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Bacteriological profile of diabetic foot ulcer

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Abstract

Background: Diabetic foot infection is one of the dreaded complications of diabetes mellitus, several studies have been undertaken in the past which have shown high variations among them and are contradictory. The aim of the present study is to know the bacteriological profile and antibiotic susceptibility pattern of such infections which will help in proper management of these patients.

Materials and methods: Samples were collected from 110 patients during April 2018 to May 2019, using sterile swabs and were processed as per standard procedures and antibiotic susceptibility testing was done as per CLSI 2019 guidelines.

Result: Samples were taken from 110 patients from whom 140 bacterial isolates were obtained. Among 110 patients, males 62 (56.36%) were affected more by diabetic foot infection as compared to female 48 (44%). Among 110 patients most common age group affected in both sexes is 41-50 years (41%) followed by 51-60 years (36.4%), 31-40 years (13%) and 61-70years (10%). No cases were reported in patients between age group of 10-20 years and age group more than 70 years. Patients with one pathogen isolated were 42(32.2%) whereas patients with more than one pathogen isolated were 68(62.0%). Total bacterial isolates obtained from 110 patients were 140 out of which 125 (89.3%) gram negative bacteria were isolated while 15(11%) were gram positive bacteria. Most common bacteria isolated is *Pseudomonas aeruginosa* 50(36%) followed by *Proteus vulgaris* 30(21.42%), *Klebsiella pneumoniae* 15(21%), *E. coli* 18(13%), *Streptococcus spp* 15(11%) and *Acinetobacter baumanii* 6(4.3%). Among staphylococcus species (n=15), *Staphylococcus aureus* were 9(60%), CONS 4(27%), MRSA 2(13.33%). Among gram negative bacteria high sensitivity was seen for Imipenem 113(94%) followed by Amikacin, Piperacillin-tazobactum 85% respectively, Gentamicin and ceftriaxone 75%, ciprofloxacin 60% and Cotrimoxazole 50%. Among Gram negative bacteria (n=125), 38(30%) isolates were ESBL producers while 13((10%) isolates were MBL producer. Among gram positive bacteria (n=15), MRSA 2(13.33) were seen.

Conclusion: Diabetic foot infection is a medical emergency and it is associated with life threatening complication. Proper management of the patient with appropriate antibiotics will help in better patient outcome.

Keywords: diabetic foot infection, coagulase negative staphylococcus aureus, methicillin resistant staphylococcus aureus

Introduction

Diabetes is a chronic disorder which affects people world-wide and has emerged as a major public health problem. Around one fourth of people with diabetes mellitus may develop diabetic ulcer during their lifetime [1, 2, 3]. Diabetc foot is one of the dreaded complications of diabetes and is one of the commonest cause of hospitalization among diabetes [4]. Diabetic foot infection is considered as medical emergency as it is associated with neuropathy, peripheral vascular disease, foot ulceration and severe condition which may even require foot amputation [5]. The Indian diabetic population is expected to increase to 57 million by 2025 [6].

Individuals with diabetes have 10 fold greater risk of being hospitalized for soft tissue and bone infections [7]. The impaired micro vascular circulation in patients with diabetic foot favors development of infection. Further local injuries, improper foot wear, improper control of blood sugar levels all favors diabetic foot infection [8]. *E. coli, Proteus species, Pseudomonas species, Staphylococcus aureus and Enterococcus species* are most common pathogens implicated in diabetic foot infection [9].

The aim of the present study is to find out bacteriological profile and antibiotic susceptibility pattern amongst patients with diabetic foot infection.

Material and Methods

The present study has been carried out in Microbiology department at a tertiary care hospital in Solapur during April 2018- May 2019. Permission from institutional ethical committee was taken. All patients with diabetic foot infections were included in the study. Pus or discharge from ulcer base and debrided necrotic tissue were taken. The samples were immediately processed, specimen were subjected to gram stain and culture was done on blood agar and Mac Conkey agar for isolation of aerobic bacteria. Plates were incubated at 37^0 C for 24 hours and identification was done as per standard bacteriological method [10]. Antibiotic susceptibility testing was done on Muller Hilton agar disc procured by Himedia, Mumbai. Antibiotic sensitivity testing was done as per CLSI guidelines 2019 [11]. Detection of ESBL, MBL, MRSA was done as per CLSI guidelines.

