Original Article

Bacteriological Profile of Diabetic Ulcer Foot and Their Antimicrobial Susceptibility Pattern in a Tertiary Care Hospital, Trichy

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Abstract

Background: Wound infections are the major factor for development of diabetic foot ulcer.

Objectives: To identify the prevalence of aerobic bacterial isolates and its antimicrobial susceptibility pattern in diabetic foot ulcer patients.

Methods: The Prospective observational study was undertaken from July 16th to September 16th 2017 in tertiary care teaching Hospital, Tiruchirappalli, Tamilnadu.

Result: Seventy-three (73) organisms were isolated from 63 diabetic foot ulcer patients. Staphylococcus aureus (26%), E. coli (19.2%) and Pseudomonas aeruginosa (19.2%) were isolated. MRSA with 53% were showed 100% sensitivity to vancomycin, linizolid and teicoplanin. By phenotypic Confirmatory Disc Diffusion Test, 57.1% of E. coli were ESBL producers whereas 50% of Klebsiella species were ESBL producers. All ESBL producers showed 100% sensitivity to imipenem.

Interpretation and Conclusion: The microbiological report helps for initiating the narrow spectrum antibiotic therapy and reduce the emergence of multidrug resistant organisms.

Keywords: Diabetic foot ulcer, ESBL, MRSA, Pseudomonas aeruginosa.

INTRODUCTION

Diabetes mellitus is a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces so it results in raised concentrations of glucose and damage many of the body's systems, in particular the blood vessels and nerves (WHO 1999).

The number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014. Almost half of all deaths are due to increased blood glucose occur before the age of 70 years. WHO projects that diabetes will be the 7th leading cause of death in 2030 (WHO 2016). According to WHO, the top10 countries with high number of diabetics are India, China, USA, Indonesia, Japan, Pakistan, Russia, Brazil, Italy and Bangladesh. The estimates for India include 31.7 million in the year 2000to a drastic increase to 79.4 million diabetics by the year 2030 (Zimmet et al., 2001).

Diabetic patients have a risk of 25% for developing foot ulceration and the risk of lower leg amputation was found to increase by 15-46 times in diabetics (Uma devi et al., 2011). Peripheral neuropathy, micro and macroangiopathy, wound infections are the major factor for development of diabetic foot and infection plays a main role in development of moist gangrene (Larsen et al., 2003). Selecting appropriate antimicrobial therapy for diabetic foot infections requires knowledge of likely etiological agents. The most common aerobic organisms are Gram positive cocci and Gram negative bacilli. Severe infections

predominantly showed polymicrobial isolates, whereas milder infections yield generally monomicrobial including anaerobes. (Anandi et al., 2004). Hence, this study has been undertaken to determine the common etiological agents of the diabetic foot infections in a tertiary care hospital and their invitro susceptibility pattern to the routinely used antibiotics.

MATERIAL AND METHODS:

Prospective observational study was undertaken from July 16th to September 16th 2017, in a tertiary care hospital, Thiruchirapalli. After getting approval form of institutional ethical committee (Ref.No : CMCH&RC/IE C -No : 43 /CMCHRC/Dt: 15.07.2017)and informed consent about the study from the 63 diabetic foot ulcer patients who was attending in surgery op, study was carried out. Socio- demographic details (age, sex etc…), clinical history was elicited and entered in the proforma.

Inclusion criteria :All the diabetic patients with ulcer foot admitted in hospital were included in this study.

Exclusion criteria: Patients having foot ulcer without diabetes, Grade 0 of diabetic patients according to Wagner's classification were excluded.

Specimen collection: The swab is collected from wound, wiped well with sterile saline, then rolled along the edges of wound. Two specimens were collected, one for smear preparation and other for the seeding cultures. Pus is collected from site over the abscess was decontaminated with surgical soap and 70% ethyl or iso- propyl alcohol, allowed to dry. With help of sterile syringe and needle, pus was aspirated and transferred to a sterile stopper test tube. Tissue material is collected from area which was washed with sterile saline and was collected by using sterile punch biopsy forceps (Betty et al., 1998).

