Original Article

Study of microbial etiology of diabetic foot ulcers with reference to MRSA and ESBL producers

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Abstract

Introduction: Worldwide, diabetic foot lesions are a major medical, social, and economic problem and are the leading cause of hospitalization for patients with diabetes. Infectious agents are associated with amputation of the infected foot if not treated promptly. **Materials and Methods:** The present study was carried out in 56 known diabetic patients with foot ulcers attending both IPD and OPD over the period of one year at tertiary health care center. A direct Gram stained smear of the specimen was examined. **Result:** The majority of the patients were in the age group of Above 40 Were 25.00% followed by 36-40-23.21%;31-35-14.28%; 26-30-12.50%; 21-25-7.14%;15-20-5.35%Majority of the Patients were Males i.e. 51.78% followed by Females 48.21%. Etiologically Staphylococcus aureus- 20 (35.71%) followed by Pseudomonas aeruginosa-18(32.14%); Escherichia coli-10 (17.85%); Proteus vulgaris-4 (7.14%); Enterococcus faecium-2 (3.57%) Klebsiella pneumonia-2 (3.57%) The Most Common organism producing MRSA was Staphylococcus i.e. (77.78%) as compared to Enterococcus faecium-2 (22.22%) and Most common ESBL was Pseudomonas aeruginosa (63.63%) followed by Escherichia coli (27.27%); Klebsiella pneumonia-(4.54%); Proteus vulgaris-(4.54%). **Conclusion:** The majority of the patients were in the age group of Above 40, Majority of the Patients were Males, Etiologically Staphylococcus aureus. The Most Common organism producing MRSA was Staphylococcus Most common ESBL was Pseudomonas aeruginosa

Keywords: Diabetic foot ulcers, MRSA, ESBL.

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INTRODUCTION

Worldwide, diabetic foot lesions are a major medical, social, and economic problem and are the leading cause of hospitalization for patients with diabetes. Infectious agents are associated with amputation of the infected foot if not treated promptly. Proper management of these infections requires appropriate antibiotic selection based on culture and antimicrobial susceptibility results; however, initial management comprises empirical antimicrobial therapy, which is often based on susceptibility data extrapolated from studies performed on general clinical isolates[1]. Several studies found methicillin-resistant *Staphylococcusaureus* (MRSA) in as many as 15–30% of diabetic wounds[1–3]. Infection with multidrug- resistant organisms (MDROs) may increase the duration of hospital stay and cost of management and may cause additional morbidity and mortality[4,5]. The Indian diabetic population is expected to increase to 57 million by the year 2025[7]. The individuals with diabetes have at least a 10-fold greater risk of being hospitalized for soft tissue and bone infections of the foot than individuals without diabetes[7]. The impaired micro-vascular circulation in patients with a diabetic foot limits the access of phagocytes, thus favoring the development of an infection[3]. The local injuries and the improper foot wear further compromise the blood supply in the lower extremities[6]. While the foot infections in persons with diabetes are initially treated empirically, a therapy which

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is directed at the known causative organisms may improve the outcome [9]. Many studies have reported on the bacteriology of Diabetic Foot Infections (DFIs) over the past 25 years, but the results have been varied and often contradictory[9]. These discrepancies could partly have been due to the differences in the causative organisms, which had occurred over time, geographical variations, or the type and the severity of the infection, as were reported in the studies[9]. Mostly, the diabetic foot infections are mixed bacterial infections and the proper management of these infections Sectionrequires an appropriate antibiotic selection, based on the culture and the antimicrobial susceptibility testing results[10].

MATERIALS AND METHODS

The present study was carried out in 56 known diabetic patients with foot ulcers attending both IPD and OPD over the period of one year at tertiary health care center. A direct Gram stained smear of the specimen was examined. The specimens were inoculated onto blood agar, chocolate agar, Mac Conkey's agar and thioglycollate medium The phenotypic test for the detection of MRSA was done by using a cefoxitin (30 µg) disc. A zone of inhibition which was equal to or more than 22 mm was considered as susceptible to Cefoxitin and the organism was reported as Methicillin Sensitive Staphylococcus aureus. Those isolates which produced a zone of inhibition which was less than or equal to 21 mm were considered as Methicillin Resistant Staphylococcus aureus (MRSA).ESBL production was confirmed by using discs of Ceftazidime (30 µg) and Ceftazidime Clavulanic acid (30/10 µg) respectively. The test organism was inoculated as a lawn on a Mueller Hinton agar plate and the above mentioned discs were placed on the plate. The plates were incubated at 37^0C overnight and they were examined next day. An increase in the zone diameter, which was equal to or more than 5 mm for the antimicrobial agent which was tested in combination with clavulanic acid, in comparison to the antimicrobial which was tested alone, indicated that the strain was an ESBL producer.

