

ORIGINAL ARTICLE

Assessing the Patient Profiles of Individuals with Diabetic Foot Conditions

Uday Kumar Jain

Associate Professor, Department of General Surgery, Santosh Medical College, Ghaziabad, Uttar Pradesh, India

ABSTRACT:

The objective of the research was to analyze both the clinical and bacterial characteristics of individuals suffering from diabetic foot conditions. This comprehensive investigation spanned a two-year period and involved patients diagnosed with Diabetes mellitus. During the study, the foot ulcers were classified into two categories: mild, which were non-limb threatening, and severe, which posed a threat to limb integrity. Prior to the initial debridement procedure, wound cultures were collected, and antibiotic sensitivity testing was conducted for each case. Additionally, the study documented potential risk factors contributing to the development of these ulcers. Among the 60 cases of diabetic foot ulcers, 36 patients (62.29%) experienced non-limb threatening infections, while 24 patients (37.7%) faced limb-threatening infections. Within this group of 24 patients with limb-threatening infections, 16 individuals (60.87%) ultimately required amputation during the one-year follow-up period. The microorganisms identified from the cultures encompassed various strains, with Staphylococcus species appearing in 14 patients (28.84%), Streptococcus species in 10 patients (21.15%), Pseudomonas species in 6 patients (15.38%), Enterococcus species in 20 patients (57.69%), and anaerobic bacteria in 10 patients (51.92%).

Keywords: antibiotic sensitivity, anaerobic, limb

Corresponding author: Uday Kumar Jain, Associate Professor, Department of General Surgery, Santosh Medical College, Ghaziabad, Uttar Pradesh, India

This article may be cited as: Jain UK. Assessing the Patient Profiles of Individuals with Diabetic Foot Conditions. J Adv Med Dent Scie Res 2015;3(4):219-221.

INTRODUCTION

Diabetes mellitus has emerged as an epidemic in the Asian sub-continent, particularly impacting India where nearly 20 million individuals are affected. Among the complications of diabetes, diabetic foot ulcers are a significant concern, estimated to afflict approximately 15% of all diabetics over their lifetime. Alarming, these ulcers precede almost 80% of foot amputations (1,2).

The complex interplay of diabetes-related factors such as neuropathy, vasculopathy, and altered musculoskeletal and soft tissue mechanics contributes to elevated plantar pressure. This heightened pressure predisposes individuals to tissue damage, particularly at weight-bearing sites, culminating in non-resolving neuro-ischemic ulcers. Notably, a majority of skin injuries in diabetic patients manifest on the plantar surface, often occurring at sites experiencing the highest pressure beneath the foot (3,4). The significance of this current study becomes particularly pronounced within the Indian context. Here, the disease is often diagnosed at an advanced stage, awareness of proper foot care among patients is

limited, and there is a substantial delay in seeking medical treatment. Moreover, a considerable portion of the population resides in rural areas and engages in fieldwork without adequate footwear, which significantly heightens the risk of additional infections. In this challenging scenario, physicians are often compelled to initiate empirical treatment while awaiting culture reports. Therefore, having a preliminary understanding of the antibiotic sensitivity patterns proves to be a valuable tool for healthcare providers in their decision-making process.

METHODS

The study encompassed a cohort of 60 patients diagnosed with diabetic foot conditions, comprising both hospitalized individuals and outpatients. Prior to their inclusion in the study, each patient provided informed consent, and the study protocol adhered to the ethical principles outlined in the 1970 Declaration of Helsinki. The average age of these patients stood at 50.4 years, spanning an age range of 30 to 66 years. The study group consisted of 32 male participants and 28 female participants.

Table1: Baseline characteristics of the study group N=60

Parameters	
Age(years)	50.4+/-11.77years
Range	30-66years
Sex	32
Males Females	28
Mean duration of diabetes Foot ulcer	8.6+/-3.2years
Non-limb threatening	36 (62.29%)
Limb threatening	24(37.7%)

The classification of foot ulceration in this study was based on severity, distinguishing between mild or non-limb threatening and severe or limb-threatening ulcers. Non-limb threatening ulcers were defined as superficial ulcers with less than 2cm of cellulitis, no significant ischemia, and no bone or joint involvement, and without systemic toxicity⁴. On the other hand, limb-threatening ulcers were described as full-thickness ulcers with more than 2cm of cellulitis, severe ischemia or gangrene, bone or joint involvement, and associated systemic toxicity. Systemic toxicity was determined by the presence of clinical symptoms along with elevated markers ESR, leucocytosis and polymorpho nuclear cytolysis. The investigations in this study followed the protocol of the diabetic clinic. The tests conducted encompassed random blood sugar, fasting and post-prandial blood sugar levels, Glycosylated hemoglobin assessment, routine and microscopic urine analysis, renal function tests (including BUN and serum creatinine), liver function tests, a chest X-ray (PA view), ECG, and fundus examination. These comprehensive investigations were conducted to assess various aspects of the patients' health relevant to their diabetic condition and foot ulceration.

Each case in the study underwent a thorough assessment, including aerobic and anaerobic culture along with antibiotic sensitivity testing. Additionally, a complete blood count with ESR (erythrocyte sedimentation rate) was conducted. To further characterize the ulcers and determine any evidence of bone involvement, a probe-to-bone test was performed. Imaging studies, such as X-ray of the wound and MRI, were conducted for all patients. These comprehensive evaluations aimed to provide a comprehensive understanding of the ulcer's nature and extent, facilitating appropriate treatment decisions.

