



ORIGINAL RESEARCH PAPER

General Surgery

A STUDY ON PROSPECTIVE MONITORING AND ANALYSIS OF DIABETIC FOOT INFECTIONS AT A TERTIARY CARE HOSPITAL

KEY WORDS: Diabetic foot infection, Swab culture method, Kirby Bauer disc diffusion method, Anti-microbial therapy.

Dr.P.Vinay	Assistant Professor, Department of General Surgery, Government Medical College, Kadapa, Andhra Pradesh, India-516002.
Dr.Devireddy Sreedhar Reddy*	Assistant Professor, Department of General Surgery, Government Medical College, Kadapa, Andhra Pradesh, India-516002.*Corresponding Author
Dr.P.Venkata Ramana	Assistant Professor, Department of Pharmacy Practice, P.Rami Reddy Memorial College of Pharmacy, Kadapa, Andhra Pradesh, India-516002.
K.Sravani	Pharm-D Intern, Department of Pharmacy Practice, P.Rami Reddy Memorial College of Pharmacy, Kadapa, Andhra Pradesh, India-516002.

ABSTRACT

Background: Diabetic foot infection is one of the most devastating complication in diabetic patients leading to frequent hospitalization and increased mortality. The increasing antibiotic resistance in the present scenario could be because of several reasons like improper empirical antibiotic usage without prior tissue cultures/sterile swab cultures, antibiotic sensitivity patterns. **MATERIALS AND METHODS** A prospective interventional study was conducted in patients with diabetic foot infection at a tertiary care hospital. Patient data relevant to the study was obtained using a standard data collection form designed. Pus samples were collected for bacterial culture from 70 patients by swab culture method and processed for isolation, identification of pathogens. The antibiotic sensitivity of the isolates was done by Kirby Bauer disc diffusion method. **RESULTS:** Out of 70 samples single organism was isolated from 57(81.42%) patients, 9(12.85%) patients got resistance to all the antibiotics and 4(5.71%) patients did not show any bacterial growth. In this study gram negative organisms were isolated frequently (68.18%) than gram positive organisms (31.81%). Klebsiella Spp., (36.4%) and E.coli (19.7%) were the predominant gram negative bacilli isolated whereas Coagulase Negative Staphylococci(21.2%) was more predominant in gram positive organisms. Among gram negative isolates 48.6% were susceptible to Amikacin followed by Gentamycin (42.8%). Gram positive isolates were susceptible to Ofloxacin(25.71%) followed by Imipenem (11.42%). **CONCLUSION** Diabetic foot infections are a severe complication of diabetes Diabetic foot lesions and one of the most common causes of hospitalizations. In order to provide safe and effective management there is need to isolate microbial cause, perform the culture sensitivity test within 24-48hrs, administer appropriate antibiotics and monitor the outcome.

INTRODUCTION

Diabetes is the leading cause of end-stage renal disease, adult-onset blindness and non traumatic lower extremity amputations resulting from atherosclerosis of the arteries. Diabetic foot is defined as the foot of diabetic patients with ulceration, infection and or destruction of the deep tissues, associated with neurological abnormalities and various degrees of peripheral vascular disease in the lower limb (1). Usually 20% of hospital admissions are due to diabetic foot ulcers in India. Risk factors for diabetic foot infections include General or systemic contributions and Local issues (3,4). Causative organisms of diabetic foot infection includes aerobic gram-negative bacilli, usually Escherichia coli, Proteus, Klebsiella and Enterobacter are frequently isolated from diabetic foot infection and gram-positive includes staphylococcus and streptococcus species. The most frequent anaerobic isolates are peptococci and peptostreptococci and less often Bacteroides species (7,8,9). Recognizing these isolates requires obtaining proper specimens and then quickly and appropriately processing them. Patients with mild infections can be treated with oral antibiotics like cephalexin, dicloxacillin, amoxicillin-clavulanate, or clindamycin for duration of 7-14 days. If methicillin-resistant S aureus infection is suspected, then clindamycin, trimethoprim-sulfamethoxazole, minocycline, or linezolid may be used. If gram-negative aerobes and or anaerobes are suspected, dual drug treatment with trimethoprim-sulfamethoxazole + amoxicillin-clavulanate or clindamycin+fluoroquinolone such as levofloxacin or moxifloxacin may be used. For moderate-to-severe infections patients should be preferred for parenteral antibiotic therapy for 2-4 weeks which includes ampicillin-sulbactam, piperacillin-tazobactam, meropenem, or ertapenem. Alternatively, ceftriaxone, cefepime, levofloxacin,

moxifloxacin, or aztreonam plus metronidazole would be sufficient to cover aerobic gram-negative and anaerobic organisms. Therefore longer duration of treatment is required for those with osteomyelitis i.e., 4-6 weeks at a minimum is suggested. The duration of the antibiotics administration should be determined according to the clinical situation, such as the presence of osteomyelitis, perfusion impairment, or implanted foreign body or surgical procedures such as debridement, resection, or amputation (10,11).

