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Original Research Article

To Observe and Evaluate the Clinical Characteristics and Outcomes of Individuals Diagnosed with Diabetic Foot Infections (DFI)

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Abstract

Aim: The study aims to find out the clinical profile and outcomes of patients with diabetic foot infections (DFI).

Methods: This prospective observational study was conducted at the Department of General Surgery, Netaji Subhas Medical College and Hospital, Bihta, Patna, Bihar, India. 200 patients with diabetes attending general surgery ward for diabetic foot ulcer management at Department of General Surgery, Netaji Subhas medical College and Hospital, Bihta, Patna, Bihar, India, included during the study period for the period of 1 year.

Results: 200 patients were diagnosed as diabetic foot. In diabetic foot, the age of patients ranged from 19 to 80 years. 42 (21%) patients were between 21 to 40 years; 86 (43%) patients were between 41 to 60 years and 36 (36%) patients were above 60 years. Out of 200 patients with diabetic foot, 180 patients were treated by debridement, in which 70 patients had deranged lipid profile and 110 had normal lipid profile. Out of 200 patients with diabetic foot, 10 patients were treated by amputation, out of which 16 patients had deranged lipid profile and 4 had normal lipid profile. Out of 200 patients with diabetic foot, 140 patients had HbA1c more than 8.5 and 60 patients had HbA1c <8.5. Mean hospital stay of patients with HbA1c> 8.5 was 10.40 days. Out of 200 patients with diabetic foot; 62 (31%) patients had pseudomonas; 46 (23%) patients had E. Coli; 42 (21%) patients had Klebsiella; 40 (20%) patients had staphylococci and 10 (5%) patients had no growth on aerobic culture media.

Conclusion: Diabetic foot pathologies are common in diabetics and pose serious health problems for developing countries. They seem to affect both sexes equally. The present study highlighted the significance of patients with DFU in tertiary care hospital in India context where diabetes is poorly controlled, there was also little awareness for foot care and delay in seeking treatment, as this will worsens the extent of tissue destruction.

Keywords: Diabetic Foot, Clinical Profile, Amputation.

Introduction

Diabetes is one of the most prevalent chronic diseases. Such a profound demographic shift is likely to yield a corresponding increase in the prevalence of diabetes chronic complications, including those in the lower extremity, the diabetic foot. [1] It is estimated that the annual population based incidence of a diabetic foot ulcer (DFU) ranges from 1.0% to 4.1%. The lifetime incidence may be as high as 25%. [2] Despite the efforts of conservative therapy, there will always be a percentage of ulcers that necessitate hospitalization. These cases may require surgical debridement, resection of distal osseous and soft tissue structure, endovascular intervention, daily dressings, strict glycemic control, and intravenous antibiotic therapy for eradication of infection. [3,4] Foot problems in diabetics can frequently be life or limb-threatening, yet have not received the same level of attention as other diabetes complications. [5]

Chronic leg and foot ulcers occur in many adults with vascular disease or diabetes and are attributed to chronic venous insufficiency, arterial disease, prolonged pressure, or neuropathy. [6] These ulcers last on average 12 to 13 months, recur in up to 60% to 70% of patients, can lead to loss of function and decreased quality of life, and are a significant cause of morbidity. [7] In India around 100,000 leg amputations are carried out per year. The life time risk of developing foot ulcer is 25% with annual incidence 2-3% in diabetic population. [8,9] There are regional differences in the prevalence of diabetes in India varying from as low as 5.3% in Central India to as high as 13.6% in Northern India. [10] Diabetic complications may be disabling or even life threatening. [11] According to the

International Working Group on the Diabetic Foot (IWGDF), a diabetic foot ulcer (DFU) is a full thickness wound penetrating through the dermis (the deep vascular and collagenous inner layer of the skin) located below the ankle in a diabetic patient. [12] Eight out of 10 non-traumatic limb amputations are attributable to diabetes, of which 85% are due to DFU. [13] The burden of diabetic foot is set to rise further in the future since its contributory factors such as peripheral neuropathy and peripheral vascular disease (PVD) are present in >10% of the cases at the time of diagnosis.

