Proportion of Methicillin Resistant Staphylococcus Aureus Among Patients With Diabetic Foot Ulcer

Aswathy K A

(*Assistant Professor in the Department of Pharmacy Practice, JMIPSR, Kayamkulam, Alappuzha*

ABSTRACT:Objective :**Primary:** To find out the proportion of methicillin resistant Staphylococcus aureus among patients with diabetic foot ulcer.
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 wereincluded 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.

I.   INTRODUCTION

Diabetes mellitus is a syndrome characterised 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.

WAGNERS CLASSIFICATION OF DIABETIC FOOT ULCER
Grade 0 – There is no open lesion but potential breakdown with high pressure deformities and sensory neuropathy.
Grade 1 – The lesion is superficial through the skin only with or without underlying bony prominences
Grade 2 – There is deep penetrating to tendon, joint or bone.
Grade 3 – There is deep abscess formation with plantar space and tendon sheath infection, osteomylitis or septic arthritis
Grade 4 – Gangrene is present locally in the toes or more diffuse over forefoot.

Grade 5 – Gangrene has spread and involves the hind foot requiring a higher amputation.
Foot ulcer significantly contributes to morbidity and mortality of patients with diabetes. The diabetic patient with foot ulcer requires long term hospitalization and carries risk of limb amputation [2]. In developing countries foot ulcers are one of the most feared complications of diabetes.
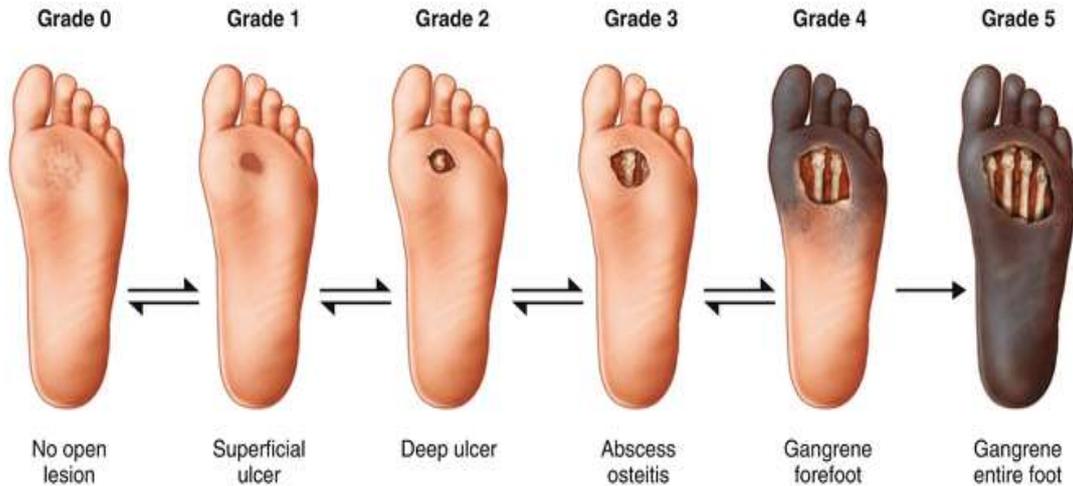
Fig 1: Wagner's classification of foot ulcer

ETIOLOGY
Recent studies have indicated multiple risk factors associated with the development of diabetic foot ulcer. These risk factors are as follows:

Gender, duration of diabetes longer than 10years, advanced age, high BMI and other co morbidities such as retinopathy, peripheral neuropathy, peripheral vascular disease, foot deformity, high plantar pressure, infections and inappropriate foot care [3].

PATHOPHYSIOLOGY
Neuropathy in DM manifests against motor, sensory and autonomic. Damage to the innervations of the leg muscle cause an imbalance between flexion and leg extension, resulting in deformity. Gradually it will cause skin damage that develops in to ulcers. Autonomic neuropathy lowers the activity of oil glands and sweat so that foot moisture is reduced and susceptible to injury. In peripheral arteries hyperglycemia causes endothelial dysfunction as well as decreased vasodilator production resulting in constriction. Hypertension and Dyslipidemia also contribute to occurrence of peripheral arterial disease. The explanation above will lead to occlusive arterial disease which then causes ischemia of the lower extremities and increases risk of ulcer[8].

CLINICAL PRESENTATION
Swelling, indurations, erythrema around lesion, local pain, palpable local warmth and presence of pus.Infection is divided in to mild (superficial, inner and limited in size), moderate (deeper and wider), and severe (necroting fasciitis, gangrenous gas, ascending cellulitis, systemic toxicity or metabolic instability)[7].

