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AEROBIC BACTERIOLOGICAL PROFILE AND ANTIBIOTIC SENSITIVITY PATTERNS OF DIABETIC FOOT INFECTION

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ABSTRACT

Diabetic foot infections are serious complication among persons with diabetes mellitus. The aerobic bacterial agents were isolated and their antibiotic susceptibility pattern was determined by the disc diffusion method. A total of 67 patients male were 47 and female were 20 and duration of foot infection <3 month 73.13% and >3 month 26.86%. Right foot was most prevalent 52.23% followed by left 43.28% and bilateral 4.44% in which Wagner's grade 2 was highest 49%. The 69 bacteria were isolated from 57 culture positive samples in which single pathogen 78.94% and double pathogen from 21%. Among GNB 72.46% *Escherichia coli* was 23.3% the most prevalent organism and among GPC 19(27.53%) *Staphylococcus aureus* was 14%. The antibiotics tested against GNB was highly sensitive to imipenem (91.64%) followed by meropenem 90.49% and amikacin 83%. GPC was highly sensitive to vancomycin (92.87%) followed by amikacin 87% and tetracycline 69.1%. The results clearly reveal that there is no definite aetiology in diabetic foot infections and helps us to choose the empirical antibiotics for cases of diabetic foot infections

Key word: Antibiotic sensitivity pattern, Bacterial isolates, Diabetic foot infection

INTRODUCTION

Diabetic foot infection is the chronic complications related to diabetes mellitus due to multiple precursors mainly neuropathy, peripheral vascular disease and impaired wound healing [1]. Diabetic foot infection (DFI) is a leading cause for hospital admission in India [2]. India has more people 61.3 million living with diabetes and issues related to diabetic foot complication represent a significant and often challenging clinical problem [3, 4]. It was reported that 25% of diabetic individuals are anticipated to develop severe foot problems at some point in their life time and often end with amputation [5]. The risk of lower extremity amputation is 15 to 46 times higher in diabetics than in persons who do not have diabetes mellitus [6]. Every year more than a million diabetic patients require limb amputation worldwide [7]. The impaired circulation in patients with diabetic foot infections limits the access of phagocytes favouring development of infection. *Escherichia coli*, *Proteus* spp., *Pseudomonas* spp., *Staphylococcus aureus* and *Enterococcus* spp. are the most frequent pathogens contributing to progressive and widespread tissue destruction. Diabetic foot infections are often polymicrobial [8,9,10]. The antibiotic susceptibility pattern also shows a lot of variation among different

geographical places and also with various periods of time. The multidrug resistant bacteria have been reported in many diabetic foot infections [11,12]. Hence, the aim of this study was to know the causative bacteria diabetic foot infection and their antibiotic sensitivity patterns.

Material and Methods:

A total of 67 patients with diabetic foot infection visited a tertiary care centre between (Dec 2013-May 2015) were selected for this study. The selected patients had not received the first dose of antibiotics when they were enrolled in the study. Diagnosis of diabetes was made based on the WHO criteria. Wagner's grading was recorded for classification of foot infections [13].

Specimen collection

Specimens were collected from infected foot ulcers, as advised by current clinical guidelines [14] and by standard method based on Levin $1cm^2$ [15].

Microbiological analysis

The specimens were streaked on culture media such as Nutrient agar, Blood agar and MacConkey agar, (Himedia Laboratories, Mumbai, India) to obtain the bacterial growth and Gram's staining was done before culture. After overnight incubation at 37°C, the morphology of the isolate was recorded. Identification of the species of pathogen was done by various bio-chemical tests. Susceptibility tests for the isolated bacteria were performed by disc diffusion method (Kirby-Bauer method) [16]. The pathogens were interpreted as resistant or susceptible on the basis of CLSI (Clinical and Laboratory Standards Institute) guidelines [17]. *E .coli* ATCC 25922 and *S. aureus* ATCC 25923 were used as a quality control strain.

