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## Original Research Article

## Bacterial profile of diabetic foot infection in a tertiary care centre

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## ABSTRACT

**Background:** Diabetes foot infections are one of the most dangerous and common drawbacks of diabetes. Amputations are resulting from other atherosclerosis of the arteries. Furthermore, intrinsic traumas are also understood without any complication as they result from foot deformities and also associated with modified foot biomechanisms.

**Aim:** To study bacterial profile of diabetic foot infection.

**Objectives:** To find the possible aerobic bacterial pathogens in diabetic foot infection. To observe the antibiogram of isolated microorganisms.

**Materials and Methods:** In our observational study the isolates were identified by standard biochemical tests and antibiotic performed by Kirby-Bauer disc diffusion method and interpreted as per the clinical and laboratory Standards Institutes (CLSI) guidelines.

**Results:** A total of 82 cases with 50 males and 32 females were included. 64 specimens yielded positive growth with total 87 isolates. 73.43% showed single isolate and rest 2 or 3 isolates. Gram negative organisms were more predominant than gram positive organisms.

**Conclusion:** Proper use of drugs based on antibiotic pattern helps the medical practitioner to reduce the risk of diabetic foot and ulcer. It will ultimately decrease the rate of amputations. Vancomycin, Linezolid and colistin are more susceptible drugs.

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## 1. Introduction

Diabetes mellitus is such a metabolic disarranged which is categorized by manifold long term issues that impact virtually each and every system in the human body. Foot difficulties are usual in those patients who are infected by diabetes and are observed one of the most exorbitant diabetes problems to cure. In advanced nations, diabetic foots are one of the most dangerous and common drawbacks of diabetes. The most obstacles of diabetes mellitus are also a type of neuropathy and foot ulcers materialization

of complication reach from uncomplicated to tortuous, including limbs cut off and life frightening infection.<sup>1</sup>

Nearly 20% of hospital admissions among patients with diabetes mellitus and the conclusion of diabetic foot infections have been guessed. In fact diabetic foot ulcers can conduct to infections, gangrene, amputation and even dying if required supervision is not served. Association of American diabetes has guided that a protection care group interpreted as a interdisciplinary squad can reduce the risks related with diabetic foot infections and cleave by 50%-85%.<sup>2</sup>

Diabetes mellitus is a major cause of last stage which can destroy the kidneys due to diabetes mellitus, armature feels blindness, and occasionally the lower limbs of patients are

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disconnected without injury in such case. Amputations are resulting from other atherosclerosis of the arteries. China is at the first rank which has a load of diabetes in the whole world whereas India is the second biggest contributor of diabetic patients. In proportion to the world wide working squad on the diabetic foot (IWGDF-INTERNATIONAL WORKING GROUP DIABETIC FOOT), diabetic foot infection is a full opacity injury pierce through the dermis which is detected below the ankle in a diabetic foot.<sup>3</sup>

### 1.1. Ethics approval

Ethics approval was obtained from TMMC Moradabad institutional Ethics Committee (TMMC-IEC) Ref no-TMMC & RC.

## 2. Materials and Methods

### 2.1. Specimen collection and transport

Specimens for microbiological assessment were obtained at the time of admission and at the time of visit to OPD, after through vigorous saline wash followed by wound debridement of superficial slough and exudates. Specimens were collected by scraping the ulcer base or the deeper portion of the wound edge with sterile curette into a wide-mouthed sterile container or scavenged using sterile swabs and transported to the microbiology lab without undue delay.

### 2.2. Specimen processing

Direct smear are made from the specimens, gram staining was done and examined under oil immersion for the presence of pus cells, epithelial cells and bacteria and to asses quality of the sample.<sup>4,5</sup>

### 2.3. Inclusion criteria

Patients with history of type 2 diabetes mellitus.

1. Admitted in surgical and medicine wards for diabetic foot ulcers.
2. Attending surgery OPD for DFU/DFI.

The patients of all age groups belonging to the both sex with DFI/DFU with or without systemic signs and symptoms of infection were considered and included in the study.

