

**A PROSPECTIVE STUDY ON BACTERIOLOGY AND PRESCRIBING PATTERN OF ANTIBIOTICS IN DIABETIC FOOT ULCER PATIENTS AT A TERTIARY CARE HOSPITAL.**Anjali George<sup>\*1</sup>, Ansu Anna Dan<sup>1</sup>, Babitha Annie Eapen<sup>1</sup>, Chaithra S<sup>1</sup>, Menaka<sup>2</sup> and Sivakumar.T<sup>3</sup><sup>1</sup>Pharm D Interns Department of Pharmacy Practice, Nandha College of Pharmacy, Erode-52.<sup>2</sup>Lecturer, Department of Pharmacy Practice, Nandha College of Pharmacy, Erode-52.<sup>3</sup>Principal, Nandha College of Pharmacy, Erode-52.**\*Corresponding Author: Dr. Anjali George**

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**ABSTRACT**

Diabetes mellitus is a disease caused by deficiency or diminished effectiveness of endogenous insulin. Our study aims to find out the most common microorganism in the infected diabetic foot and the prescribing pattern of antibiotics in treating the diabetic foot ulcer in a tertiary care hospital. This is a prospective observational study conducted in surgery department of a tertiary care hospital for a period of 3 months (March-May 2016). The predominant micro-organisms isolated were Staphylococcus aureus and Escherichia coli (22 and 20 cases respectively). Out of 74 patients included in our study 26 were under monotherapy 20 had two antibiotic drug combination 23 had three antibiotic combination and 5 were more than three antibiotic drug combination. These finding encouraged for the development of a fixed antibiotic regimen for treating the diabetic foot ulcer patients empirically.

**KEYWORDS:** Antibiotics, Culture & Sensitivity, Diabetic Foot Ulcer, Resistance.**INTRODUCTION**

Diabetes mellitus is a disease caused by deficiency or diminished effectiveness of endogenous insulin. It is one of the most common disease globally with a prevalence rate of about 8% in 2011 and predicted to show an increase in upcoming years.<sup>[1]</sup> According to clinical guideline for diabetes mellitus all patients should be screened annually to found their risk for foot ulceration. Many infections are seen more frequently in diabetes and they are indications of poor diabetic control. Foot ulcers can be divided into two categories :1)Classical neuropathic ulceration ,which occurs on the sole of the foot. These ulcers can be deep but they are painless. 2) Ischaemic ulcers which are classically painful usually occur on the distal ends of the toes.<sup>[2]</sup> A variety of foot lesions seen in patients with uncontrolled diabetes mellitus include fissure, abscess, cellulitis, ulcer, claw toes and Charcot's joints.<sup>[3]</sup> Diabetic patients have at least 10-fold greater risk of being hospitalized for soft tissue and bone infection of foot than individual without diabetics.<sup>[4]</sup> The largest non-traumatic cause of lower extremity amputation in diabetic patients is due to lower limb infections. This may be accounting for about 90,000 amputation per year.<sup>[5]</sup> In patients with diabetic foot, impairs micro-vascular circulation which limit the access of phagocytes, thus causes the development of infection.

The local injuries and use improper foot wear reduce the blood supply in the lower extremities.<sup>[6]</sup> Diabetic foot infections are predominantly polymicrobial with a combination of gram positive and gram negative aerobes and anaerobes.<sup>[7]</sup> Bacterial species isolated from patients with diabetic foot infections include S.aureus, S.epidermidis, E.coli, P.aureginosa, Proteus mirabilis, Klebsiella pneumoniae etc. The main component for the management of diabetic foot may include various methods. Removal of callus skin with a scalpel is the best method. Appropriate treatment with antibiotic should be provided for local infection, and it should be continued for a protracted period of time.<sup>[8]</sup> Our study aims to find out the most common microorganism in the infected diabetic foot and the prescribing pattern of antibiotics in treating the diabetic foot ulcer in a tertiary care hospital.

**MATERIAL AND METHODS**

This is a prospective observational study conducted in surgery department of a tertiary care hospital for a period of 3 months (March-May 2016). The antibiotic prescribing patterns of diabetic foot ulcer for both sexes and all ages were considered in our study.74 diabetic patients with foot ulcers were included. Diabetic charts

and culture sensitivity reports of the patients were checked.

### Antibiotic Susceptibility

All diabetic foot ulcer patients were empirically treated. After getting the culture and sensitivity report all patients were prescribed with the sensitive antibiotics. Mostly all the antibiotics were given for mostly seven days and it extends depends on the depth and healing of the ulcers. For testing the culture and sensitivity, samples were collected from the deeper portion of the ulcers using the sterile swabs and sent it for the microbiological laboratory. Antibiotic susceptibility testing done by using disc diffusion method against selected antibiotics; Amikacin, ampicillin/cloxacillin, augmentin,

cefotaxim,ceftriaxone SB, cephalixin, Ciprofloxacin, clindamycin, clotrimazole, colistin, doxycycline, gentamycin, imipiramin, metronidazole, ofloxacin, vancomycin.