MATERIALS AND METHODS

This prospective observational study was performed for a period of 1 year in general surgery department Rajiv Gandhi Institute of Medical sciences, a south Indian tertiary care teaching Government hospital Kadapa. A total of 70 study populations were taken and patients were enrolled based on inclusion and exclusion criteria by using study materials like specially designed patient data collection form, informed consent form, Culture sensitivity assessment form. Inclusion criteria includes patients with age group of above 30 yrs, patients with Type II diabetes mellitus, patients with diabetic foot ulcers, patients who have evidence of purulent exudates or edema were included in the study, patients who are willing to participate in the study & patients who signed Informed consent form. Exclusion criteria includes patients with Type I diabetes mellitus, patients with other co morbidities like Myocardial infarction, Atherosclerosis, Congestive Heart Failure, Angina Pectoris and Stroke.

RESULTS

A total of 70 patients were recruited in that majority i.e., 24(34.28%) between the age group of 60-70 years, 18(25.71%) in between 40-50 years, 14(20%) in between 50-60 years, 9(12.85%) in between 30-40 years and very less

5(7.14%) in between age group of 70-80 years. Patients were distributed based on gender is as follows out of 70 patients 55(78.57%) were males,15(21.42%) patients were females and their ratio was 3.6:1. Patients were distributed based on the social habits which shows that out of 70(100%) patients, majority i.e., 44(62.85%) patients were without social habits and 26(37.14%) were with social habits. Patients were distributed based on history of amputation which shows that majority of patients i.e., 53(75.71%) do not have a prior history of amputation and 17(24.28%) patients had a history of amputation. Patients were distributed based on anti-diabetic therapy in that out of 70 patients majority i.e., 38(54.28%) belongs to oral hypoglycaemic therapy, then 19(27.14%) patients belongs to Insulin therapy and only few patients belongs to both i.e., 13(18.57%). Patients were distributed based on isolated organism in that out of 66 patients, major organism isolated was Klebsiella spp. i.e., 24(36.36%) followed by Coagulase Negative Staphylococci 14(21.21%), Escherichia coli 13(19.69%), Pseudomonas aeruginosa 8(12.12%), Enterococci 2(3.03%) and S. Aureus 5(7.57%).Therefore gram -ve organisms were 45(68.18%) which were more in number than gram +ve i.e., 21(31.81%).(Fig.1).

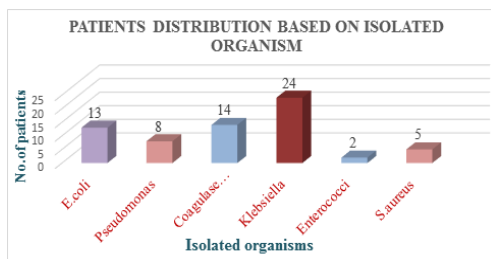


Fig.1 Patients Distribution Based on Isolated Organism

Patients were distributed based on susceptibility profile as follows out of 70 patients, 34 (48.57%) patients were sensitive to Amikacin , 30 (42.85%) patients were sensitive to Gentamycin, 18 (25.71%) patients were sensitive to Ofloxacin, 16 (22.85%) patients were sensitive to Augmentin, 14 (7.14%) patients were sensitive to Ciprofloxacin, 8 (11.42%) patients were sensitive to imipenem, 7 (10%) patients were sensitive to Ceftriaxone. (Fig.2).

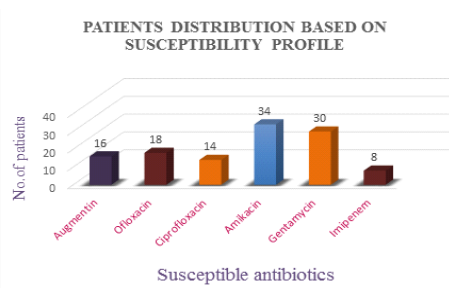


Fig.2 Distribution of Patients Based on Susceptibility Profile

Patients were distributed based on antibiotic susceptibility pattern. Major organism isolated from Gram negative species was Klebsiella and it was more susceptible to Amikacin followed by Gentamycin, Ofloxacin and Ciprofloxacin. Among Gram positive major organism isolated was Staphylococcus aureus and it was more susceptible to Imipenem and Ofloxacin which was shown in Table 1.

