>	<b>No. of patients</b>
<b>6-8</b>	19
<b>9-15</b>	28
<b>16-20</b>	5
<b>&gt;20</b>	2
<b>Total</b>	54

**Table 4: Types of ulcers**

<b>Sex</b>	<b>No. of patients</b>	<b>Single ulcer</b>	<b>Multiple Ulcer</b>
<b>Male</b>	34	31	3
<b>Female</b>	20	19	1
<b>Total</b>	54	50	4

**Table 5: Location of the Ulcer**

<b>Location of Ulcer/Site</b>	<b>No. of Patient</b>
<b>Toe</b>	34
<b>Dorsum of foot</b>	7
<b>Malleolus</b>	5
<b>Heel</b>	3
<b>Metatarsal Joint</b>	4
<b>Lateral Aspect of Foot</b>	1

**Discussion:**

Diabetic foot is caused by a combination of several factors, including hyperglycemia, neuropathy, and peripheral vascular disease. High blood sugar damages the nerves in the feet, causing loss of sensation, also known as diabetic neuropathy. Therefore, diabetics may not feel pain or other sensations in their feet. In addition, high blood sugar can also damage

the blood vessels, resulting in poor circulation in the legs. This reduced blood flow makes it harder for the body to heal and fight infections. [8]

In this study, 54 patients, whose age group were ranged between 51-60 years, out of which 34 male and 20 were female. Saravanan et al [9] have reported similar findings in their study.

In this study, the prevalence of diabetic foot was 14.21% with 62.96% male and 37.04% female. 57.41% patient had diabetic retinopathy changes, 37.08% had the history of HTN, 20.37% patients had vascular disease, 59.26% had smoking history, 27.78% subjects on insulin, 46.30% on oral hypoglycemic drug and 25.92% patients were on both insulin and oral hypoglycemic drug. This study is in accordance with many previous studies.[10-11]

Several risk factors increase the likelihood of developing diabetic foot, including poor blood sugar control, smoking, alcohol consumption, obesity and hypertension. Patients with a history of foot ulcers, peripheral neuropathy, or peripheral vascular disease also have an increased risk of developing diabetic foot. In addition, patients who are over 60 years of age, have long-standing diabetes or have a family history of diabetic foot are at higher risk.[12]

The commonest clinical presentation in this study is ulcer followed by gangrene and abscess. The most common site of involvement was toe, which is comparable with the study of Vanlaluklua et al,[13]

According to this study, T2DM patients with foot ulcers have elevated levels of various biochemical markers that affect quality of life. Both male and female patients with T2DM had elevated blood sugar levels according to World Health Organization (WHO) diagnostic criteria for diabetes. The adverse effects of poorly controlled PPBS levels on the arteries have been associated with either microvascular or macrovascular problems, or both. [14]

Diabetic foot management is highly dependent on proper control of diabetes. Broad spectrum antibiotics were initially used and then switched to specific antibiotics based on culture and sensitivity reports. The majority of cases were treated with debridement, regular dressing with re-epithelialization, and good prognosis. Other treatment modalities included amputation/disarticulation, and split skin graft. Some patients needed to amputate or disarticulate to heal. There were no fatalities in this study.[15]

Management of diabetic foot requires a multidisciplinary approach, involving healthcare providers from various specialties, including endocrinology, podiatry, and wound care. The use of novel therapies, such as growth factors, stem cells, and hyperbaric oxygen therapy, may also be considered to promote healing and prevent amputation. [16]

Patients with diabetic foot should monitor their blood sugar levels regularly and follow a healthy diet and exercise regimen. They should also avoid smoking and limit their alcohol intake. To reduce the risk of infections, patients should keep their feet clean and dry and wear

shoes that fit properly. They should also inspect their feet daily for any signs of injury, such as cuts or blisters. [15]

Diabetic foot prevention is important in reducing the risk and severity of foot disease. Prevention strategies include regular foot exams, foot care, exercise, quitting smoking, and controlling your blood sugar levels. Patients should wear proper shoes and avoid barefoot walking to avoid foot injuries and foot infections. [17]