### RESULTS AND DISCUSSION

74 specimens were obtained from 48 males and 26 females. All of the patients in our study age ranged between 30 and 85 years. Higher incidence of Diabetic foot ulcer was noted among the patients in the age range of 51-60 years. The bacterial growth patterns of the culture positive cases and percentage of bacterial isolates from infected foot ulcers were represented in the table 1 & 2.

**Table 1: Growth patterns in culture of foot ulcers samples of 74 patients.**

CULTURE REPORTS	NUMBER OF CASES	PERCENTAGE (%)
POSITIVE CULTURE	70	94.5
PURE BACTERIAL GROWTH	68	92
MIXED GROWTH	2	2.7
NO GROWTH	4	5.4

**Table 2: Percentage of bacterial isolates from infected foot ulcers.**

Bacterial isolates	Number of bacterial isolates	Percentage
Gram positive		
Staphylococcus aureus	25	35.7%
Streptococcus species	10	14.2%
MRSA	2	2.8%
Gram negative		
Escherichia coli	20	28.5%
Pseudomonas aeruginosa	6	8.5%
Klebsilla Pneumonia	5	7.1%
Mixed growth		
Klebsilla pneumonia + E.coli	2	2.8%

The predominant micro-organisms isolated were Staphylococcus aureus and E.coli (22 and 20 cases respectively).The most common isolated microorganism from deeper lesion of our study were gram positive micro organism in accordance with the previous studies in other countries conducted by Candel et al and Abdul Razak et al.<sup>[9,10]</sup> Similar studies carried out in India by Gadepalli et al and Raja NS et al showed that Proteus and Pseudomonas aeruginosa were the most frequently isolated bacteria.<sup>[11,12]</sup> Difference in the geographical study setting might be the reason for this. No growth were observed in four of our cases.

In the present study, we isolated 52.7% of gram positive microbes which constitutes 35.7 % staphylococcus aureus, 14.2% streptococcus species, 2.8%MRSA and 44.1 % of gram negative organisms comprised of 28.5% of Escherichia coli ,8.5% Pseudomonas aeruginosa and 7.1% Klebsilla pneumonia. In two cases we observed polymicrobial growth (Klebsilla pneumonia and E.coli).

The diabetic foot ulcer is known for polymicrobial infections, but here there was a preponderance of monomicrobial infections and the result were slightly similar to the study on the microbial pattern of soft tissue infection in diabetic patients study by Dhanashekar et al.<sup>[13]</sup> In contrast to our study, the research carried out by Mehta et al concluded that gram negative bacilli as the most common bacteria with pseudomonas aeruginosa as the predominant organism in 27% of the total isolates obtained.<sup>[14]</sup> Our results supported by the Hena et al ,they isolated S.aureus as the common organism (43.2%).<sup>[15]</sup> All patients in our research were Wegeners classification of diabetic foot ulcer grade 1 and 2. So there were no anerobic species isolated.

Two of our isolates were mixed infection culture, in which they showed high resistance to ciprofloxacin and sensitive to third generation cephalosporins. Almost all strains of staphylococcus isolated were sensitive to cephalosporins antibiotics and vancomycin where 6 of

them shows resistance to fluoroquinolones. Alvali et al reported that *S.aureus* was 91% sensitive to ciprofloxacin.<sup>[16]</sup> We stated that two isolates of MRSA were sensitive to vancomycin but resistant to cefotaxim. *E.coli* shows much resistance to third generation cephalosporins and fluoroquinolones but sensitive to vancomycin and linezolid. As the study conducted in a tertiary care setting there was a chance of wide spread usage of antibiotics leading to the isolation of resistant strains. Our study supported by Sivaraman et al. In contrary to this, Hena et al reported that *e.coli* showed higher sensitivity to third generation cephalosporins. *Pseudomonas aeruginosa* shows a greater resistance to cephalosporins class of antibiotics and sensitive to colistin as agreed by the study of Priyadarshini et al, in which it showed resistance to gentamycin third and

fourth generation cephalosporins.<sup>[17]</sup> Initially the patient were treated empirically, after getting the culture and sensitivity report, appropriate antibiotic regimen should be started. Course of the therapy depends on the depth and healing of the infection. Wound debridement was done to all patients.