Specimen processing: Then samples were inoculated into Nutrient agar, Blood agar and Mac conkey agar and were incubated at 35 to 37 degree Celcius for 24 hours. The isolates were identified by colony morphology, gram's staining, motility test and biochemical tests (Collee et al., 2007).

The isolates were subjected to antimicrobial susceptibility testing which were done by Kirby-Bauer's disc diffusion method on Mueller-Hinton agar according to Clinical Laboratory standard institute (CLSI 2017). Commercially available discs (Himedia) were used.

Methicillin resistance in Staphylococcus aureus (MRSA) was tested by using Cefoxitin disc (30mcg). Suspected extended-spectrum beta lactamases (ESBLs) producing Enterobacteriaceae was confirmed by Phenotypic Confirmatory Disc Diffusion Test (PCDDT) using both Ceftazidime (30mcg) and Cefotaxime (30mcg) discs alone and in combination with clavulanic acid (10mcg) as per CLSI guidelines 2017. Staphylococcus aureus (ATCC 25923), E. coli (ATCC 25922) and P.aeruginosa (ATCC 27853) was used as quality control throughout the study for culture and antimicrobial susceptibility testing

Statistical analysis: Data was analyzed using version17.0 of the Statistical Package for the Social Sciences (SPSS). The values were expressed as frequency and percentage.

RESULTS:

- Out of 63 subjects, male constituted 73%(n=46), while female was 27%(n=17). The most affected age group was 51 to 60 years with 22 patients (35%) followed by 41 to 50 years with 19 patients (30.1%) and 61 to 70 years with 13 patients (21%).

- Among the subjects, 52 (82.5%) patients were more than 1 year of duration of diabetes and 100% had type 2 diabetes mellitus. Majority of (n=32; 51%) patients had taken oral hypoglycemic agents, whereas 29 (46%) of the patients had taken both insulin and oral hypoglycemic agents, and 2 (3.2%) of the patients had not taken any medication. The duration of diabetic foot ulcer with more than 30 days was observed among 39(62%) patients and the size of the ulcer was recorded more than 4 cm2 (n=38; 60.3%). The diabetic foot lesions were graded according to Meggitt-Wagner's classification. Majority (n=33; 52.4%) of the patients were grade III, followed by 8(13%), 16(25.4%) and 6(9.5%) with grade I, II and IV respectively. The detailed demographic and clinical details were depicted in Table 1.

Table I: Demographic and clinical details of diabetic foot ulcer patients

Demographic details		**Number of subjects included**
Age (yrs)	40 and below	7 (11.11)
	41-50	19 (30.1)
	51-60	22 (35)
	61-70	13 (21)
	71 and above	2 (3.2)
Gender	Male	46 (73)
	Female	17 (27)
Clinical details		
Type of diabetes	Type 1	-
	Type 2	63 (100)
Duration of Diabetics (Years)	<1 year	11 (17.4)
	>1 year	52 (82.5)
Diabetic medications	Oral antidiabetic	32 (51)
	Insulin only	-
	Both	29 (46)
	None	2 (3.2)
Duration of ulcer (days)	<30 days	24 (38)
	>30 days	39 (62)
Size of ulcer	<4 cm^2	25 (40)
	>4 cm^2	38 (60.3)
Grade of Ulcer (Wagner's Classification)	0	-
	I	8 (13)
	II	16 (25.4)
	III	33 (52.4)
	IV	6 (9.5)
	V	-
H/o previous amputation	Present	4 (6.3)
	Absent	59 (94)

• In these 63 studied groups, 61(98.3%) cases showed positive culture from which 51(80%) samples showed growth of one organism, 8 (18.3%) samples yielded growth of 2 organisms, whereas 2 (1.6%) cases showed growth of 3 organisms. In this study 2 (1.6%) samples do not yield any organisms. (Figure 1)

