

## INCIDENCE OF MRSA INFECTION AMONG PATIENTS WITH DIABETIC FOOT ULCER

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### ABSTRACT

#### Objectives

#### Primary

1. To find out the proportion of methicillin resistant *Staphylococcus aureus* among patients with diabetic foot ulcer.

#### Secondary

2. To determine the antimicrobial sensitivity pattern of MRSA
3. To determine the prescribing patterns in diabetic foot ulcer.
4. To assess the knowledge and practice of foot care among these patients.

#### Methodology

The study was conducted among 130 consecutive patients from the Department of Surgery, Government Medical college, Thiruvananthapuram and they were diagnosed with Diabetic foot ulcer and those who are willing were included in the study and those with cognitive impairment were excluded from the study.

#### Study Procedure

A written informed consent will be taken from the patient or caregiver in a prescribed format. Patient who met the inclusion criteria will be enrolled for the study. All information relevant to the study was

collected from case records and direct interview with patient with the help of questionnaires. The laboratory reports were collected to determine the proportion and susceptibility pattern of methicillin resistant *Staphylococcus aureus*. Knowledge and practice of foot care was assessed using questionnaire based on recommendation by American Diabetics Association

#### Results

In the study population, the proportion of MRSA was found to be 9.9%. Considering the bacteriological profile of these patients the organism whose percentage found to be highest was *Pseudomonas* (27.6%), followed by *Klebsiella* (27.6%), *E.coli* (6.3%), *Proteus* (6.3%) and *Acinetobacter* (3.4%). MRSA was highly sensitive to Vancomycin (100%), followed by Linezolid 94.7%, Gentamycin (9.4%), Amikacin (9.4%) and Clindamycin (9.4%).

#### Conclusion

The degree of resistance or sensitivity of MRSA towards commonly used antibiotics is recognized to be diverse from region to region, and vancomycin was the only antibiotic found to give uniform sensitivity. Wound duration was identified as the only risk factor for MRSA infection in DFU. . Appropriate implementation of

foot care strategies reduce the risk of amputation by 49%-85%. To achieve this effect, we must emphasize on awareness of foot care.

Key words: Diabetic foot ulcer, Knowledge, Lesion, Methicillin resistant Staphylococcus aureus, Proportion, Practice, sensitivity.

## **INTRODUCTION**

Diabetes mellitus is a syndrome characterized by disordered metabolism and inappropriate high blood sugar resulting from either low level of hormone insulin or from abnormal resistance to insulin effect coupled with inadequate level of insulin secretion to compensate. Diabetes care account for up to 15% of the health care expenditure and 70- 80% of it is for the hospitalization due to complications.

Diabetic foot ulcer is one of the common complications of diabetes. WHO defines it as infection, ulceration and or destruction of deep tissues associated with neurological abnormalities and various degrees of peripheral vascular disease of lower limb. Foot problems in diabetic patients accounts for more hospital admission than other long term complications of diabetes and also resulting morbidity and mortality [1].

A clinical classification developed from a study of the natural history of the progressive foot breakdown used as the basis for comprehensive management.

## **METHODOLOGY**

### **STUDY DESIGN:**

Cross-sectional study

### **STUDY SETTINGS:**

Department of General surgery

Government Medical College,  
Thiruvananthapuram

### **STUDY PERIOD:**

Study was done only after getting the clearance from Human Ethics Committee, Govt. Medical College, Thiruvananthapuram.

### **STUDY POPULATION:**

Inclusion criteria:

1. Patients who are diagnosed with diabetic foot ulcer.
2. Patients who are willing to participate in the study.

Exclusion criteria:

2. Patient with cognitive impairment

**SAMPLE SIZE:** 130 Participants

### **SAMPLE SIZE CALCULATION:**

Sample size is calculated using the formula:

$$N = (Z_{1-\alpha/2} \times p \times q)^2 / d^2$$

### **STUDY VARIABLES:**

Sociodemographic variables- age, gender, education, clinical features, Laboratory parameters, Treatment and other disease condition.