RATIONALE BEHIND THE STUDY
The knowledge of prevalence of MRSA and their current antimicrobial profile become necessary in the selection of appropriate empirical treatment of diabetic foot infection. Among various complication that are associated with diabetes foot disease is highly frequent being associated with significant morbidity, mortality and cost. Such information is important for policy makers to advocate for implementation of prevention and treatment recommendations. Studies related to prevalence and susceptibility pattern of MRSA were limited. Various studies shows that the knowledge and practice of foot care were poor among the patients with diabetics.

BACTERIOLOGICAL PROFILE

Lower extremity infections are frequent causes of substantial morbidity and mortality in diabetic population, and these infection consume a large portion of resources expended on diabetic populations. Gram positive cocci, particularly Staphylococcus aureus are the most important pathogen in diabetic foot infections.The most common infective organism in diabetic foot sepsis are streptococci, aerobic gram negative bacilli and anaerobic bacteria. Mixed facultative and obligatory anaerobes have been reported to be mainly responsible for the foul smelling gas forming infections of diabetic foot[9].

1. Gram positive organisms – Staphylococcus aureus, Staphylococcus epidermis, Streptococcus species, Enterococcus , Cornybacterium species.

2. Gram negative organisms – Proteus mirablis, Escherichia coli, Klebsiella, Serratia species, Enterobacter cloacae, Pseudomonas aeruginosa, Acinobacter species, Clostridium.

MANAGEMENT
- Pharmacological
- Non pharmacological

Empirical antibiotic therapy for:
1. Non- limb Threatening infections [8]
2. Limb threatening infections

Empiric antibiotic therapy for non limb threatening infections

Oral agents	Parenteral agents
Amoxicillin/Cephalexin	Cefazolin
Dicloxacillin	Cefotaxime
Clindamycin	Oxacillin
Levofloxacin	Ampicillin/ Sulbactam
	Clindamycin

Empiric antibiotic therapy for limb- threatening and life threatening infections

Limb- threatening	Life- threatening
Ampicillin/ Sulbactam	Ampicillin/ Sulbactam + Aztreonam
Ticarcillin/ Clavulanate Vancomycin	Piperacillin/ Tazobactam + Vancomycin
Piperacillin/Tazobactam	Vancomycin + Metronidazole + Ceftazidime
Ceftazidime + Clindamycin	Imipenam / Cilastatin
Cefotaxime + Clindamycin	Flouroquinolone + Vancomycin + Metronidazole
Flouroquinolone + Clindamycin	
Vancomycin + levofloxacin + Metronidazole	

Non pharmacological
1. Education
50% of foot ulcer cases can be prevented by effective education. Currently a wide range and combinations of patient educational interviews have been evaluated for the prevention of ulcer [5].

2. Debridement
Debridement is the removel of necrotic and senescent tissue as well as foreign and infected materials from a wound which is considered as most important therapeutic step leading to wound closure and decrease in possibility of limb

amputation. Different type of debridement including surgical, enzymatic, autolytic, mechanical and biological [6].

3. Offloading

The use of offloading techniques commonly known as pressure modulation is considered the important for the management of neuropathic ulcer. Offloading techniques include total contact casting, bracing, walkers, offloading dressing and felted foam dressing [10].

4. Advanced dressing

Wound dressing can be categorized as active, passive or interactive. Passive dressings are useful for acute wounds because they absorb reasonable amount of exudates. Active and interactive dressings are capable of modifying the physiology of a wound by stimulating cellular activity [10].

5. Surgery

In general surgery for diabetic foot ulcer healing includes non vascular foot surgery, vascular foot surgery and in some cases amputation. Non vascular foot surgery is divided in to elective, prophylactic, curative and emergent surgery. Vascular surgery can be bypass graft and peripheral angioplasty[10].

6. Advanced therapies

a. Hyperbaric oxygen

Hyperbaric oxygen therapy involves intermittent administration of 100%oxygen usually in daily sessions.

b. Electrical stimulation

It has been reported as a perfect adjuvant therapy for ulcer healing.

c. Negative pressure wound therapy

It uses controlled localized negative pressure to heal chronic and acute wounds.

d. Bioengineered skin

This method replaces the degraded and destructive milieu of extra cellular matrix with the introduction of a new ground substance matrix with cellular components.

e. Growth factors

Platelet derived growth factor, fibroblast growth factor, vascular endothelial growth factor and transforming growth factor [10].