In the current study, we attempt to record the clinical profile and outcome of diabetic foot hospitalization, and to provide a report which may become a reference for further improvement in diabetic foot management in the tertiary care center.

Materials and Methods

This prospective observational study was conducted at the Department of General Surgery, Netaji Subhas Medical College and Hospital, Bihta, Patna, Bihar, India. 200 patients with diabetes attending general surgery ward for diabetic foot ulcer management at Department of General Surgery, Netaji Subhas medical College and Hospital, Bihta, Patna, Bihar, India included during the study period for the period of 1 year. Patients willing to participate in the study were enrolled. Informed consent was taken from all the patients. The study followed the Declaration of Helsinki guidelines.

Inclusion criteria:

- The patients >18 years of age with diabetic foot

Exclusion criteria:

- The patients who had deranged renal function tests.
- Previously undergone revascularization surgery or Burger's disease.

All the patients underwent detailed history including duration of diabetes, presenting features and clinical examination at baseline including details of ulcer, evaluation of palpable pulses (i.e., femoral, popliteal, anterior tibial, posterior tibial, and dorsalis pedis), and Ankle brachial index (ABI). The discharge from the ulcer was sent for microbiological examination. Patients were classified as per the IWGDF-IDSA classification into mild, moderate, and severe diabetic foot infections (DFI).[3] Ulcer size was determined by tracing the outline of the wound on a graph paper divided into 1 cm squares. The wound area was calculated by manually counting the squares within the wound. The ulcers of the patient were debrided, antibiotic was given as per culture sensitivity, and the daily aseptic dressing was done. The patients were followed up every month for 3 months. The outcome was assessed in terms of ulcer healing, readmission, minor/major amputation, and mortality during the 3 months.

Statistical Analysis

The statistical analysis was carried out using the SPSS Version 20, IBM, NY, USA. The normality of the data was checked by the Kolmogorov Smirnov test. The quantitative data were presented as mean ± SD for normally distributed data, means were compared using an independent t-test, and for skewed data/scores Mann–Whitney U-test was applied. The Chi-square test was applied for qualitative data. A value of $P < 0.05$ was considered statistically significant. The association of clinical outcome (ulcer healing, readmission, minor/major amputations, and mortality) with various parameters was computed using the Cross Tabs-Chi-square test or ANOVA. A baseline logistic regression analysis was carried out with all the parameters.

Results

Table 1: Age distribution of patients with diabetic foot and Distribution of patients according to the treatment and lipid profile

Age (in years)	Diabetic foot(n=200)	Percentage
<20	0	0%
21-40	42	21%
41-60	86	43%
>60	72	36%
Treatment (n=200)	Deranged lipid profile	Normal lipid profile
Amputation (n=20)	16	4
Debridement (n=180)	70	110

200 patients were diagnosed as diabetic foot. In diabetic foot, the age of patients ranged from 19 to 80 years. 42 (21%) patients were between 21 to 40 years; 86 (43%) patients were between 41 to 60 years and 36 (36%) patients were above 60 years. Out of 200 patients with diabetic foot, 180 patients were treated by debridement, in which 70 patients had deranged lipid profile and 110 had normal lipid profile. Out of 200 patients with diabetic foot, 10 patients were treated by amputation, out of which 16 patients had deranged lipid profile and 4 had

normal lipid profile. Patients with deranged lipid profile had increased chances of amputation.

Table 2: Mean parameters of patient according to HbA1c

Mean Parameters	HbA1c> 8.5 (n= 140)	HbA1c <8.5 (n= 60)
Mean hospital stay	10.40	7
Mean creatinine	1.70	1.25

Out of 200 patients with diabetic foot, 140 patients had HbA1c more than 8.5 and 60 patients had HbA1c <8.5. Mean hospital stay of patients with HbA1c> 8.5 was 10.40 days. Mean hospital stay with HbA1c<8.5 was 7 days. Mean serum creatinine of patients with HbA1c >8.5 was 1.70 mg/dl. Mean serum creatinine of patients with HbA1c< 8.5 was 1.25 mg/dl. The hospital stay and serum creatinine values were significantly higher in patients with HbA1c>8.5.