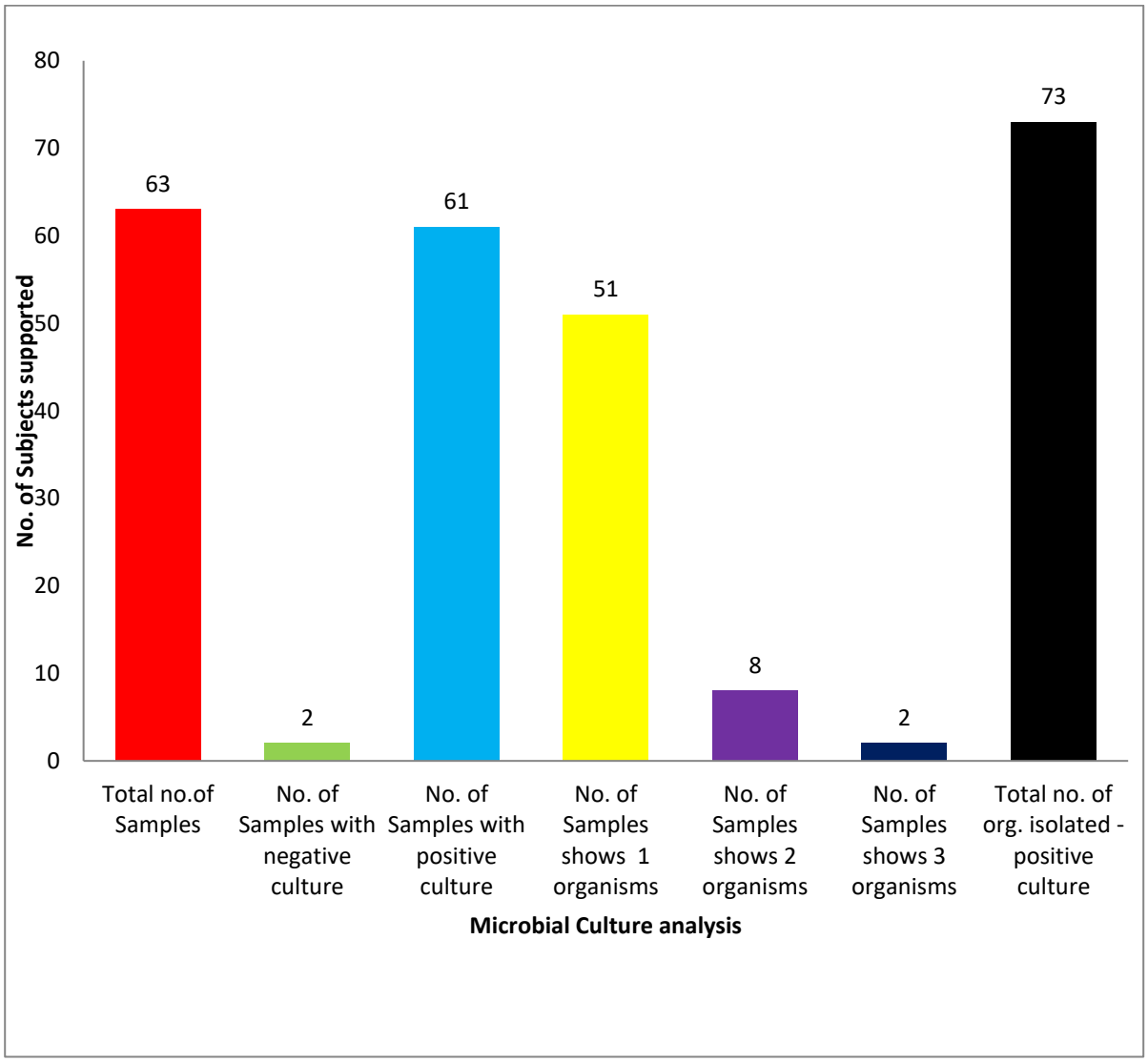

Figure 1: Characteristics of diabetic foot ulcer specimens.

• In this study, total number of 73 organisms was isolated from 61 positive culture cases. Gram negative bacilli accounted for 47 (64.4%) and Gram positive cocci accounted for 26 (35.6%) of the growth. (Figure 2)