Table 1 Susceptibility of the Bacterial Isolates to Different Antibiotics

Organism	Susceptible Antibiotics
Klebsiella Spp	Amikacin, Gentamycin, Ofloxacin, Ciprofloxacin, Nefilmycin, Amoxyclav,Cefoperazone-Sulbactam

Coagulase Negative Staphylococci	Ofloxacin, Ceftriaxone, Cloxacillin, Gentamycin
Escherichia coli	Ciprofloxacin, Ceftriaxone, Ofloxacin
Pseudomonas aeruginosa	Ofloxacin, Gentamycin, Ciprofloxacin
Staphylococcus aureus	Imipenem, Ofloxacin, Amikacin
Enterococci	Ciprofloxacin, Cefoperazone-salbactam

DISCUSSION

Diabetic ulcers have 15 to 45 times higher risk of limb amputation than foot ulcers due to other causes. Every year more than a million diabetic patients require limb amputation worldwide (12).

Most of the patients were middle aged persons and geriatrics from rural regions with limited access to health care, patients were unaware about the seriousness of DFUs (Diabetic Foot Ulcers) and neglected timely care in early stage. This can be attributed chiefly to walking barefoot and neglect of self-care, especially in rural India which was comparable with the study **MaksumRadji et al.** (13)

Male predominance in DFU could be linked to factors such as gender-related differences in life styles and professional roles that require the feet to tolerate more pressure. Increased level of outdoor work and poor compliance to foot care practices were more dominant among males than females which was comparable with the study **Patricia Ferreir et al.** (14)

Risk factors such as inadequate self care, poor glucose control, improper footwear, obesity, lack of timely resources may be the prime reasons for diabetic foot ulcer in patients without social habits whereas in remaining patients social habits like alcohol and smoking may be the reasons for foot ulceration. This indicates that social habits with or without above mentioned risk factors are strongly associated with incidence of diabetic foot ulcer which was comparable with the study **Rastogi, A et al.** (15)

Incidence of DFU is rising compared to prevalence (incidence > prevalence), a history of previous ulcers is a strong predictor of future ulcers. Up to 34% of people develop another ulcer within 1 year after healing from the previous ulcer which was comparable with the study **Chavan SK et al.** (16)

Gram negative aerobes were predominant over gram positive aerobic bacteria with a ratio of about 2:1. Klebsiella Spp.(36.3%) was the major gram negative bacteria isolated from 24 patients upon culture sensitivity test followed by Escherichia coli (19.69%) isolated from 13 patients, Pseudomonas aeruginosa(12.1%) isolated from 8 patients and among gram positive, major organism isolated was Coagulase Negative Staphylococci (21.21%) in 14 patients followed by staphylococcus aureus (7.57%) and enterococci in 2(3.03%) patients which was comparable with studies **Jain M, Patel MH et al** (17), **Lipsky BA et al** (18), **Frykberg, R. G et al.** (19)

In the present study, most of the Klebsiella pneumonia culture isolates were sensitive to amikacin (48.57%) and Gentamycin (42.85%). E.coli isolates were sensitive to ciprofloxacin (20%) and ceftriaxone (10%).Coagulase negative staphylococci isolates were sensitive to Ofloxacin (25.71%), and staphylococcus aureus were sensitive to imipenem (11.42%). This indicates gram negative aerobes were more sensitive to Aminoglycosides, few were sensitive to fluoroquinolones and cephalosporins whereas gram positive aerobes were more sensitive to fluoroquinolones and Carbapenems.

Majority of the patients in this study were prescribed with antimicrobials based on culture sensitivity reports like Amikacin for 34(48.57%) patients followed by Gentamycin for 30(42.85%) patients, Ofloxacin for 18(25.71%) patients, Augmentin for 16(22.85%) patients, ciprofloxacin for 14(20%) patients, imipenem for 8(11.42%) patients, ceftriaxone for 7 (10%) patients respectively.

CONCLUSION

Diabetic foot infections are a severe complication of diabetes Diabetic foot lesions and one of the most common causes of hospitalizations. In order to provide safe and effective management there is need to isolate microbial cause, perform the culture sensitivity test within 24-48hrs, administer appropriate antibiotics and monitor the outcome. Decision to select a proper antibiotic should always rely on culture and antibiotic sensitivity tests.

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