RESULTS

Among the 60 patients included in the study, wound cultures were conducted for all cases. Following an incubation period of 48-72 hours, the microbiological profile obtained from these cultures is presented in Table 2. This profile likely includes information about the types of microorganisms identified and their respective proportions in the wound cultures, shedding light on the bacterial composition associated with diabetic foot ulcers.

Table 2: Microbiological profile of patients N=60

Organism	No. of patients	Percentage
Staphylococcus sp.	14	28.84
Streptococcus sp.	10	21.15
Pseudomonas	6	15.38
Enterococcus sp.	20	57.69
Anaerobes	10	51.92

Table3: Antibiotic sensitivity pattern of patients N=60

Antibiotic	No. of patients	Percentage
Amoxicillin-clavulanic acid	57	94.23
Ceftriaxone	56	92.30
Ceftazidime	49	80.32
Cefuroxime	42	66.85
Cephalexin	33	52.09
Cephadroxil	31	50.81
Ampicillin	34	55.73
Cloxacillin	44	70.13
Co-trimexazole	46	74.40
Ciprofloxacin	52	86.24
Ofloxacin	51	83.60
Sparfloxacin	51	81.60
Chlormphenicol	55	90.16
Nitrofurantoin	52	84.24
PolymyxinB	53	89.88
Gentamycin	47	77.04
Amikacin	55	90.16

In an attempt to ascertain the potential factors contributing to the development of diabetic foot, a comprehensive investigation was carried out. A detailed patient history was collected, with a focus on relevant factors. Additionally, a thorough examination of the foot was conducted to identify pressure points on the sole. Through these assessments, efforts were

made to uncover and understand the factors that might be associated with the onset or progression of diabetic foot complications.

DISCUSSION

India is home to a staggering population of approximately 20 million individuals with diabetes,

making it the highest in the world. Alarming, nearly 15% of these individuals suffer from the serious complications associated with diabetic foot (5). Diabetics in India face a unique set of challenges due to sociocultural practices, such as walking barefoot, engaging in religious practices like walking on fire, using inadequate footwear, and a lack of awareness regarding proper foot care. These factors collectively contribute to the heightened prevalence of diabetic foot complications in the country, presenting a significant healthcare concern. Diabetic foot ulcers don't develop spontaneously but result from a complex interplay of various factors. These include neuropathy, autonomic neuropathy, peripheral vascular disease, along with changes in plantar pressure, inadequate footwear, and restricted joint mobility. Furthermore, cell-mediated immunity is particularly affected, leading to abnormalities in key immune cells such as polymorphonuclear leukocytes (PMNL), monocytes, and lymphocytes. These abnormalities manifest in impaired functions like adherence, chemotaxis, phagocytosis, oxidative burst, and intracellular killing, collectively contributing to the development and exacerbation of diabetic foot ulcers.

In addition to the noted abnormalities in innate immunity, adaptive cellular immunity is also impacted, leading to a reduced lymphocyte proliferative response to stimuli like *Staphylococcus aureus*. In the current study, the isolation of *S. aureus* was observed in nearly 14% of patients, a significant finding. The culture yield was enhanced by obtaining deep wound samples, which likely contributed to this observation. Interestingly, similar patterns of microbial growth have been reported in other studies, such as the one conducted by Lipsky et al (1). However, in our study, Enterococcus species and anaerobic bacteria were the most prevalent among the isolated microorganisms. In our study, it was found that ill-fitting shoes and shoe-related conditions were more common contributors to diabetic foot issues than the habit of walking barefoot. This prevalence may be attributed to the hilly terrain, economic challenges, and the improper distribution of pressure on the sole

associated with traditional footwear. Additionally, the relatively cooler climate in the region discourages barefoot walking. Trivial trauma and ingrown nails accounted for approximately 20% of these cases. Interestingly, in 5 cases (8.19%), no specific cause for diabetic foot issues could be definitively identified.

CONCLUSION

Enterococcus species, Staphylococcus species, and anaerobic bacteria were identified as the predominant culprits behind the majority of foot ulcers in this study. Importantly, these microorganisms displayed sensitivity to conventional antibiotics, suggesting no significant evidence of antibiotic resistance. Therefore, the empirical use of these antibiotics, whether administered orally or by injection (depending on the type of foot ulcer), is justified. Additionally, it is strongly recommended to provide proper education to patients on the importance of appropriate footwear and foot care to prevent and manage diabetic foot ulcers effectively^{6,7}.

REFERENCES

1. Lipsky BA. Evidence based antibiotic therapy of diabetic foot infections. *FEMS Immunology and Medical Microbiology* 1999 ; 26 : 267.
2. Deresinski S. Infections in diabetic patients: Strategies for clinicians. *Infectious Disease Reports* 1995 ; 1 : 1.
3. Lipsky BA. Osteomyelitis of the foot in diabetic patients. *Clin Infect Dis* 1997 ; 25 : 1318.
4. Pendsey SP. Epidemiological aspects of diabetic foot. *Int J Diab Dev Countries* 1994; 14 : 37-38
5. Boulton AJM. The pathway to ulceration: Aetiopathogenesis. Boulton AJM, Conner H, Cavanagh PR (eds). *The Foot in Diabetes*. 3rd edition. John Wiley and sons Ltd, Chichester, West Sussex: 2000 ; pp 19-31.
6. Reiber GE, Vileikyte L, Boyke EJ. Asual pathways for incident lower extremity ulcers in patients with diabetes from two settings. *Diabetes Care* 1999 ; 22 : 157-162.
7. Caputo GM, Cavanagh PR, Ulbrecht JS *et al*. Current concepts: Assessment and management of foot disease in patients with diabetes. *N Eng J Med* 1994 ; 331 : 854.