II. 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:
$N = (Z1 - \propto/2 \times p \times q)^2 / d^2$ P= 42.86%
$= (1.96)2 \times 42.86 \times 57.14/ (20/100 \times 42.86)2$
Q= 100-P
$= 130$
$d^2 =$ degree of precision (20% of P)

REFERENCE:
1. Murugan S, Uma Devi P, Mani K R. Prevalence of Methicillin resistant Staphylococcus aureus among Diabetes patients with foot ulcers and their antimicrobial susceptibility pattern. Journal of Clinical and Diagnostic research; 2008; 2:979-984

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℃ 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.

III. 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.

IV. RESULTS
A.SOCIO-DEMOGRAPHIC BACKGROUND

Age in years	Percentage
45-55	32.7
56 - 65	36.8
66 - 75	22.2
>75	8.2
Total	100

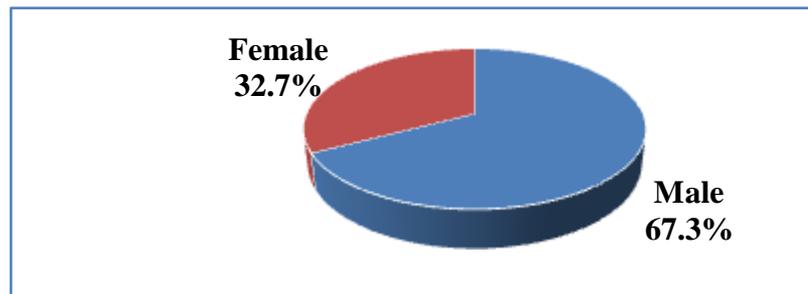**Table 1: Distribution of Patients according to age**
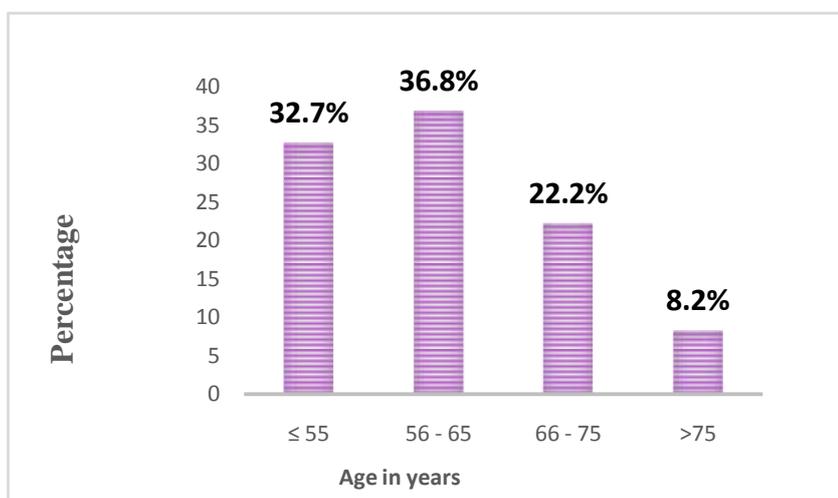
Figure 2: Percentage distribution of patients according to age

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.

Gender	Percentage
Male	67.3
Female	32.7
Total	100

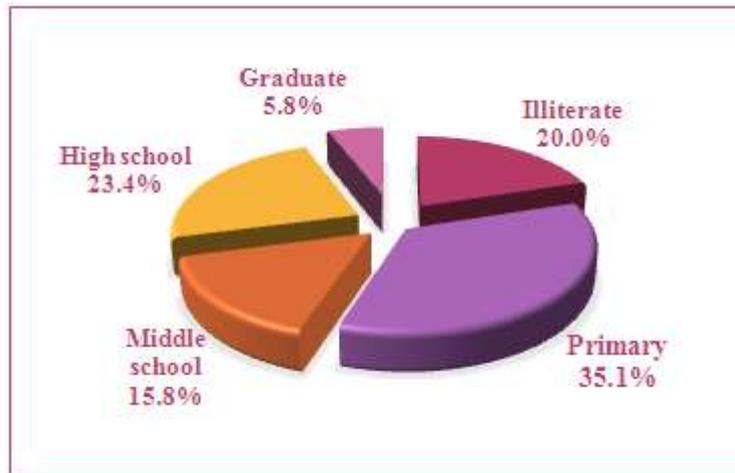**Table 2: Distribution of patients according to gender**

Figure 3: Percentage 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.