### **DATA COLLECTION TOOL:**

1. Standard data collection form
2. Laboratory data

3. Patient case sheet
4. Questionnaire based on recommendation by American Diabetic Association

#### **DATA COLLECTION TECHNIQUE:**

1. Interviewing
2. Patient case sheet and from microbiology lab

#### **STUDY PROCEDURE:**

A detailed description regarding the study is given to the participants who met the inclusion criteria. Informed consent will be collected from the participants. The baseline measures including patient demographics, co-morbidities, and co-medication can be recorded in the prescribed format. All information relevant to the study can be collected from case records and direct interview with patient with the help of questionnaires. The samples were obtained from foot ulcer base with a sterile swab and were sent to the microbiology lab. The samples were cultured in blood agar, Mac Conkey agar and were then incubated at 37°C for 24 to 48 hrs under aerobic conditions. The colony morphology was determined and gram staining was performed. Identification of bacteria was done using conventional biochemical procedures.

The antibiotic susceptibility test was carried out by the Kirby Bauer disk diffusion method in Muller-Hinton agar. The antibiotic susceptibility was detected following the guidelines of the Clinical Laboratory Standard Institute.

#### **STATISTICAL ANALYSIS:**

- Data obtained will be entered in to the Microsoft Excel sheet. Statistical analysis was done by spss version 20.0.
- Qualitative variables was expressed in percentages.
- Quantitative variables were expressed in mean, standard deviation and confidence interval.
- Chi- square test was used to find out the association between selected variables.
- Bar and pie chart was used to present percentage distribution of selected variables in the study.

#### **ETHICAL CONSIDERATION:**

Ethical clearance was obtained from Ethics Committee of Government Medical College, Thiruvananthapuram. All data were kept confidential and was used for the purpose of this study only.

#### **RESULTS**

In our study majority of the patients (36.8%) belongs to 56-65years, 32.7% were in the age group of 45-55 years, 22.2% were in the age group of 66-75 years and only 8.2% were in the age group above 75 years. The mean age was found to be 60.88 ±10.4 years.

#### **Distribution of patients according to gender**

Among the study population, 67.3% were males and 32.7% were females. From these results it was found that the disease were found more common in male population than in female population.

#### **Distribution of patients according to educational status**

According to modified Kuppusamy's socio-economic status scale it was observed that majority of patients had primary education 35.1%, 23.4% were with high school education, 15.8% with middle school level of education, 20.0% were illiterates and 5.8% with graduate level of education.

#### ***Distribution of patients according to Socio- Economic Status***

According to modified Kuppusamy's socio-economic status, majority of patients belongs to BPL category (84.8%) and the remaining (15.2%) belongs to APL category.

#### ***Distribution of patient according to the habit of smoking***

In our study among 171 patients, 50.9% were smokers and 49.1% were non-smokers. Smoking is a risk factor for diabetic foot amputation. The above data shows that majority of patients had a smoking history. These results were supported by studies done by *Min Liu et.al.*

#### ***Distribution of patients according to the habit of alcohol consumption***

Above data shows that out of 171 patients 46.29% were alcoholics and 53.8% were non alcoholics. Theoretically alcohol intake has been noted to cause nerve damage which can results in foot ulcer and amputations. In our present study 46.2% were alcoholics and these results complies with the study done by *Bergqvist et.al.*

#### ***Distribution of patients according to previous history of Diabetic foot ulcer***

In our study, 62.0% of the patients had relevant history of the disease and remaining 38.0% were not having any previous history of foot ulcer. Previous history of foot ulcer was found to be statistically associated with MRSA infection having Pearson correlation coefficient of 0.000.