### 2.4. Exclusion criteria

1. Foot ulcers and foot infection in patients without diabetes.
2. Patients who had received antibiotics (oral, topical, injection) with in the previous week.
3. Patients who deny the consent.

### 2.5. Antimicrobial sensitivity testing<sup>6</sup>

By using the modified Kirby Bauer disc diffusion method, in accordance with the CLSI guidelines, using antibiotic discs, all isolates were tested for antibacterial susceptibility in Muller Hinton agar.

### 2.6. Inoculation of Mullen Hinton agar plates as per CLSI guidelines<sup>6</sup>

Within 15 minutes after adjusting the turbidity of the inoculums, dip a sterile cotton swab into the inoculums and press it tightly on the side wall of the test tube to drain the excess broth. The Muller Hinton agar plate was inoculated by scratching the swab twice on the surface of the intestinal sterile agar and rotating the plate at an angle of approximately 60° to ensure uniform distribution of the inoculums. The edges of the agar are wiped in a circular motion. Leave the closed board for 3-5 minutes to absorb any excess surface moisture before applying the antibacterial sheet.

### 2.7. Application of antimicrobial discs

The battery of drugs to be applied is determined and the following antimicrobial discs- Gentamicin, Amikacin, Amoxycillin, Ampicillin, Amoxycylav, Oxacillin, Erythromycin, Cotrimaxazole, doxycycline, ciprofloxacin, ofloxacin, cephelexin, Cefixime, ceftazidime, ceftriaxone, cefotaxime, cefipime, ceftazidime, clavulanicacid, aztreonam, imipenam and are tested for all isolates.

In addition to the above drugs, azithromycin and vancomycin were also tested for Gram-positive cocci. Piperacillin-tazobactam is only used for Escherichia coli, Klebsiella and Pseudomonas. Place the disc on the agar plate with thumb pliers and gently press down to ensure complete contact with the agar surface. The use of the disc should ensure that the minimum distance from the center of the disc to the center of the disc is 25 mm. The plates are then incubated at 37° for 16 – 18 hrs in ambient air. Control strains are also inoculated following the same procedure.

### 2.8. Interpretation

After the stipulated period of incubation, the plates are examined under good light. Satisfactory streaking is confirmed by semi confluent lawn of growth and uniform circular zones of inhibition. Measure the area completely depressed from the center of the disc. Use the area ruler to measure the area to the nearest millimeter. The petri dish is fixed a few inches above a black non-reflective background, which is illuminated with reflected light. The area of inhibition is the edge where the growth is not visible with the naked eye, and is explained with reference to the CLSI standard guidelines updated from time to time. The organism is reported as sensitive or resistant to the drugs

that are tested. An intermediated zone of inhibition is also reported but the clinical application of the data is doubtful. Control plates were also read using the same procedure and reliability of the test is ensured.

### 3. Observation & Result

A total of 82 samples were collected. These samples came from 82 DFI/DFU patients in the Department of Surgery and patients admitted to TMMC&RC in MORADABAD. A total of 82 samples were processed in the microbiology laboratory of TMMC&RC. In the general population, there were 50 cases of diabetic foot infections in men (60.98%) and 32 cases in women (39.02%). 64 (78%) showed significant growth, while 18 (22%) showed no biological growth.

A total of 87 species of organisms were produced from 64 samples after processing. A total of 87 species of organisms were produced from 64 samples after processing. Microbial isolation is the cause of single microbial growth in 47 (73.43%) samples, while 17 (26.57%) samples show the cause of polymicrobial growth.