Results

Samples were taken from 110 patients from which 140 bacterial isolates were obtained. Among 110 patients, males 62(56.36%) were affected by diabetic foot infection as compared to female 48(44%). Among 110 patients most common age group affected in both sex was 41-50

Years (41%) followed by 51-60 years (36.4%), 31-40 years (13%), 61-70 years (10%). No cases were reported in patients between age group of 10-20 years and age group more than 70 years. Patients with one pathogen isolated were 42(32.2%) whereas patients with more than one pathogen isolated were 68(62.0%). Total bacterial isolates obtained from 110 patients were 140 out of which 125 (89.3%) gram negative bacteria were isolated while 15(11%) were gram positive bacteria. Most common bacteria isolated is *Pseudomonas aeruginosa* 50(36%) followed by *Proteus vulgaris* 30(21.42%), *Klebsiella pneumoniae* 15(21%), *E.coli* 18(13%), *Streptococcus spp* 15(11%) and *Acinetobacter baumanii* 6(4.3%). Among *Staphylococcus species (*n=15), *Staphylococcus aureus* 9(60%), *CONS* 4(27%), *MRSA* 2(13.33%). Among gram negative bacteria high sensitivity was seen for Imipenem 113(94%) followed by Amikacin, Piperacillin- tazobactum 85% respectively, Gentamicin and ceftriaxone 75%, ciprofloxacin 60% and Cotrimoxazole 50%. Among Gram negative bacteria (n=125), 38(30%) isolates were ESBL producers while 13((10%) isolates were MBL producer. Among gram positive bacteria (n=15) MRSA 2(13.33) were seen.

Discussion

In the present study 110 patients were included in the study from which 140 bacterial isolates were obtained. Among 110 patients, diabetic foot infection more commonly seen in males 62(56.4%) as compared to females 48(44%), study done by Sivaraman Uma devi *et al* [12], Priyadarshini Shanmugum *et al* [13] also shows that diabetic foot infections are more common amongst males which may be due to their more active life style and tendency to get injury more common as compared to females.

In the present study, most common age group affected by diabetic foot infection is 41-50 years is (41%), followed by 51-60 years (36.4%) and 31-40 years (13%). Studies by Priyadarshini Shanmugum *et al* [13] showed most common age group affected is 60-65 years followed by 51-55 years. Studies done by Michelle Cezimbra Perim *et al.* [14] shows most common mean age group from 36-75 years which is similar to our findings, this can be attributed to the fact that type 2 diabetes mellitus patients most commonly present to the hospital in their late 30s to 40 years.

In the present study mono-microbial growth was seen in 42(32.2%) of samples while polymicrobial growth was seen in 68(62%) of samples. Similar results were seen in study done by Sivaraman Uma devi *et al* [12]. Study done by Priyadarshini Shanmugan *et al* [13] shows equal number of samples showing mono-microbial and polymicrobial growth. Michelle Cezimbra Perim *et al* [14] also shows result similar to the results of our study.

In the present study out of 140 bacterial isolates 125 (89.3%) isolates were gram negative bacteria while 15(11%) isolates were gram positive bacteria. Studies by Priyadarshini Shanmugum *et al,* [13] Sivaraman Uma devi *et al.* [12] shows gram negative bacteria more commonly isolated than gram positive bacteria in diabetic foot infections. However study done by Michelle Cezimbra Perim *et al* [14] shows result contrasting to our finding.

Most commonly isolated bacteria were *Pseudomonas aeruginosa* 36% followed by *Proteus vulgaris* 21.42%, *Klebsiella pneumonie*, *E.coli* 13%, *Staphylococcus species* 11% and *Acinetobacter baumanii* 4.3 %. Various studies have shown variation in bacterial isolates from diabetic foot infection but overall it is seen in majority of the studies that gram negative bacteria have outnumbered gram positive bacteria.

In the present study high sensitivity was seen for Imipenem, Amikacin, Piperacillin- Tazobactam amongst gram negative isolates while among gram positive isolates high sensitivity is seen for Vancomycin, Erythromycin, Gentamicin and Clindamycin.

Among gram negative bacteria 30% isolates were ESBL which most commonly belong to Enterobacteriaceae family and 10 % isolates were MBL producers. While in gram positive bacteria 13.33 % isolates were MRSA. The prevalence of ESBL, MBL and MRSA is quite low as compared to studies done by Sivaraman Uma devi *et al* [12], Gadepalli R *et al* [15], Shankar E.M. *et al* [16], Goldstein E.J. *et al* [17], Benwan K.A. *et al* [18], Alavy S.M. *et al* [19].Variation in the antibiotic susceptibility pattern may be due to geographical differences, there may be difference even between different institutions and the type of population it caters and local prescribing habits of physicians and availability of over the counter drugs [20].

Conclusion

The present study shows that there is high prevalence of gram negative isolates from diabetic foot ulcers. Knowledge of local antibiotic sensitivity pattern will help in determination of drugs for the empirical treatment of diabetic ulcers.

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