



## A STUDY ON THE PRESCRIPTION PATTERN OF ANTIMICROBIALS FOR TREATING DIABETIC FOOT ULCER

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### ABSTRACT

**Aim:** The study aimed to analyse the epidemiology, antibiotic prescribing patterns, bacterial isolates, and clinical outcomes associated with diabetic foot ulcers (DFUs) to optimize treatment strategies.

**Methods:** A prospective observational cross-sectional study was conducted at Government Cuddalore Medical College and Hospital over six months. Data from DFU patients receiving antibiotic therapy were analysed for demographics, diabetes duration, antibiotic prescriptions, bacterial isolates, and clinical outcomes. **Results:** Among 80 DFU cases, 85% were male, predominantly aged above 60 with varied diabetes durations. Cefotaxime was the most prescribed antibiotic (46%), and *Pseudomonas aeruginosa* predominated among gram-negative bacteria (52%). Cefotaxime was common for gram-negative infections during hospitalization (30%), while linezolid prevailed for gram-positive infections (75%). Mono antibiotic therapy was common for gram-negative infections upon discharge (90%). Cephalosporins were frequently prescribed, and amputation was the primary clinical outcome (52%). **Conclusion:** The study highlights a significant gender disparity in diabetic foot ulcer (DFU) cases, predominantly affecting elderly males with varying diabetes durations. Cefotaxime was commonly prescribed, with *Pseudomonas aeruginosa* being the predominant gram-negative bacterium. Dual therapy, especially with cephalosporins, was prevalent for treating gram-negative infections, providing insights for optimizing DFU treatment strategies.

**KEYWORDS :** Diabetic foot ulcers, antibiotic prescribing patterns, bacterial isolates, clinical outcomes

### INTRODUCTION

Diabetes mellitus (DM) is a global health concern, projected to affect 552 million adults by 2030, with India facing a staggering rise to 142.7 million cases by 2035. Despite medical advancements prolonging diabetic lives, complications such as foot disorders remain significant contributors to morbidity. Foot ulcers affect about a quarter of diabetic individuals, with infections posing severe risks, including limb amputation if not promptly treated. The Wagner-Meggitt and University of Texas classification systems aid in assessing these ulcers, guiding treatment strategies. However, the emergence of multidrug-resistant organisms has heightened the challenge of diabetic foot infections (DFIs), necessitating careful antibiotic selection. Empirical antimicrobial therapy, informed by local epidemiological data, is often initiated due to the urgency of DFIs. Standardized antibiotic guidelines, like those provided by the International Working Group on the Diabetic Foot, are vital for effective DFI management. This study aims to optimize antimicrobial prescription patterns for diabetic foot ulcers by aligning with evidence-based guidelines and local epidemiological insights. Establishing standardized approaches to DFI management is crucial for improving patient outcomes and combating the escalating threat of multidrug-resistant organisms in diabetic foot infections.

### Methodology

**Study site:** Department of surgery, Government Cuddalore medical college and hospital (GCMCH), a tertiary care hospital. Study period: September 2023-February 2024 (6 months)

**Study tool:** Proforma, Source of study: The case sheets of inpatients in GCMCH.

**Study design:** Prospective observational cross-sectional

study.

**Study recruitment:** Recruited based on the inclusion and exclusion criteria. Inclusion Criteria are patients diagnosed with diabetic foot ulcers, Age 18 years and above, both male and female. Patients prescribed with antibiotic therapy for treatment. Exclusion Criteria are Patients with DM but no diabetic foot ulcers. Patients with other ulcers. Patients with incomplete data

**Study procedure:** The study procedure involves subject selection based on inclusion/exclusion criteria. Demographic and treatment data, including microbial cultures and antibiotics, will be extracted from medical records. Analysis using descriptive statistics via Microsoft Excel will be conducted, followed by interpretation of results based on collected data.

### RESULTS

In the study of 80 diabetic foot ulcer cases, a significant gender disparity was observed, with 85% being male. Age-wise distribution shows 45% occurring in individuals aged 30-45, 15% in 46-60, and the majority (50%) in those over 60, emphasizing increased risk with older age.

#### Duration Of The Disease (TYPE II Diabetes Mellitus)

Half of the patients exhibited a duration of type 2 diabetes mellitus spanning 1 to 5 years, while 20% had a duration exceeding 10 years. Fifteen percent of the patients had diabetes for less than one year, and an additional 15% had a duration ranging from 6 to 10 years.

#### Antibiotics Prescribed In The Treatment Of DFU

Most prescribed antibiotics in diabetic foot ulcer is cefotaxime 46%. Then ofloxacin and gentamycin are commonly given about 12%. Other antibiotics like ciprofloxacin (9%),

metronidazole (8%), linezolid (6%), amikacin (6%), ceftriaxone (5%), piperacillin tazobactam (4%) are prescribed in the treatment of diabetic foot ulcer (fig:1).

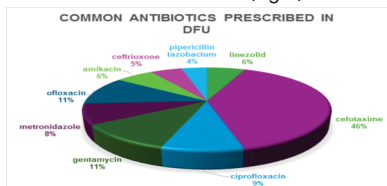


Figure: 1 Common antibiotic prescribed in DFU.

**Bacterial Isolates In Diabetic Foot Ulcers**

The predominant gram-negative bacteria found in diabetic foot ulcer is *Pseudomonas aeruginosa* (52%). The other gram-negative bacteria found in diabetic foot ulcer were *Klebsiella sp.* (26%), *E. coli* (10%) and *Proteus sp.* (10%). The only gram-positive organism found in this study from the cases collected is *Staphylococcus aureus*.