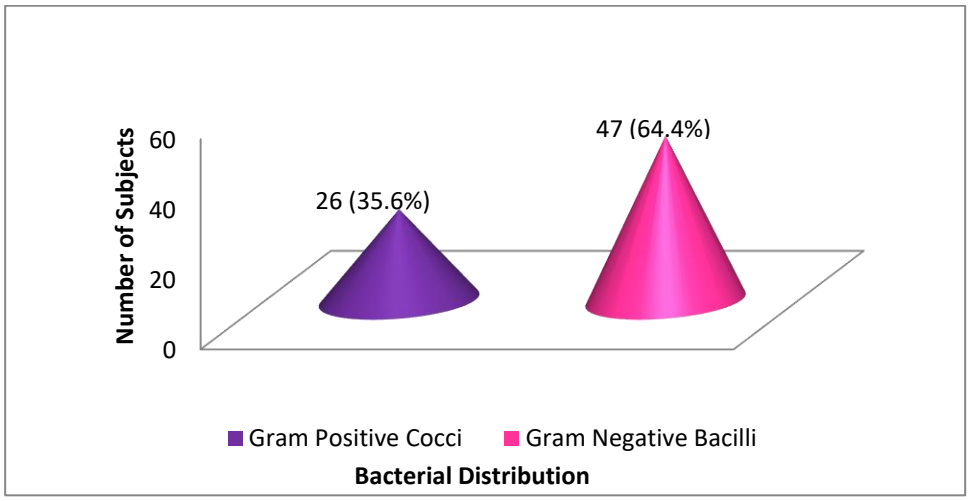

Figure 2: Distribution of organisms based on Gram's Reaction.

• Staphylococcus aureus was the most common isolate accounting for 19(26%) in this study. Escherichia coli and Pseudomonas aeruginosa both accounted for 14 (19.2%), followed by Klebsiella species 8(11%), Proteus species 6(8.2%), Coagulase negative Staphylococccus species (CONS) 5 (7%), Acinetobacter species 3 (4.1%). Enterococcus species and Citrobacter koseri both accounted 2 (3%) in this study (Figure 3).

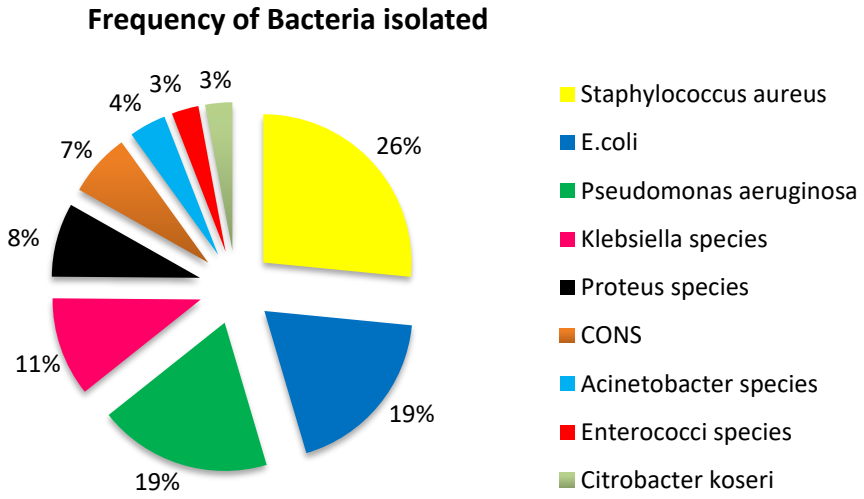

Figure 3: Frequency of Bacteria Isolated

• In this study, we found that vancomycin, linezolid, teicoplanin, ciprofloxacin, amikacin and clindamycin were effective against Gram positive cocci (Table II).

TABLE II: Antibiotic Sensitivity Pattern of Gram Positive Cocci

Antibiotics	***Staphylococcus aureus*** **n=19**	***CONS*** **n=5**	***Enterococcus*spp.** **n=2**
Penicillin	0	0	1(50)**

Cefoxitin	9 (47.3)	5(100)	NT
Erythromycin	9 (47.3)	4 (80)	NT
Clindamycin	15(79)	5(100)	NT
Gentamicin	7 (37)	2 (40)	2(100)*
Amikacin	16 (84.2)	5(100)	NT
Ciprofloxacin	15 (79)	4 (80)	2(100)
Vancomycin	19 (100)	5(100)	2(100)
Linezolid	19(100)	5(100)	2(100)
Teicoplanin	19(100)	5(100)	2(100)
Co-trimaxozole	8 (42.1)	3(60)	NT
Tetracycline	7 (37)	2 (40)	NT
Piperacillin-Tazobactum	NT	NT	2(100)