RESULT AND DISCUSSION

A total of 67 patients identified 47 were male and 20 were female with male to female ratio was 2.3:1. The age ranged from 20 to 80 years the mean age was 58.7 years. Diabetic foot infections were the highest among the age group of 61-70 years followed by 51-60 years (table 1). A total of 69 Bacteria were isolated from these 57 patients in 78.94% patients only one pathogen was isolated, while in 21% patients two pathogens were isolated. Similar results were also obtained by Mohammad Zubair et al. [18]. Duration of disease was <3 month 73.13and >3 month 26.86% (table 2). Right foot infection was more 52.23% followed by left 43.28% and bilateral 4.47% (table 3).Distribution of diabetic foot infection according to Wagner grade the highest number was grade 2 and least grade 4 (table 4). This study is correlate with other studies [19,20,21]. In the present study Table no 5. Bacteria that are isolated from the diabetic foot infections *Escherichia coli* 23.3% was the predominant bacterium isolated followed by *Staphylococcus aureus* 14% and other bacteria. This includes both gram negative 72.46% and gram positives 27.53% bacteria were isolated. Thus it confirms the fact that the cause of diabetic foot infection more by gram negative bacteria in similar two recent studies, gram-negative bacteria were the commonest agents [22,23]. But other earlier studies have documented gram-positive bacteria as the predominant organisms associated with diabetic foot infections [24, 25, 26]. Antibiotic sensitivity pattern of isolated organism were tested and GNB was highly sensitive to imipenem 91.64% followed by meropenem 90.49% and amikacin 83%. GPC was highly sensitive to vancomycin 92.87% followed by amikacin 87% and tetracycline 69.1% (table no.6 and 7). Amikacin was the sensitive against the both GNB and GPC but present study data differs from the various other studies [27, 28].

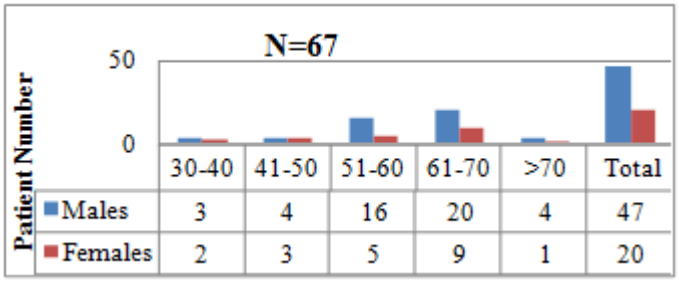

Figure 1: Age and Sex wise distribution of diabetic foot infection patients.