#### ***Distribution of patients according to the proportion of MRSA***

In our study population, only 9.9% of the patients reported the presence of MRSA among 171 patients having foot ulcer and the remaining patients (90.1%) were reported the presence of other microorganisms.

it was found that pseudomonas (27.6%) occupies highest percentage followed by *Klebsiella* (23.8%), *MRSA* (9.9%), *MSSA* (21.8%), *E.coli* (6.3%), *Proteus* (6.3%) and *Acinetobacter*

### **DISCUSSION**

#### **A. SOCIO – DEMOGRAPHIC BACKGROUD**

##### **a. Age**

In the study 36.8% of patients belongs to the age group of 56-65 years and the mean age was found to be  $60.88 \pm 10.4$  years. 32.7% were in the age group of 66-75 years and only 8.2% were in the age above 75 years. As age increases the risk of diabetic foot ulcer also increases. The results were supported by the findings in the study conducted by *Shao-Hua Wang et.al.* In their study also majority of patients belongs to the age group of 56-65 years.

##### **b. Gender**

In our study it was found that majority of patients were males 67.3% and remaining 32.7% were females.

### c. Education

In the study population, 35.1% of patients had primary education, 23.4% were with secondary education, 15.8% with high school level of education, 20.0% were illiterates and 5.8% with graduate level of education.

### d. Socio-Economic status

In our study, majority of patients belongs to BPL category (84.8%) and the remaining 15.2% belongs to the APL category.

### e. Habit of smoking

Among the study population, 50.9% were smokers and 49.1% were non-smokers. Smoking diminishes tissue perfusion.

### f. Habit of alcohol consumption

In our study it was found that out of 171 patients 46.29% were alcoholics and 53.8% were non alcoholics.

Theoretically alcohol intake has been noted to cause nerve damage which can results in foot ulcer and amputations..

### c. Proportion of MRSA

From the data it was found that only in 9.9% of patients were reported the presence of MRSA among 171 patients having foot ulcer and the remaining patients(90.1%) were reported the presence of other microorganisms. In our study proportion of MRSA was found to be lower compared to previous studies. This may be due to implementation of strict antibiotic policy

which will prevent the overuse of antibiotics and due to improvement in the environmental conditions in the hospital which will lower hospital acquired MRSA rates and associated costs.

### d. Bacteriological profile

The highest percentage of organism was found to be *Pseudomonas* (27.6%) followed by *Klebsiella* (23.8%), *MRSA* (9.9%), *MSSA* (21.8%), *E.coli* (6.3%), *Proteus* (6.3%).

In our study gram positive bacilli were more prevalent than gram positive cocci. Major factor which predisposed to foot ulceration which led to infection are usually related to peripheral neuropathy and impaired circulation which limited the access of the phagocytes. *Pseudomonas* infection is associated with smoking history and with uncontrolled diabetes. The commonmost isolate was *Pseudomona aeruginosa* (27.6%), followed by *Klebsiella* (23.8%), *E.Coli* (6.3%), *Proteus* (6.3%) and *Acinetobacter* (3.4%). Among gram positive *Staphylococcus* was the common most organism isolated and these results were similar to the finding from the study conducted by *Priyanka Patil et al.*

### f. Antimicrobial sensitivity pattern of MRSA

In the study 94.7% were sensitive to Vancomycin, 100.0% were sensitive to Linezolid and 9.4% were sensitive to Clindamycin, Amikacin and Gentamycin. In our study MRSA was found to be resistant to Penicillin, Ampicillin, Cephalosporin and Erythromycin and sensitive to Vancomycin, Linezolid, Amikacin and Gentamycin.

## CONCLUSION

In our study, 171 patients with Diabetic foot ulcers were studied. Majority of patients belongs to Grade 4 of Wagner's classification indicating that they had not sought treatments in the early stages of the disease. This shows that patients were not aware of the complications related to Diabetic foot. *Pseudomonas aeruginosa* was the most common organism isolated from the swab followed by *Klebsiella*

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