### **Conclusion:**

Diabetic foot ulcer is a common complication of prolonged diabetes mellitus which increases with age of the patient and duration of the disease. Proper education at high risk group like self-inspection, foot hygiene, use of suitable footwear, good sugar control, surveillance early recognition and prompt professional treatment are important. The development of novel therapies and interventions may provide hope for improving outcomes for patients with diabetic foot. Treatment for diabetic foot focuses on managing blood sugar levels, reducing the risk of infections, and promoting wound healing. The surgical management of diabetic foot ulcers should be based on the knowledge of pathophysiology of diabetes and practice of new treatment modalities. Risk factors for diabetic foot include poor glycemic control, smoking, alcohol consumption, obesity, hypertension, and a history of foot ulcers or neuropathy.

### **References:**

1. Arora M, Mahat RK, Kumar S, Tyagi S, Batra J. Oxidative stress and its relation to glycemic control in patients of type 2 diabetes mellitus. *Int J Med Sci Public Health* 2016;5. DOI: 10.5455/ijmsph.2016.12102015177
2. Gemechu FW, Seemant F, Curley CA. Diabetic foot infections. *Am Fam Physician*. 2013;88(3):177-84.
3. Edmonds M, Manu C, Vas P. The current burden of diabetic foot disease. *J Clin Orthop Trauma*. 2021 Jun; 17: 88–93.
4. Ingrid Kruse, Evaluation and treatment of diabetic foot ulcers: *Clinical Diabetes* 2006.
5. Espensen EH, *J Am Podiatric Med Assoc* 92: 39-57, 2002.
6. Lipsky BA, *Clinic Infectid* 25: 1318-26, 1997.
7. Pecoraro RE, *Diabetes Care* 13: 513-521, 1990.
8. Schreiber AK, Nones CFM, Reis RC, Chichorro JG, Cunha JM. Diabetic neuropathic pain: Physiopathology and treatment. *World J Diabetes*.2015 Apr 15; 6(3): 432–444.
9. Saravanan K K, Ali V A M M. “Clinical Profile and Outcome of Diabetic Foot Ulcer in South Indian Tertiary Care Centre”. *Surgical Rev Int J Surg Trauma Orthoped*. 2021;7(2):01-05.
10. Shibu TS, Smitha KS, Gilsa ES, Ajith VL. Biochemical Profile in Diabetic Foot Ulcer Patients – A Descriptive Study from Kerala. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* 2017;16(1):57-9.
11. Sanghani H, Agravatt AK, Shah H, Lakhani N. Biochemical parameters and its association with quality of life in patients with diabetic foot ulcers. *MedPulse International Journal of Biochemistry*. April 2019; 10(1):16-23.

12. Singhal A, Passi MR, Kumar S. Prevalence and Biochemical Profile of Diabetic Foot Ulcer among Adult Diabetic Patients Who Attend the Diabetic Follow-Up Clinic. *International Journal of Life Sciences, Biotechnology and Pharma Research* April-June 2023;12(2):1850-54.
13. Vanlalhlua C, Sailo SL. A Clinical Study of Diabetic Foot Ulcers and Management at a New Medical College. *Ann. Int. Med. Den. Res.* 2020; 6(2):SG01-SG04.
14. Cheekurthy AJ, Rambabu C, Kumar A. Biochemical Biomarkers-Independent Predictors of Type 2 Diabetes Mellitus. *J Bioanal Biomed* 2015, 7:2. DOI: 10.4172/1948-593X.1000121.
15. Yazdanpanah L, Nasiri M, Adarvishi S. Literature review on the management of diabetic foot ulcer. *World J Diabetes.* 2015 Feb 15; 6(1):37–53.
16. Alexiadou K and Doupis J. Management of Diabetic Foot Ulcers. *Diabetes Ther.* 2012 Dec; 3(1):4.
17. Miranda C, Ros RD, Marfella R. Update on prevention of diabetic foot ulcer. *Arch Med Sci Atheroscler Dis.* 2021; 6: e123–e131.