**Antibiotics Prescribed For Gram Negative Bacteria During Hospital Stay And At Discharge**

During hospitalization, cefotaxime (30%) and ofloxacin (16%) were the most prescribed antibiotics for gram-negative bacteria, followed by gentamycin and metronidazole (each at 11%). Dual therapy was prevalent (52%), while 21% received monotherapy. At discharge, cefotaxime remained dominant (45%), followed by ofloxacin (25%). Amikacin (15%), gentamicin (10%), and ciprofloxacin (5%) were also prescribed (Table :1). Monotherapy was common (90%) at discharge, with only 10% receiving dual antibiotic therapy. These findings highlight treatment dynamics in managing gram-negative diabetic foot ulcers, with a shift towards monotherapy upon discharge.

**Antibiotics Prescribed For Gram Positive Bacteria During Hospital Stay And At Discharge**

During hospitalization, linezolid was the predominant antibiotic prescribed for gram-positive bacteria, accounting for 75% of cases. Cefotaxime was administered in the remaining 25% of cases as an alternative treatment option (Table :1). All the patients with diabetic foot ulcer who are infected with gram positive organism received dual antibiotic therapy during their hospital stay. Mostly all the patients prescribed with gram negative bacteria in diabetic foot ulcer at discharge is prescribed with cefotaxime antibiotic. All the patients with diabetic foot ulcer who are infected with gram positive organism received mono antibiotic therapy at discharge.

Table :1 Types of antibiotics prescribed.

Type of Bacterial species	Antibiotics prescribed at hospital stay	Antibiotics prescribed at discharge
Gram negative	Linezolid – 4% Cefotaxime – 30% Ceftriaxone – 2% Ciprofloxacin – 9% Gentamycin – 11% Amikacin – 7% Metronidazole – 11% Ofloxacin – 16% Piperacillin Tazobactam – 4%	Cefotaxime – 45% Ciprofloxacin – 5% Gentamycin – 10% Amikacin – 15% Ofloxacin – 25%
Gram positive	Cefotaxime – 25% Linezolid – 75%	Mostly Cefotaxime antibiotic is prescribed

**Class Of Antibiotics Prescribed In Both Gram Positive And Negative Bacterial Sp:**

In diabetic foot ulcers (DFU) with *Pseudomonas infection*, cephalosporins dominated prescriptions at 43%, followed by nitroimidazole antibiotics at 18%. Aminoglycosides and

fluoroquinolones each accounted for 12%, while quinolones and oxazolidinones stood at 6%. For *Klebsiella sp.* infection, cephalosporins were prescribed in 42% of cases, with aminoglycosides mirroring this percentage, and oxazolidinones used in 14%. Cephalosporins and quinolones dominated again in *Proteus sp.* cases at 50%, while quinolones and fluoroquinolones each accounted for 25%. For gram-positive *Staphylococcus aureus* infections, cephalosporins and oxazolidinones were the primary choices (Table:2).

**Clinical Outcome Of Diabetic Foot Ulcer With Infection**

Clinical outcome of the patients who are diagnosed diabetic foot ulcer with gram positive or negative infection are mostly amputation 52%. 42% of the cases are conservative management.

Table :2 Class of antibiotics prescribed.

Bacterial species	Class of antibiotics prescribed					
	Cephalosporin	Nitroimidazole	Oxazolidinone	Fluoroquinolones	Aminoglycosides	Quinolones
<i>Pseudomonas aeruginosa</i>	43%	18%	6%	12%	12%	6%
<i>Klebsiella sp.</i>	42%	-	14%	-	42%	-
<i>Escherichia coli</i>	99%	-	-	-	-	-
<i>Proteus sp.</i>	33%	-	-	33%	-	33%
<i>Staphylococcus aureus</i>	99%	-	-	-	-	-

**DISCUSSION**

In this study of 80 cases of diabetic foot ulcers, a notable gender imbalance was evident, with males comprising 85% and females only 15%, aligning with previous findings [1]. Most patients were aged above 60 (45%), followed by 40% aged between 46-60, and only 15% aged 30-45, consistent with prior research. Regarding diabetes duration, 50% had diabetes for 1-5 years, 20% for over 10 years, 15% for less than a year, and another 15% for 6-10 years. This distribution mirrors previous studies, notably Gregg EW et al. and Gadepalli et al., [1,2] emphasizing the chronic nature of diabetic foot ulcers, particularly in older males. Recent studies indicate a shift in diabetic foot infection causative agents towards gram-negative bacteria, with *Pseudomonas aeruginosa* being predominant (52%) [5]. Antibiotic prescriptions during hospitalization favored cefotaxime (30%) for gram-negative infections and linezolid (75%) for gram-positive cases. At discharge, cefotaxime (45%) and ofloxacin (25%) were top choices for gram-negative infections. Cephalosporins were frequently prescribed for *Pseudomonas aeruginosa* (43%) and *Proteus sp.* (50%) infections. Clinical outcomes revealed amputation in most cases (52%), highlighting the severity of diabetic foot ulcers. These insights into bacterial isolates, antibiotic prescribing patterns, and clinical outcomes provide guidance for optimizing diabetic foot infection treatment strategies and improving patient outcomes.

**CONCLUSION**

This study of 80 cases of diabetic foot ulcers revealed a striking gender disproportion, with males representing 85% of cases. Most patients were aged above 60 (45%), followed by those aged 46-60 (40%), and a smaller proportion aged 30-45 (15%). Cefotaxime was the most prescribed antibiotic (46%), with *Pseudomonas aeruginosa* as the predominant gram-negative bacterium (52%). During hospitalization, cefotaxime was common for gram-negative infections (30%), while linezolid prevailed for gram-positive infections (75%). Dual therapy was administered to 52% of gram-negative cases, with all gram-positive cases receiving it. Mono antibiotic therapy was common for gram-negative infections upon

discharge (90%). These insights are useful for optimizing diabetic foot ulcer management.

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