Table 3: Organism in Diabetic Foot

Organism	Diabetic foot(n= 200)	Percentage
Pseudomonas	62	31%
E. coli	46	23%
Klebsiella	42	21%
Staphylococci	40	20%
No growth	10	5%

Out of 200 patients with diabetic foot; 62 (31%) patients had pseudomonas; 46 (23%) patients had E. Coli; 42 (21%) patients had Klebsiella; 40 (20%) patients had staphylococci and 10 (5%) patients had no growth on aerobic culture media.

Discussion

The most common cause of soft tissue infections is Staphylococcus aureus. [14] Frequently these patients are diabetic, immune compromised, etc. Establishing the diagnosis of Necrotizing Soft Tissue Infection (NSTI) can be the main challenge in treating patients with NSTI, and knowledge of all available tools is the key for early and accurate diagnosis. [15] The skin is the largest organ of the body and, with the underlying soft tissue, which includes the fat layers, fascia and muscle, represents the majority of the tissue in the body. It acts as a tough, flexible, structural barrier to invasion. [16] Failure to do so result in an extremely high mortality rate (80 to 100%), and even with rapid recognition and intervention, current mortality rates remain approximately 30 to 50%. [17]

Abbott et al [18] reported that more than 2% of diabetic patients will develop new foot ulcers annually. The prevalence of DFU varied between 4% and 20.4% among hospital-based studies in individuals with diabetes. [19,20] According to some authorities [21,22], diabetic foot problems are responsible for 23–50% of the hospital bed occupancies by diabetic patients. Our study documented a 16.2% prevalence rate of DFU among consecutive, unselected diabetic patients admitted to the largest medical inpatients service in Semarang, Indonesia. These patients have a significant risk of poor-healing ulcers, foot infection, and LEA, which is reportedly more frequent among low socioeconomic group patients with precarious hygiene conditions. [23] 100 patients were diagnosed as diabetic foot. In diabetic foot, the age of patients ranged from 19 to 80 years. 20 (20%) patients were between 21 to 40 years; 42 (42%) patients were between 41 to 60 years and 38 (38%) patients were above 60 years. Out of 100 patients with diabetic foot, 90 patients were treated 200 patients were diagnosed as diabetic foot. In diabetic foot, the age of patients ranged from 19 to 80 years. 42 (21%) patients were between 21 to 40 years; 86 (43%) patients were between 41 to 60 years and 36 (36%) patients were above 60 years. Out of 200 patients with diabetic foot, 180 patients were treated by debridement, in which 70 patients had deranged lipid profile and 110 had normal lipid profile. Out of 200 patients with diabetic foot, 10 patients were treated by amputation, out of which 16 patients had deranged lipid profile and 4 had normal lipid profile. Patients with deranged lipid profile had increased chances of amputation. In a study by Lavery et al. duration of ulcers > 30 days was a factor related to development of a wound infection. [24] In our report, infection was present invariably in nearly all patients and Gram-negative bacteria were the most commonly isolated.

Out of 200 patients with diabetic foot, 140 patients had HbA1c more than 8.5 and 60 patients had HbA1c <8.5. Mean hospital stay of patients with HbA1c> 8.5 was 10.40 days. Mean hospital stay with HbA1c<8.5 was 7 days. Mean serum creatinine of patients with HbA1c >8.5 was 1.70 mg/dl. Mean serum creatinine of patients with HbA1c< 8.5 was 1.25 mg/dl. The hospital stay and serum creatinine values were significantly higher in patients with HbA1c>8.5. For a variety of reasons, good glucose control is not easily obtained in many Indian patients; poor drug compliance, lack of

financial resources, and poor access to medical facilities may all compound this problem. [25] Overall mean HbA1c in this study was 11.2%, higher than what Hartemann-Heutier et al. and Ozkara et al. have shown (mean HbA1c 8.7% and 10.3%, respectively). [26,27] The patients with diabetic foot having HbA1c levels> 8.5 showed increased serum creatinine levels and increased duration of hospital stay. Christman et al demonstrated that patients with HbA1c >7 have poor wound healing as compared to patient with HbA1c < 7. [28]