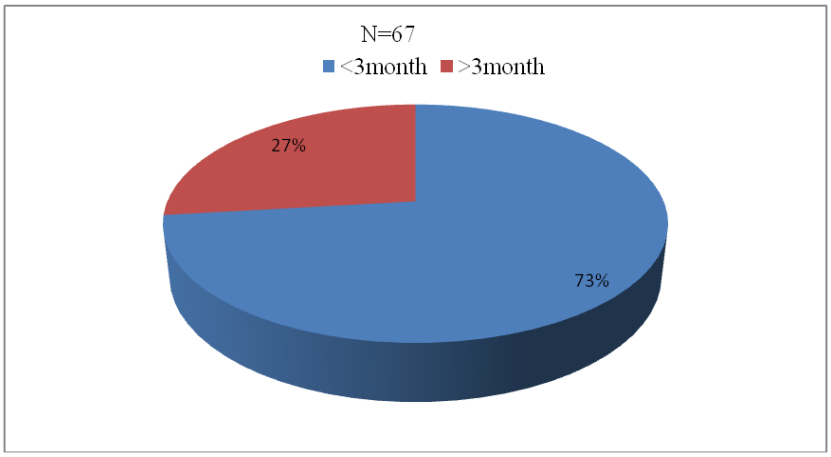

Figure 2: Duration of foot infection

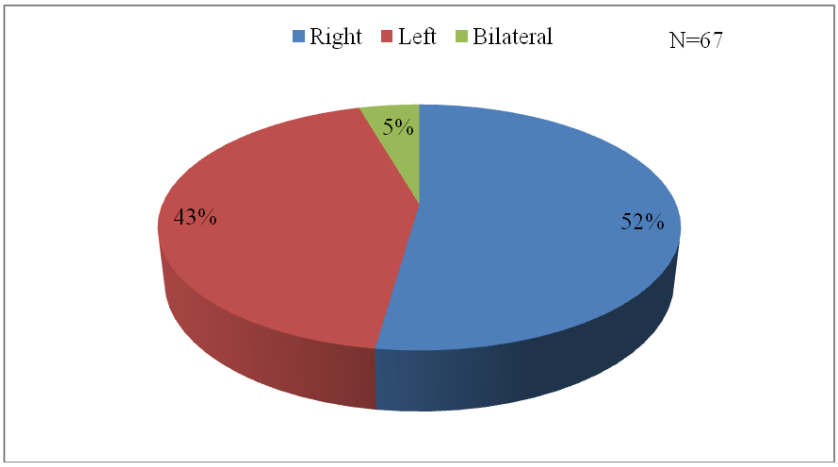

Figure 3: Site of infection.

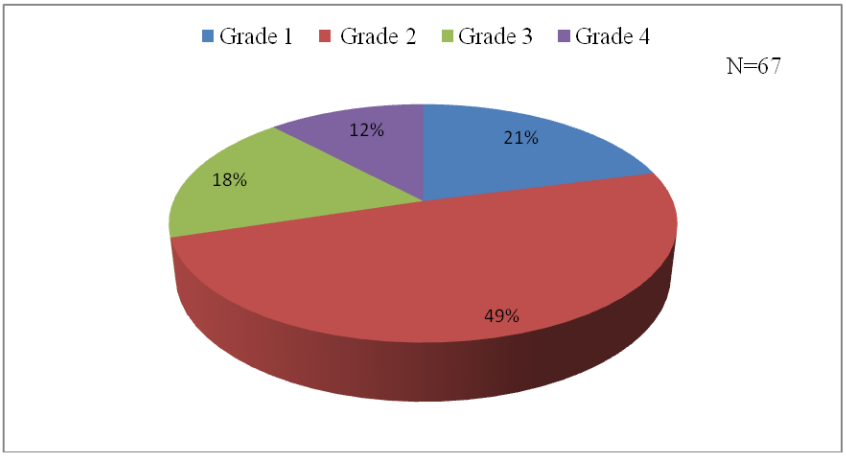

Figure 4:According to Wagner's grade distribution of diabetic foot patient.

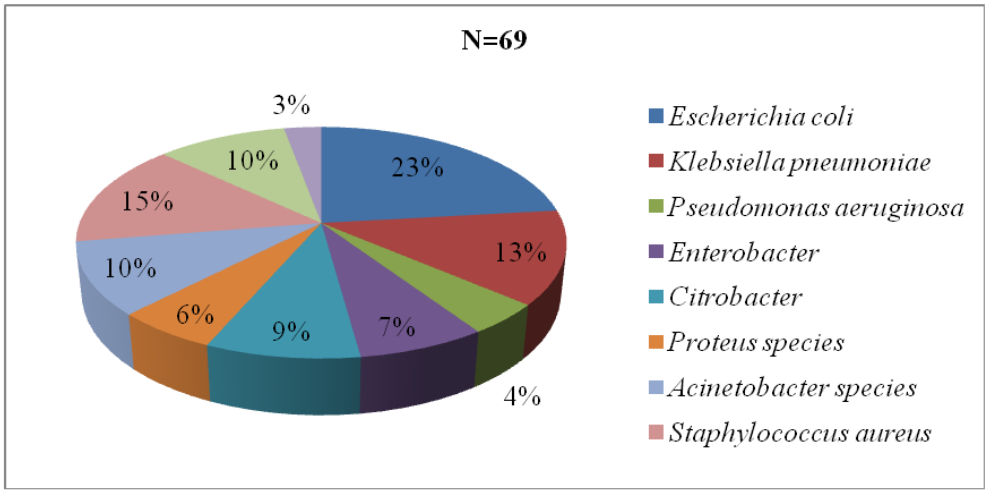

Figure 5:Distribution of isolates.

Table 1: Antibiotic sensitivity pattern of GNB.