[Figure in parenthesis denoted percentage]

NT- Not Tested, *High Level gentamicin **Ampicillin

- Antimicrobial agents like imipenam, piperacillin- tazobactum, amikacin and ciprofloxacin were found to be effective against Gram negative bacilli in this study (Table III)

TABLE III: Antibiotic Sensitivity Pattern of Gram Negative Bacilli

Antibiotics	***E.coli*** **n=14**	***Klebsiella*** **species n=8**	***Proteus*** **species n=6**	***Citrobacter koseri*** **n=2**	***Pseudomonas aeruginosa*** **n=14**	***Acinetobacter*** **species n=3**
Ampicillin	0	0	0	0	0	0
Amoxy-clav	4(28.5)	3(37.5)	1 (17)	0	NT	NT
Cefuroxamine	1(7.1)	1(12.5)	0	0	0	0
Cefotaxime	6 (43)	4(50)	3 (50)	0	6 (43)	1 (33.3)
Ceftazidime	6(43)	4(50)	4 (67)	0	8 (57.1)	2 (67)
Cefepime	6(43)	4 (50)	4 (67)	2 (100)	8 (57.1)	2 (67)
Piperacillin-Tazobactum	12(86)	7(87.5)	5 (83.3)	2 (100)	12 (86)	3 (100)
Aztreonam	6(43)	4(50)	4 (67)	0	8 (57.1)	3 (100)

Ciprofloxacin	9(64.2)	5(62.5)	4 (67)	2 (100)	10 (71.4)	2 (67)
Gentamicin	5(36)	2(25)	3 (50)	1 (50)	2 (14.2)	2 (67)
Amikacin	12(86)	6(75)	6 (67)	2 (100)	10 (71.4)	3 (100)
Co-Trimaxozole	5(36)	5(62.5)	3 (50)	2 (100)	8 (57.1)	2 (67)
Tetracycline	3(21.4)	3(37.5)	2 (33)	0	4 (28.5)	1 (33.3)
Imipenam	14(100)	8(100)	6 (100)	2 (100)	14 (100)	3 (100)

[Figure in parenthesis denoted percentage](NT- Not Tested.)

- Out of total 14 E.coli, 57.1% (n=8) were ESBL producers whereas 43% (n= 6) were non ESBL producers. Out of total 8 Klebsiella species, 50% (n=4) were ESBL producers whereas 50% (n=4) were non ESBL producers.

DISCUSSION:

Diabetic foot ulcer (DFU) is one of the most common clinical complications that requiring hospitalization among diabetic patients. A diabetic foot infection is defined as any inframalleolar infection in a diabetic. These include paronychia, cellulitis, myositis, abscesses, necrotizing fasciitis, septic arthritis, tendinitis and osteomyelitis. (Lipsky et al., 2004)

Demographic details of diabetic foot ulcer patients.

Males were predominant in the study population 46(73%). The data depicted in this study also supported with the study conducted by Gadepalli et al (2006) and Kavitha et al (2014). The duration of diabetic foot ulcer more than 30 days was 39 (62%) and the size of the ulcer more than 4 cm2 was 38 (60.3%) and the maximum cases supported Wagner grade 3 and least of grade 4 which is compared to other studies (Hayat et al., 2011; Bansal et al., 2011).Thirty two (51%) patients had taken oral hypoglycemic agents, whereas 29 (46%) of the patients had taken both insulin and oral hypoglycemic agents and 2 (3.2%) of the patients had not taken any medication and the same was also studied with the history of previous amputation seen in 6.3% of the patients (Mohanasoundaram et al., 2012).

Distribution of organisms based on Gram's Reaction

In this study, Gram negative bacilli showed 64.4% (n=47) and Gram positive cocci showed 35.6% (n=26) from total number of 73 isolates and the same was compared and compiled by Mohanasoundaram et al (2012).

