

Prevalence of MRSA isolated from Diabetic foot Ulcer in Tertiary care Centre

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I. Introduction

Diabetes mellitus is a metabolic disorder in which there is increased level of blood glucose because of insulin deficiency leading to significant morbidity and mortality¹. Global prevalence of diabetes is 6.3% in the general population and 8.7% among persons aged 20 years and older, corresponding to total number of 171 million of patients, this number will double and reach 366 million in 2030². Diabetic foot ulceration and infections are a major medical, social, economic problem and a leading cause of morbidity and mortality, especially in developing countries like India³. The major predisposing factor to foot ulceration is usually related to peripheral neuropathy⁴. Approximately one in four with diabetes will develop an ulcer during their lifetime and as many as half of those ulceration will develop as infection^{5, 6}. A number of studies have found that *Staphylococcus aureus* is the main causative pathogen^{7, 8}. Almost 50% of *S. aureus* isolated are Methicillin-Resistant *Staphylococcus aureus* (MRSA). MRSA has been increasingly isolated from diabetic foot ulcers and the prevalence of MRSA is as many as 15 to 30% in diabetic wounds^{9,10,11}. The infection leads to early development of complication even after a trivial trauma, the disease progresses and become refractory to antimicrobial therapy¹².

Patients with community acquired MRSA (CA-MRSA) infections often do not exhibit the risk factors known in patients with hospital associated MRSA (HA-MRSA) infections. Infectious agents are associated with amputation of infected foot if not treated promptly. Furthermore, there is evidence that MRSA colonization of chronic ulcers is associated with delayed healing times¹³. Mode to eliminate MRSA from colonized wounds is therefore essential and should have the simple, low-cost, effective treatments methods. The objective of this study was to identify the prevalence of MRSA in diabetic foot ulcers.

II. Materials And Methods

The study was carried out in patients attending diabetology Out Patient (OP) department and In Patients (IP) in Madha Medical College & Research Institute, Chennai, India. The study material consisted of samples from 100 diabetic foot patients with informed consent. Comprehensive particulars of the patient are meticulously noted before collecting the sample. The particulars include name, age, sex, patient number, monthly income of the family, date of admission, presenting complaints, site affected, duration of the complaint, history of injury and duration of diabetes and blood sugar level. The condition of the patient on the day of discharge is also observed, and the details of the medical and surgical treatment for each patient are recorded. Out of 100 Patients of which there were 64 male patients and 36 female patients. Mean age of subjects is 58.4 +/- 8.2 years, mean duration diabetes is 9.6 +/- 7.2 years, and mean glycated Hb is 8.2 +/- 1.4%. According to Wagner's classification many number of patients had grade 2 and grade 3 ulcers¹⁴.

Collection of Specimens

Pus samples of 100 patients were collected using sterile swabs from foot ulcers at 2 different sites, before applying antiseptic dressing to the wound and antibiotics treatment. Smears were made with one swab and another swab was used for culture.

Processing Of Specimens

Macroscopic Examination

The collected specimens are evaluated macroscopically for colour, consistency and odour. The colour of the pus specimens ranged from green-yellow to brown-red and green. The red colour is due to admixture with blood.

Culture Method

All the bacterial isolates were identified by their characteristic colony morphology, gram staining, motility, catalase test, oxidase test, coagulase test and biochemical reactions based on the guidelines described in the Koneman’s Colour Atlas and Textbook of Diagnostic Microbiology¹⁵.

Antimicrobial Susceptibility Testing

All the clinical isolates were subjected to antimicrobial susceptibility testing on Mueller Hinton agar using the Kirby-Bauer method. The procedures outlined in the fourteenth edition of bailey and scott’s diagnostic microbiology is followed¹⁶.

MRSA Detection Method

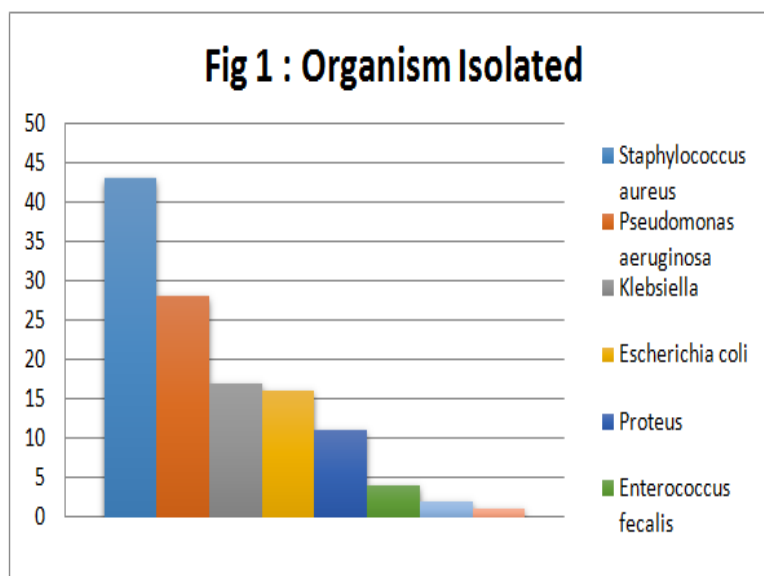
Studying the antibiogram pattern of the Staphylococcus aureus isolates, the strains which are resistant to cefoxitin (30µg) with zone size <=21mm is considered as MRSA