Organism	AMP	AS	PIT	CTX	CTR	CAZ	CX	AK	CIP	GEN	IPM	MP
Escherichia coli	50.23	65.78	62.89	43.34	45.46	35.12	65.34	77.39	61.45	40.65	85.54	83.11
Klebsiella pneumoniae	45.45	43.89	45.11	53.43	15.23	53.23	47.45	78.34	40.45	32.46	94.13	92.344
Pseudomonas aeruginosa	35.54	37.29	30.22	43.67	17.44	47.76	47.23	76.45	34.52	45.54	95.54	95.43
Enterobactr species	52.77	56.65	70.39	54.47	55.23	65.78	45.34	80.56	54.37	50.76	96.35	96.23
Proteus species	32	25.36	56.87	37.89	34.23	65.56	57.76	67.65	53.54	32.82	87.54	85.43
Acinetobacter spp	43.12	50.64	67.4	41.43	34.45	25.79	34.45	78.24	42.57	40.34	90.76	90.45

Note: AMP-Ampicillin, AS-Ampicillin-sulbactam, PIT-Piperacilin-tazobactaam, CTX-Cefotaaxime, CTR-Ceftriaxome, CAZ-Ceftazidime, CX-Cefoxitin, AK-Amikacin, CIP-Ciprofloxacin, GEN-Gentamycin, IPM-Imipenem, MP-Meropenem

Table 2: Antibiotic sensitivity pattern of GPC.

Organism	OX	CX	E	CD	LZ	VA	RIF	CH	COT	CIP	GEN	AK	TE
Staphylococcus aureus	35.5	47.43	38.54		73.34	95.11	65.29	67.77	53.12	52.68	47.93	89.12	72.54
Enterococcus spp	32.5	50.23	35.43		75.09	97.76	52.34	62.67	57.31	51.59	41.33	85.54	65.67

Note: OX-Ofloxacin, CX-Cefoxitin, E-Erythromycin, CD-Clindamicin, LZ-Linezolid, VA- Vancomycin, RIF-Rifampin, CH-Chloramphenicol, COT-Cotrimoxazole, CIP-Ciprofloxacin, GEN- Gentamycin, Ak-Amikacin, TE-Tetracyclin

CONCLUSION:

Among 67 patient of diabetic foot infection 51-60 years group was most prevalent in wager grade 2 having <3 month duration of infection. GNB was the most causative agent of diabetic foot infection

REFERENCE:

[1]. Consensus Development Conference on Diabetic Foot Wound Care, Boston, Massachusetts. American Diabetes Association. Diabetes Care. 1999;22:1354-60.