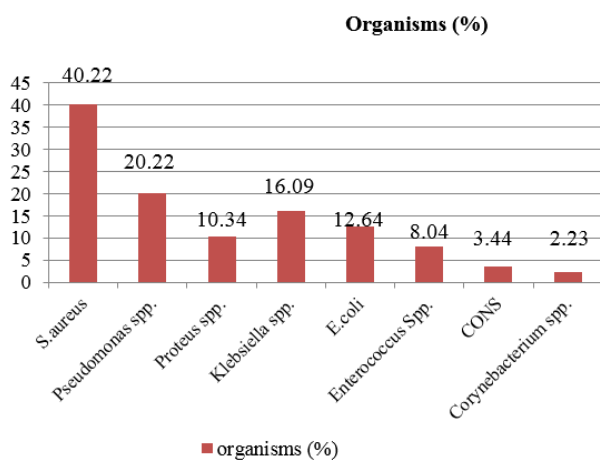


Fig. 1: Isolated organisms

The following organisms were isolated from 82 samples and 64 positive cultures to be studied. In our study Gram negative organisms 52(59.78%) were more predominant pathogens than gram positive organisms 35(40.22%). *Staphylococcus aureus* – 23 (26.43%), *Pseudomonas spp*- 18 (20.22%), *Proteus Spp*- 9 (10.34%), *Klebsiella spp*- 14 (16.09%), *Escherichia coli*- 11(12.64%), *corynebacterium spp*- 2(2.23%), CONS- 3(3.44%), *Enterococcus spp*- 7(8.04%).

### 4. Discussion

Diabetic foot infections are major health problem in individuals which might require intensive care by health professionals. This research was carried out at TMMC&RC

MORADABAD December 2019 to October 2020. After participants understood the procedure and gave consent, Pus swabs was obtained from 82 cases having lesion secondary to DM. 60.98% constitutes male population, the remaining 39.02% being the female population. Older population falling in the age group of 51-70 years contributes the majority (65.86%) of the disease undergoing treatment for diabetic foot infections in TMMC&RC, Moradabad.

Age DMs variety affects immunity of individual making them susceptible to occurrence of lesions. This may be attributed to lesser survival rate among above 70 year age group in our country which in turn put the blame on socioeconomic factors.

We found 73.57% positive growth out of total 82 samples that is very high in numbers as compare to Zubair M et al,<sup>7</sup> Anandi C et al,<sup>8</sup> Kant R et al<sup>9</sup> or Citron D M et al.<sup>10</sup> Monomicrobial growth was 73.43% in this study when we compare to studies of Zubair M et al,<sup>7</sup> Anandi C et al<sup>8</sup> they observed 56.6%, 19%, 23% of monomicrobial identification. Study of Pappu k et al<sup>11</sup> observed that 92% growth of monomicrobial in that study which is same as the finding of our result. The most common combinations that were isolated in this study were *Paureuginosa* with *E.coli* then *E.coli* and Staph. aureus.

Commonest bacteria are gram gram negative (55.18%) after that gram positive bacteria (44.82%) in this study which show commons with the findings of pappu k et al,<sup>11</sup> Patahare NA et al.<sup>12</sup> other studies of Mantey I et al;<sup>13</sup> Dang CN et al,<sup>14</sup> find that gram positive organisms are main cause in these study. These studies show better distribution of population according to age or sex and also show the difference of finding and reasons for differences.

### 5. Conclusion

In this study we found that male patients are more affected than female from diabetic foot infections. Male patients were 50 patients and female patients were 32 patients. Mainly gram negative bacteria are predominant pathogens as compare to gram positive organism. Gram negative organism were 52 (59.78%) isolated and gram negative organisms 35 (40.22%) isolated out of 64 samples which were affected from diabetic foot infections.

To conclude *Staphylococcus aureus* (26.43%), *Pseudomonas aeruginosa* (20.22%), *Klebsiella spp*. 16.09% and *Escherichia coli* (12.64%) these organisms are more frequent in our study. In this study we observe that vancomycin, linezolid and colistin are the most susceptible drugs.

### 6. Acknowledgment

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## 7. Conflict of Interest

The authors have stated explicitly that there are no conflicts of interest in connection with this article.

## 8. Source of Funding

None.

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