Out of 74 patients included in our study 26 were under monotherapy 20 had two antibiotic drug combination 23 had three antibiotic combination and 5 were more than three antibiotic drug combination and were depicted in Table 3. Zachariah et al, reported that 34.52% prescriptions had antibiotic monotherapy and 5.95% prescriptions were more than three antibiotic drug combinations.<sup>[4]</sup>

**Table 3: Pattern of use of antibiotics in diabetic foot ulcer patients.**

S.no	Prescribing pattern	No:of prescription	Percentage of prescription
1	Monotherapy	26	35.13%
2	Two drug combination	20	27.02%
3	Three drug combination	18	24.32%
4	More than three drug combination	10	13.51%

## CONCLUSION

These findings encouraged for the development of a fixed antibiotic regimen for treating the diabetic foot ulcer patients empirically. Most of the patients were from lower socio economic strata there will be a risk of developing gangrene and higher chances of amputation of the foot. Here comes the role of the clinical pharmacist who does properly counseling about diabetic foot care and selecting the antibiotics which are rational. Today India faces lot of setbacks in the irrationality of drug use, especially in the prescription pattern of antibiotics. The rational use of drug requires five R's. Right drug, right dose, right route, right frequency and of right duration, moreover it should be lowest cost to them and their community.

## REFERENCES

1. Shamima Aktar, Mizanur M, Sarah Krull, Sultana. Bulletin of the WHO., 2014; 92: 204-213.
2. Roger Walker, Clive Edwards. Clinical Pharmacy and Therapeutics. Churchill Livingstone. Third Edition., 2003; 661-676.
3. Reginald Alex, Benjamin Ratnaraj, Jacob KS. Risk factors for foot ulcers in patients with diabetes mellitus – A Short report from Vellore. Indian Journal of Community Medicine., 2010; 35(1): 183-185.
4. Zachariah Thomas, Kambala Narendra, Ayyappa swamy, Mahedravaran, Senthilvelan. Study on drug utilization, prescribing pattern and use of antibiotics in the management of diabetic foot ulcer. International Journal of innovative pharmaceutical sciences and research., 2015; 3(8): 1037-1049.
5. Wilbian Xavier, Mangalanandan Sukumaran T, Gopi Chellan. Emergence of multi drug resistant bacteria in diabetic patients with lower limb wounds. The Indian Journal of Medical research., 2014; 140(3): 435-437.
6. Nora A, Manal M, Magda H, Maha M. Bacteriology of diabetic foot ulcer among an Egyptian population: A retrospective study. World Journal of Medical Sciences., 2014; 10(4): 494-502.
7. Swarna SR, Radha Madhavan, Gomathi S, Thamaraiselvi. A study of biofilm on diabetic foot ulcer. International Journal of Research in Pharmaceutical and Biomedical Sciences., 2012; 3(4): 1809-1814.
8. Nicki Colledge R, Brian Walker R, Stuart Ralston H. Davidson's Principles & Practice of Medicine. Churchill Livingstone. 21<sup>st</sup> Edition., 2010; 818.
9. Candel Gonzalez, Alramadan, Matesanz, Diaz, Gonzalez Romo, Candel. Infections in diabetic foot ulcers. Eur J Int Med., 2003; 14: 341-3.
10. Abdulrazak, Bitar, Al-Shamali, Mobasher. Bacteriological study of diabetic foot infections. J Diabetes Complications., 2005; 19: 138-41.
11. Gadepalli, Dhawan, Sreenivas, Kapil, Ammini, Chaudhry. A clinico-microbiological study of diabetic foot ulcers in an Indian tertiary care hospital. Diabetes Care., 2006; 29: 1727-32.
12. Raja NS. Microbiology of diabetic foot infections in a teaching hospital in Malaysia: a retrospective study of 194 cases. J Microbiol Immunol Infect., 2007; 40: 39-44.
13. Dhanasekaran, Sastry, Mohan. Microbial pattern of soft tissue infections in diabetic patterns in south

- india. Asian journal of Diabetology., 2003; 5(5-6): 8-10.
14. Vaidehi Mehta, Kunjan Kikani, Sanjay Mehta. Microbiological profile of diabetic foot ulcers and its antibiotic susceptibility pattern in a teaching hospital. International Journal of Basic Clinical Pharmacology., 2014; 3(1): 92-95.
  15. Vimalin Hena, Growther. Studies on Bacterial Infections of Diabetic Foot Ulcer. Afr J Cln Exper Microbiol., 2010; 11(3): 146-9.
  16. Alvalii, Khosravi, Sarami, Dashtebozorg, Montazeri. Bacteriologic. Study of diabetic Foot ulcer. Pak J Med Sci., 2007; 23: 681-4.
  17. Priyadarshini Shanmugam, Jeya, Linda Susan. The bacteriology of diabetic foot ulcers, with a special reference to multidrug resistant strains. Journal of clinical and diagnostic research., 2013; 7(3): 441-445.