Bacteria isolated from Diabetic foot ulcer patient: In this study, the predominant aerobic isolates of the diabetic foot ulcer were Staphylococcus aureus (26%), followed by E.coli (19.2%),Pseudomonas aeruginosa (19.2%), Klebsiella species(11%),Proteus species(8.2%), CONS (7%), Acinetobacter species (4.1%), Enterococci species &Citrobacter koseri (3%).(Table IV)

Characteristics of diabetic foot ulcer specimens

In our study, monomicrobial infections were predominated and the same were compared (Dhanasekaran et al., 2003; Kavitha et al., 2014). Among them, S. aureus dominated followed by E. coli and P. aeruginosa..

Table IV: Comparison of other studies of various bacterial isolates

Study	*Staphylococcu saureus*	*CONS*	*Enterococcus Species*	*E.coli*	*Klebsiella Species*	*Proteus species*	*C.koseri*	*P.aeruginosa*	*Acinetobacterspecies*
El-Tahaway *et al.*, 2000	28%	**7%**	11%	5.5%	6%	18%	-	**22%**	-
Vaidehi*et al.*, 2003	17%	2%	**3%**	**19%**	22%	**7%**	-	27%	2%
Gadepalli *et al.*, 2006	13.7%	**6.6%**	11.5%	12%	6.6%	12.6%	0.5%	9.8%	9.3%
Vimalin *et al.*, 2010	42.3%	-	-	15.3%	9%	6.3%	**2.7%**	24.3%	-
Bansal *et al*., 2011	19%	-	5%	18%	**21%**	**10%**	1%	**22%**	**4%**
Mohanasoundara M *et al*., 2012	**26.1%**	4.3%	4.3%	18.4%	9.7%	6.5%	-	13%	14.15*
Kavitha *et al.*, 2014	32.31%	**6.15%**	6.15%	4.62%	15.38%	15.38%	-	12.31%	-
Shashanka *et al.*, 2016	16.8%	-	**3.1%**	18.4%	8.4%	4.8%	3.1%	26.2%	7.6%
Present study	**26%**	**7%**	**3%**	**19.2%**	**19.2%**	**8.2%**	**3%**	**19.2%**	**4.1 %**

*NFGNB- Non Fermenting Gram Negative Bacilli

Antibiotic Sensitivity Pattern of Gram Positive Cocci

In our study, all Gram positive cocci isolated from diabetic foot ulcer were showed 100% sensitivity to linezolid, vancomycin and teicoplanin which is similar to other studies by Priyadarshini et al (2013), Shashanka et al (2016) and Hayat et al (2011).

Antibiotic Sensitivity Pattern of Staphylococcus aureus

Sensitivity pattern of S.aureus in amikacin, clindamycin, ciprofloxacin, erythromycin and gentamicin was found to be 84.2%, 79%, 79%, 47.3% and 37% respectively. This study showed reduced sensitivity to tetracycline (37%) and Co-trimoxazole (42.1%).In a study of Hayat et al(2011), S.aureus showed 100% sensitivity to amikacin, followed by ciprofloxacin and gentamicin (73.3%). In co-relation with our study, Kavitha et al (2014) study, the sensitivity pattern of amikacin, clindamycin, ciprofloxacin, erythromycin and gentamycin was found to be 86%, 71.4%, 62%, 43% and 38.1%. Similar study by Gadepalli et al (2006) showed 36% sensitivity to co-trimoxazole and tetracycline which is almost equal to our study. Detection of MRSA using cefoxitin disc was found to be 53% (n=10) which is similar to the study by Gadepalli et al., 2006 (56%), Bansal et al.,2011 (55.5%), Mohanasundaram et al., 2012 (54.2%). MRSA isolates showed 100% sensitivity to linezolid, vancomycin and teicoplanin which is correlates with other study. (Priyadarshini et al., 2013; Shashanka et al., 2016; Hayat et al., 2011)

Antibiotic Sensitivity Pattern of Coagulase Negative Staphylococcus Species (CONS)

In our study, CONS showed 80% sensitivity to erythromycin and ciprofloxacin & 60% sensitivity to co-trimoxazole. CONS showed reduced sensitivity to gentamicin and tetracycline (40%). Similar results were observed in a study by Kavitha et al (2014), where CONS showed 100% sensitivity to amikacin and clindamycin, 75% sensitivity to erythromycin, 50% sensitivity to gentamicin and ciprofloxacin. In a contrast with our study, Gadepalli et al (2006), CONS showed 66% sensitivity to tetracycline &amikacin, 50% sensitivity to ciprofloxacin.