III. Result

Total of 100 patients with diabetic foot in OP and IP were included in this study. Maximum number of patients was in the age group of 50 to 60 years followed by age group of 61 to 70 years. Out of 100 patients 64 were males, females were 36. Out of 100 patients 19 Insulin Dependent Diabetes Mellitus (IDDM) and 81 cases were of Non-Insulin Dependent Diabetes Mellitus (NIDDM). In 100 samples 74 had growth positive with 122 Aerobic Organism isolated. Out of 122 aerobic organisms, mono-microbial Infection is 69 (56.55%) and Poly-microbial Infection is 53 (43.44%). Organisms isolated were shown in (Table 1) and (Fig 1).

Table 1 :Organism Isolated

Name	Number Of Isolates	Percentage
Staphylococcus aureus	43	35.25
Pseudomonas aeruginosa	28	22.95
Klebsiella	17	13.11
Escherichia coli	16	13.93
Proteus	11	9.02
Enterococcus faecalis	4	3.28
Streptococcus pyogens	2	1.64
Streptococcus epidermidis	1	0.82
Total	122	100



The prevalence of MRSA in diabetic foot patients was found to be 28 (65.11%) in 43 isolated S. aureus.

IV. Discussion

Diabetes mellitus recognized to be common in Indians of the Asian subcontinent. Currently, 50.8 million Indians have diabetes. The projections indicate that India will have the largest number of diabetic patients by the year 2030 A.D¹⁷. Diabetic foot infection is the common cause of hospital admissions of the diabetic patients and caused by a number of socio-cultural practices in India¹⁸. Such practices include bare foot walking, inadequate facilities for diabetic care, and low levels of education and poor socio economic conditions¹⁷.

The prevalence of MRSA in diabetic foot patients was found to be 28 (65.11%) in 43 isolated *S. aureus*. This high prevalence confirms that patients admitted to our Diabetic Foot Unit (DFU) were at particularly high risk for MRSA acquisition, probably because they had a combination of several known risk factors, such as diabetes mellitus, surgical intervention, and close contact with hospital personnel or exposure to a health care setting within 6 months^{19, 20}.

In our study, *Staphylococcus aureus* is the single largest isolate (35.25%), *Pseudomonas aeruginosa* (22.95%) is the second most responsible organism for diabetic foot infection, compared to Enterobacteriaceae like *Klebsiella* sp(13.11%) and *Escherichia coli* (13.93%), *Proteus* (9.02%) as in Gibbons and ellopoulos²¹ have reported *staphylococcus aureus* and *staphylococcus epidermis* are the commonest isolates. Shanker et al²² from south India, reported the prevalence of the causative organism as follows *Staphylococcus aureus* (25%), followed by *Proteus* sp (23%), *E. coli* (22%), *Pseudomonas aeruginosa* (18%) and *Klebsiella* sp (12%). Narayan Krishna Bhowmik²³ from Bangladesh reported the pathogens as *Staphylococcus aureus*, Streptococci (group D and B) followed by Gram negative bacilli. All these studies imply, *Staphylococcus aureus*, proteus, *E.coli*, *Pseudomonas aeruginosa* and Streptococci are the most common organisms isolated from diabetic foot ulcer patients and this is accordance with our study.

A study by dhawan et al²⁴ from Indian tertiary care hospital reported 56% MRSA from diabetic foot ulcer and tentolorius et al²⁵ as reported as prevalence of MRSA as 46.2% which is lower compared to our study which has the prevalence of MRSA in diabetic foot patients 28 (65.11%) in 43 isolated *S. aureus*. In our study maximum patients were having wagner grade 2 and grade 3 type of ulcer and maximum number of organisms was isolate from these cases. Similar observation was reported by gonzalez et al²⁶.

V. Conclusion

Patients with diabetes for long duration with high blood sugar level, increasing age, and size of the ulcer were the risk factor for MRSA infection. The prevalence of multi drug resistant organisms was alarmingly high in patient in India because of indiscriminate use of antibiotics. Most of the diabetic foot infections are mixed bacterial infections. So, empirical use of antibiotic therapy to be emphasised for patients with risk factors in diabetic patients with diabetic foot to prevent MRSA in patient.

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