[2]. Viswanathan V. Epidemiology of diabetic foot and management of foot problems in India. Int J Low Extrem Wounds. 2010; 9:122-26.
[3]. Alberti KG., Zimmet P, Shaw J. International Diabetes Federation. Diabet Med. 2007;24(5):451-63. .
[4]. Powlson AS, Coll AP. The treatment of diabetic foot infections. J Antimicrob Chemother . 2010;65:3-9.
[5]. Viswanathan V, Jasmine JJ, Snehalatha C, Ramachandran A. Prevalence of pathogens in diabetic foot infection in South Indian type 2 diabetic patients. J Assoc Physicians India. 2002; 50: 1013-1016.
[6]. Armstrong DG, Lavery LA, Quebedeaux TL and Walker SC. Surgical morbidity and the risk of amputation due to infected puncture wounds in diabetic versus nondiabetic adults. South Med J. 1997;90:384-9.
[7]. Khanolkar MP, Bain SC, Stephens JW. The diabetic foot. QJM, 2008; 101: 685-95.
[8]. Anandi C. et al., Bacteriology of diabetic foot lesions. Indian J Med Microbiol. 2004; 22: 175-8.
[9]. Gadepalli R, Dhawan B, Sreenivas V, Kapil A, Ammini AC, Chaudhry R. A Clinico-microbiological study of diabetic foot ulcers in an Indian tertiary care hospital. Diabetes Care, 2006; 29: 1727-32.
[10]. Alavi SM, Khosravi AD, Sarami A, Dashtebozorg A, Montazeri EA. Bacteriologic study of diabetic foot ulcer. Pak J Med Sci., 2007; 23: 681
[11]. Mohammad Zubair, Abida Malik and Jamal Ahmad. Clinico-bacteriology and risk factors for the diabetic foot infection with multidrug resistant microorganisms in north India. Biol and Med. 2010;2:22-34.
[12]. Pappu AK, Aprana Sinha, Aravind Johnson. Microbiological profile of diabetic foot ulcer. Calicut Med J. 2011;9::2-4
[13]. Wagner FW Jr. The dysvascular foot: a system for diagnosis and treatment. Foot Ankle. 1981; 2: 64-122.
[14]. National Institute for Health and Clinical Excellence NICE clinical guideline inpatient management of diabetic foot problems. London: National Institute for Health and Clinical Excellence.2011;119:1-135.
[15]. Bonham PA. Swab cultures for diagnosing wound infections: a literature review and clinical guideline. J Wound Ostomy Continence Nurs. 2009;36: 389-395.
[16]. Bauer AW, Kirby WM, Sherris JC, Turck M. Antibiotic susceptibility testing by a standardized single disk method. Am J Clin Pathol.1966;45: 493-496.
[17]. CLSI (2013) Performance Standards for Antimicrobial Disk document M02-A11. Wayne, PA: Clinical and Laboratory Standards Institute
[18]. Mohammad Zubair, Abida Malik, Jamal Ahmad. Clinico-bacteriology and risk factors for the diabetic foot infection with multidrug resistant microorganisms Biology and Medicine. 2010; 2: 22-34
[19]. G.S. Banashankari, H.K. Rudresh and A.H. Harsha. Prevalence of Gram Negative Bacteria in Diabetic Foot A Clinico-Microbiological Study. Ame J Med Sci.,20012 5:224 -32
[20]. Jasmine Janifer, Geethalakshmi Sekkizhar, Satyavani Kumpatla1 and Vijay Viswanath. Bioburden vs. Antibiogram of Diabetic Foot Infection. Clin Res Foot Ankle 2013, 1:3-5
[21]. Sharma VK, Khadka PB, Joshi A, Sharma R. Common pathogens isolated in diabetic foot infection in Bir Hospital Kathmandu University Medical Journal.2006;3:295-301.
[22]. Gadepalli R, Dhawan B, Sreenivas V, Kapil A, Ammini AC, Chaudhry R. A Clinico-microbiological study of diabetic foot ulcers in an Indian tertiary care hospital. Diabetes Care.2006; 29: 1727-32.
[23]. Shankar EM, Mohan V, Premalatha G, Srinivasan RS, Usha AR. Bacterial etiology of diabetic foot infections in South India. Eur J Intern Med., 2005; 16: 567-70.
[24]. Mantey I, Hill RL, Foster AV, Wilson S, Wade JJ, Edmonds ME. Infection of foot ulcers with Staphylococcus aureus associated with increased mortality in diabetic patients. Commun Dis Public Health, 2000; 3: 288-90.
[25]. Dang CN, Prasad YD, Boulton AJ, Jude EB. Methicillin-resistant Staphylococcus aureus in the diabetic foot clinic: a worsening problem. Diabet Med., 2003; 20: 159-

[26]. Sivaraman Umadevi, Shailesh Kumar, Noyal Mariya Joseph, Joshy M Easow, G Kandhakumari, Sreenivasan Srirangaraj, Sruthi Raj, Selvaraj Stephen. Microbiological Study of Diabetic Foot Infections. Indian Journal of Medical Specialities, 2010; 9:76-84.

[27]. Raymundo MFP and Mendoza MT. The microbiological features and clinical outcome of diabetic food infections among patients admitted at UP-PGH. Phil J Microbiol Infect Dis. 2002;31:51-63.

[28]. Tentolouris N, Jude EB, Smirnof I, Knowles EA, Boulton AJ. Methicillin-resistant Staphylococcus aureus: An increasing problem in a diabetic foot. Diabet Med. 1999; 1:767-71.