RESULT

Table 1: Age wise distribution of the Patients

Age (in years)	No.	Percentage (%)
15-20	3	5.35%
21-25	4	7.14%
26-30	7	12.50%
31-35	8	14.28%
36-40	13	23.21%
Above 40	14	25.00%
Total	**56**	**100.00%**

The majority of the patients were in the age group of Above 40 Were 25.00% followed by 36-40-23.21%;31-35-14.28%; 26-30-12.50%; 21-25-7.14%;15-20-5.35%

Table 2: Distribution of the Patients with respect to Gender

Gender	No	Percentage
Male	29	51.78%
Female	27	48.21%
Total	**56**	**100.00%**

Majority of the Patients were Males i.e. 51.78% followed by Females 48.21%

Table 3: Bacteriological Etiology of Diabetic ulcer

Bacteria	No. of isolates (Mono microbial)	No. of isolates (Poly microbial)	Total No. of isolates
Staphylococcus aureus	15	5	20(35.71%)
Enterococcus faecium	2	0	2(3.57%)
Pseudomonas aeruginosa	12	6	18(32.14%)
Escherichia coli	8	2	10(17.85%)
Klebsiella pneumoniae	2	0	2(3.57%)
Proteus vulgaris	4	0	4(7.14%)
Total	**43**	**13**	**56 (100.00%**

Etiologically Staphylococcus aureus- 20 (35.71%) followed by Pseudomonas aeruginosa-18 (32.14%); Escherichia coli-10 (17.85%); Proteus vulgaris-4(7.14%); Enterococcus faecium-2 (3.57%) Klebsiella pneumonia-2 (3.57%)

Table 4: Distribution of Etiological Bacteria with respect to MRSA and ESBL

	Staphylococ-cus	Enterococcus faecium	Pseudomo-nas aeruginosa	Escherichia coli	Klebsiella pneumoniae	Proteus vulgaris	Total
MRSA	7 (77.78%)	2 (22.22%)	-	-	-	-	9 (100.00%)
ESBL	-	-	14 (63.63%)	6(27.27%)	1(4.54%)	1(4.54%)	22(100.00%)
Non MRSA	13 (100%)	0 (0%)	-	-	-	-	13(100.00%)
Non ESBL	-	0(0%)	4(33.33%)	4(33.33%)	1(8.33%)	3(25.00%)	12(100.0

							0%)
Total	20 (35.71%)	2 (22.22%)	18 (32.14%)	10(17.85%)	2(3.57%)	4(7.14%)	56(100.00%)

The Most Common organismproducing MRSA was Staphylococcus i.e. (77.78%) as compared to Enterococcus faecium-2 (22.22%) and Most common ESBL was Pseudomonas aeruginosa (63.63%) followed by Escherichia coli (27.27%); Klebsiella pneumonia-(4.54%); Proteus vulgaris-(4.54%)

DISCUSSION

Diabetes mellitus is a endocrine disorder affecting cells of Islets of Langerhans leading to relative deficiency of Insulin. Complications of Diabetes are multiplewhich includes Diabetic retinopathy, Diabetic neuropathy, Diabetic nephropathy etc But apart from the above said complications diabetic foot lesions are of major concern which occur following a minor trauma. Each year more than 700,000 new cases were diagnosed. According to present scenario majority of the people affected with Diabetes mellitus were young adults, children, elderly people, teenagers. Till now no permanent cure is available for Diabetes mellitus[11]. Foot ulceration and infection in Diabetic patients is one of the major cause for morbidity, hospitalization and amputation[12]. Diabetic foot infections include Cellulitis, abscess, Necrotizing fasciitis, Pyogenic or Suppurative arthritis, Osteomyelitis, Tendinitis[13] lesions in patients with chronic Calcaneal spurs. The life time risk to a person with diabetes for developing foot ulcer could be as high as 25%[14]. Infection is most often as a consequence of foot ulceration which typically occurs after trauma to a neuropathic foot. Infection may be caused by pathogenic bacteria originating from external environment as well as by bacteria forming physiological microflora of skin. The presence of infection depends mainly on the number of micro organisms residing in the wound, where as the healing process depends on the type of bacterial strains and their pathogenicity [15].Diabetic foot ulcer is defined as Infection, Ulceration and destruction of deep tissues associated with neurological abnormalities and various degrees of Peripheral Vascular Disease in the lower limb (WHO, 1985).

CONCLUSION

The majority of the patients were in the age group of Above 40, Majority of the Patients were Males, Etiologically Staphylococcus aureus. The Most Common organism producing MRSA was Staphylococcus Most common ESBL was Pseudomonas aeruginosa.

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