Out of 200 patients with diabetic foot; 62 (31%) patients had pseudomonas; 46 (23%) patients had E. Coli; 42 (21%) patients had Klebsiella; 40 (20%) patients had staphylococci and 10 (5%) patients had no growth on aerobic culture media. The hospital stay and serum creatinine values were significantly higher in patients with HbA1c>8.5. In studies from England, Tanzania, and Nigeria, the mean duration of hospital stay was 22.2, 36.2 days, and 60.3 days, respectively. [29-31] The variation from study to study might be related to differences in clinical practice, severity of illness, and availability of supportive care in their hospital. However, the relatively lower duration of hospitalization in the present study may be a result of death at early date or discharge from the hospital.

Conclusion

Diabetic foot pathologies are common in diabetics and pose serious health problems for developing countries. They seem to affect both sexes equally. The present study highlighted the significance of patients with DFU in Hospital in India context where diabetes is poorly controlled, there was also little awareness for foot care and delay in seeking treatment, as this will worsens the extent of tissue destruction. Many patients fail to receive timely and optimal care once present in the hospital. In the end, Lower Extremity Amputation is a common outcome of Diabetic Foot who was admitted to our hospital, as well as being a notable cause of morbidity and mortality.

References

1. Burrows PE, Mason KP. Percutaneous treatment of low flow vascular malformations. Journal of Vascular and Interventional Radiology. 2004 May 1;15(5):431-45.
2. GE R. Epidemiology of foot ulcers and amputations in the diabetic foot. The diabetic foot. 2001.
3. Adam DJ, Raptis S, Fitridge RA. Trends in the presentation and surgical management of the acute diabetic foot. European journal of vascular and endovascular surgery. 2006 Feb 1;31(2):151-6.
4. El-Maadawy G, Sabry A, Elden AM, Salm N, Mera M, Elkhalek HA. Different procedures in management of diabetic foot infections. Trends in Medical Research. 2010;5(1):16-30.
5. Waspadji S. Kaki diabetik: kaitannya dengan neuropati diabetik. Kaki diabetik: patogenesis dan penatalaksanaan. 1996: E1-23.
6. Richmond NA, Maderal AD, Vivas AC. Evidence-based management of common chronic lower extremity ulcers. Dermatol Ther. 2013;26(3):187-96.
7. CADTH Rapid Response Reports. Optimal Care of Chronic, Non-Healing, Lower Extremity Wounds: A Review of Clinical Evidence and Guidelines. Ottawa: Canadian Agency for Drugs and Technologies in Health; 2013.
8. Singh N, Armstrong DG, Lipsky BA. Preventing foot ulcers in patients with diabetes. JAMA. 2005;293(2):217-28.
9. Reiber GE, Vileikyte L, Boyko EJ, Aguila M, Smith DG, Lavery LA, et al. Causal pathways for incident lower-extremity ulcers in patients with diabetes from two settings. Diabetes Care. 1999;22(1):157-62.
10. Rao N, Lipsky BA. Optimising antimicrobial therapy in diabetic foot infections. Drugs. 2007;67(2):195-214.
11. Hamano K, Nakadaira I, Suzuki J, Gonai M. N-terminal fragment of probrain natriuretic peptide is associated with diabetes microvascular complications in type 2 diabetes. Vasc Health Risk Manag. 2014;10: 585-9.
12. Bakker K, Apelqvist J, Lipsky BA, Van Netten JJ, International Working Group on the Diabetic Foot. The 2015 IWGDF guidance documents on prevention and management of foot problems in diabetes: development of an evidence-based global consensus. Diabetes Metab Res Rev. 2016;32 (1):2-6.
13. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). UK Prospective Diabetes Study (UKPDS) Group. Lancet. 1998;352(9131): 837-53.
14. Vinh DC, Embil JM. Rapidly progressive soft tissue infections. The Lancet infectious diseases. 2005 Aug 1;5(8):501-13.
15. Mishra SP, Singh S, Gupta SK. Necrotizing soft tissue infections: surgeon's prospective. International journal of inflammation. 2013 Dec 24;2013.
16. Mims C, Playfair J, RoittI, et al. Medical Microbiology London Mosby Int Ltd, ISBN 0 7234 2781.