Antibiotic Sensitivity Pattern of Enterococcus species

In our study, Enterococcus species were showed 100% sensitivity to piperacillin- tazobactum, high level gentamicin and ciprofloxacin whereas penicillin showed 50% sensitivity. The reference study by Kavitha et al (2014), showed 75% sensitivity to clindamycin and amikacin. A study by Bansal et al (2011), showed 62.5% sensitivity to ciprofloxacin which is almost similar to this study.

Antibiotic Sensitivity of Gram Negative Bacilli

In our study, all GNB obtained from diabetic foot ulcer were showed 100% sensitivity to imipenem which is similar to other studies by Gadepalli et al (2006), Bansal et al(2011), Kavitha et al (2014).

Antibiotic Sensitivity Pattern of E.coli

In this study, E.coli showed 86% sensitivity to piperacillin-tazobactum and amikacin, followed by 64.2% to ciprofloxacin, 43% to amoxy-clav, ceftazidime, ceftaxime and cefepime. This study showed reduced sensitivity to gentamicin (36%), co-trimoxazole (36%), and cefuroxime (7.1%). In association with our study, a study by Kavitha et al (2014) showed 100% sensitivity to piperacillin-tazobactum, amoxy-clav, amikacin, followed by ciprofloxacin and cefotaxime (67%). Ceftazidime, gentamicin and co-trimoxazole comprised 34%. Gadepalli et al(2006) study showed 50% sensitivity to ciprofloxacin and amikacin, 45.4% sensitivity to amoxy-clav, cefotaxime, ceftazidime and piperacillin –tazobactum which is association with our study. In a Hayat et al (2011) study showed 100% sensitivity amikacin and ciprofloxacin, followed by gentamicin (70%), cefotaxime (60%), ceftazidime (50%) and cefuroxime (30%) which is co-relates with our study.

Antibiotic Sensitivity Pattern of Pseudomonas aeruginosa

Piperacillin-Tazobactum showed 86% sensitivity, whereas ciprofloxacin and amikacin showed 71.4%. Ceftazidime, cefipime, aztreonam and co-trimoxazole showed 57.1% sensitivity. P.aeruginosa showed reduced sensitivity to cefotaxime (43%) and gentamicin(14.2%) in this study.In a study of Kavitha et al(2014) showed 75% sensitivity to amoxy-clav and piperacillin-tazobactum, followed by 62.5% sensitivity to amikacin& 37.5% sensitivity to gentamicin, ciprofloxacin, co-Trimoxazole, ceftazidime and cefotaxime. The sensitivity pattern of P.aeruginosa (Hayat et al.,2011) in amikacin, ceftazidime, ciprofloxacin, co-trimoxazole, cefotaxime and cefuroxime was found to be 96%, 72%,48%, 44%, 42% and 16% respectively which is almost co-relates with our study. In association with our study, a study by Gadepalli et al (2006) showed 70.5% sensitivity to amikacin, 72.2% sensitivity to piperacillin- tazobactum, 61.1% sensitivity to amoxy-clav, ceftazidime & cefotaxime, 55.5% sensitivity to ciprofloxacin.

Antibiotic Sensitivity Pattern of Klebsiella species

The sensitivity of piperacillin-tazobactum was found to be 87.5%, followed by amikacin (75%), ciprofloxacin & co-trimoxazole (62.5%). Fifty percent showed sensitivity to ceftazidime, cefotaxime and cefipime where as 37.5% to amoxy-clav & tetracycline, 25% to gentamicin. The reference study by Kavitha et al (2014), Klebsiella sp. showed 90% sensitivity to piperacillin–tazobactum and 70% sensitivity to amikacin, amoxy-clav followed by 60% sensitivity to ciprofloxacin, 50% sensitivity to co-trimoxazole, ceftazidime and 30% sensitivity to cefotaxime which is similar to our study. Amikacin and piperacillin–tazobactum showed80% sensitivity, cefipime showed 60% sensitivity, cefotaxime showed 45% sensitivity in Klebsiella sp. of Priyadarshini et al (2013) study.