17. Charles Brunicardi F. Surgical Infections. In: Schwartz Principles of Surgery. Chapter 5. 8th edition. USA: Mc Graw Hill; 2006:93.
18. Abbott CA, Carrington AL, Ashe H, Bath S, Every LC, Griffiths J, Hann AW, Hussein A, Jackson N, Johnson KE, Ryder CH. The North-West Diabetes Foot Care Study: incidence of, and risk factors for, new diabetic foot ulceration in a community-based patient cohort. Diabetic medicine. 2002 May;19(5):377-84.
19. Bouter KP, Storm AJ, De Groot RR, Uitslager R, Erkelens DW, Diepersloot RJ. The diabetic foot in Dutch hospitals: epidemiological features and clinical outcome. The European journal of medicine. 1993 Apr 1;2(4):215-8.
20. Benotmane A, Mohammedi F, Ayad F, Kadi K, Azzouz A. Diabetic foot lesions: etiologic and prognostic factors. Diabetes & metabolism. 2000 Apr 1;26(2):113-7.
21. Smith DM, Weinberger M, Katz BP. Predicting nonelective hospitalization: a model based on risk factors associated with diabetes mellitus. Journal of General Internal Medicine. 1987 May;2(3):168-73.
22. Waugh NR. Amputations in diabetic patientsa review of rates, relative risks and resource use. Journal of Public Health. 1988 Nov 1;10(4):279-88.
23. Abbas ZG. Reducing diabetic limb amputations in developing countries. Expert review of endocrinology & metabolism. 2015 Jul 4;10(4):425-34.
24. Lavery LA, Armstrong DG, Wunderlich RP, Mohler MJ, Wendel CS, Lipsky BA. Risk factors for foot infections in individuals with diabetes. Diabetes care. 2006 Jun 1;29(6):1288-93.
25. Sutanegara D, Budhiarta AA. The epidemiology and management of diabetes mellitus in Indonesia. Diabetes research and clinical practice. 2000 Oct 1;50:S9-16.
26. Hartemann-Heurtier A, Van G H, Danan JP, Koskas F, Jacqueminet S, Golmard JL, Grimaldi A. Outcome of severe diabetic foot ulcers after standardised management in a specialised unit. Diabetes & metabolism. 2002 Dec 1;28(6 Pt 1):477-84.
27. Ozkara A, Delibası T, Selcoki Y, Fettah Arikan M. The major clinical outcomes of diabetic foot infections: one center experience. Open Medicine. 2008 Dec 1;3(4):464-9.
28. Christman AL, Selvin E, Margolis DJ, Lazarus GS, Garza LA. Hemoglobin A1c predicts healing rate in diabetic wounds. Journal of Investigative Dermatology. 2011 Oct 1;131(10):2121-7.
29. Coles DR, Coppini DV. Survey of hospital admissions related to diabetic foot disease. Diabetic Foot. 2004 Mar 22; 7:47-50.
30. Chalya PL, Mabula JB, Dass RM, Kabangila R, Jaka H, Mchembe MD, Kataraihya JB, Mbelenge N, Gilyoma JM. Surgical management of Diabetic foot ulcers: A Tanzanian university teaching hospital experience. BMC Research notes. 2011 Dec; 4:1-7.
31. Ogbera OA, Osa E, Edo A, Chukwum E. Common clinical features of diabetic foot ulcers: perspectives from a developing nation. The International Journal of Lower Extremity Wounds. 2008 Jun;7(2):93-8.