Antibiotic Sensitivity Pattern of Proteus species

In this study, Proteus sp. showed 83.3% sensitivity to piperacillin-tazobactum, cefepime and amikacin, followed by 67% sensitivity to ciprofloxacin, ceftazidime and aztreonam. Fifty percent of Proteus sp. showed sensitivity to cefotaxime and gentamicin. In a study by Kavitha et al (2014), Proteus species showed 90% sensitivity to piperacillin –tazobactum and amoxy-clav, 80% sensitivity to amikacin, followed by 60% sensitivity to gentamicin, 50% sensitivity to cefotaxime and ciprofloxacin 40% sensitivity toco-trimoxazole &ceftazidime which is similar to our study. In a study by Priyadarshini et al (2013) showed 100% sensitivity to piperacillin –tazobactum and 60% sensitivity to aztreonam and cefipime, followed by 20% sensitivity to amikacin, cefotaxime, ciprofloxacin which is almost co-relates with our study.

Antibiotic Sensitivity Pattern of Acinetobacter species

Acinetobacter spp showed 100% sensitivity to piperacillin-tazobactum, amikacin and aztreonam, followed by 67% sensitivity to ceftazidime, cefipime, ciprofloxacin, gentamicin and co-trimoxazole. Cefotaxime and tetracycline showed reduced sensitivity (33.3%).The sensitivity pattern of ciprofloxacin showed 100% and amikacin, amoxy-clav, cefotaxime, ceftazidime, piperacillin-tazobactum showed 76.4% (Gadepalli et al., 2006).In a study by Priyadarshini et al (2013) showed 83% sensitivity to piperacillin- tazobactum and 67% sensitivity to amikacin, co-trimoxazole followed by 50% sensitivity to cefotaxime, gentamicin and tetracycline. The study of Priyadarshini et al (2013) showed reduced sensitivity to ciprofloxacin (33%) and ceftazidime (17%) which is similar to this study.

Antibiotic Sensitivity Pattern of Citrobacter koseri

Citrobacter koseri showed 100% sensitivity to cefipime, piperacillin- tazobactum, amikacin, co-trimoxazole in this study. Similar to our study, a study by Vimalin et al (2010) showed 100% sensitivity to ciprofloxacin, piperacillin-tazobactum, amikacin and 50% sensitivity to ceftazidime. In a Priyadarshini et al (2013) study showed 50% sensitivity to amikacin and 40% sensitivity to aztreonam followed by 25 % sensitivity to cefepime and ciprofloxacin.

Table 4 represents about ESBL producing E.coli (57.1%), Klebsiella species(50%) both showed 100% sensitivity to imipenem, followed by highly sensitive to amikacin and moderately sensitive to piperacillin-tazobactum and ciprofloxacin, less sensitivity to gentamicin and co-trimoxazole. This is almost co-relating with the study conducted by Gadepali et al (2006) and Priyadarshini et al (2013).

The awareness of the causative organisms in diabetic foot infections and their antimicrobial susceptibility pattern is essential for the institution of appropriate antimicrobial therapy. Various factors like age, sex, type of diabetes, smoking, immunocompromised status, duration of diabetes, injury to the foot, duration of ulcer, neuropathy, peripheral vascular disease and resistance to ongoing treatment are responsible for aggrevation of diabetic foot ulcer. Proper treatment of diabetes, proper care of foot, and rigorous adherence to the principles of asepsis is the foundation of ulceration site infection prevention.

Limitation:

- The anaerobic bacteria and fungal isolation were not included in this study.
- The detection of the production of metallo-β-lactamases is in future analysis.
- Less subjects included thus the clear picture of antibiogram is less confident.

CONCLUSION:

The patterns of microbial infections are not stable in patients with diabetic foot infections and also increasing rate of multidrug resistant organisms, thus there is a need for continuous surveillance to provide the basis of the empirical therapy so has to reduce the risk of the complications. The inadvertent use of broad spectrum antibiotics should be discouraged. The selection of the antibiotic treatment should be based on the commonest organism which are isolated and their antimicrobial susceptibility patterns. For this situation, we have to use the reports and follow up of microbiological findings for initiating the

narrow spectrum antibiotic therapy. This will improve and promote the overall antibiotic utilization and reduce the emergence of multidrug resistant organisms.

Conflict of interest: None

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