Education	Percentage
Illiterate	20.0
Primary	35.1
Middle school	15.8
High school	23.4
Graduate	5.8

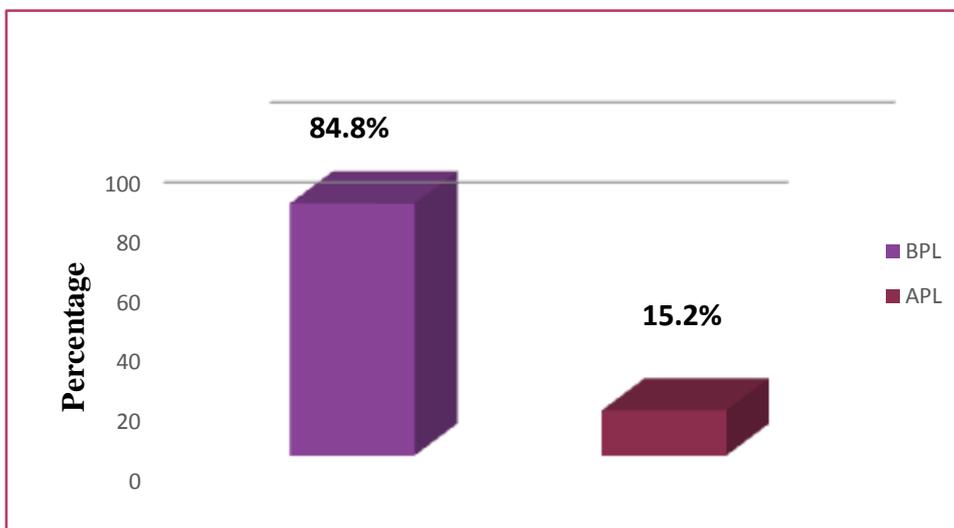**Table 3: Distribution of patients according to educational status**

Figure 4: 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.

SES	Percentage
BPL	84.8
APL	15.2
Total	100

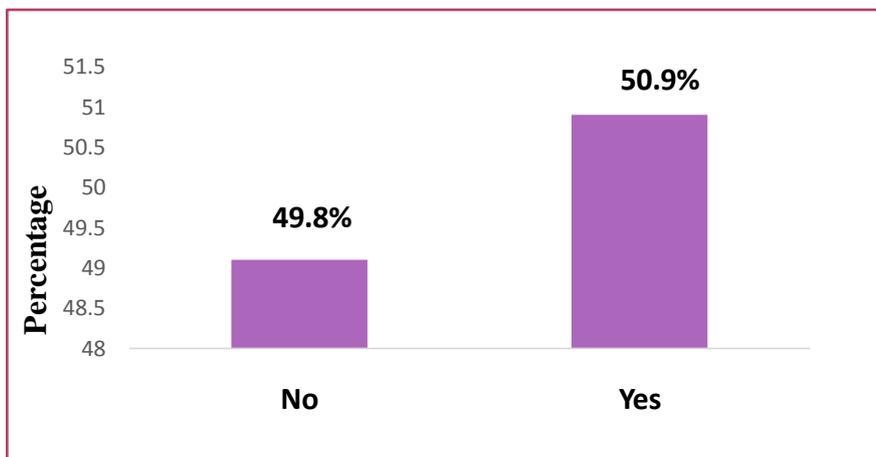**Table 4: Distribution of patients according to the Socio-Economic Status**

Figure 4: 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.

Smoker	Percentage
No	49.1
Yes	50.9
Total	100

Table 5: Distribution of patients according to the habit of smoking
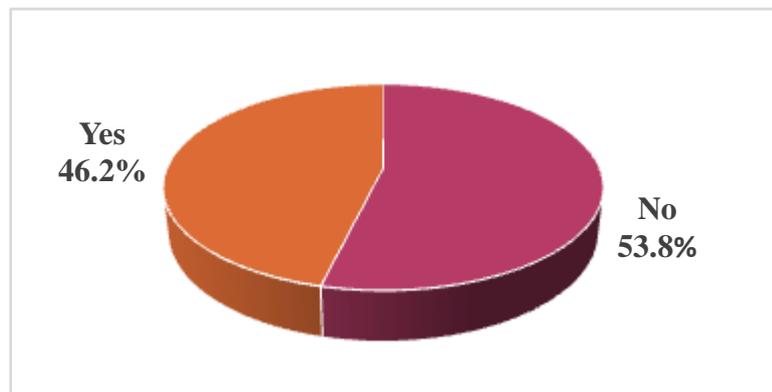

Figure 6: Distribution of patient according to the habit of smoking

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.**

Alcoholics	Percentage
No	53.8

| Yes | 46.2 |
| | |

Table 6: Distribution of patients according to alcohol consumption

Figure 7: 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**.

Previous history of diabetic foot ulcer	Percentage
No	38
Yes	62

Table 7: Distribution of patients according to previous history of Diabetic foot ulcer
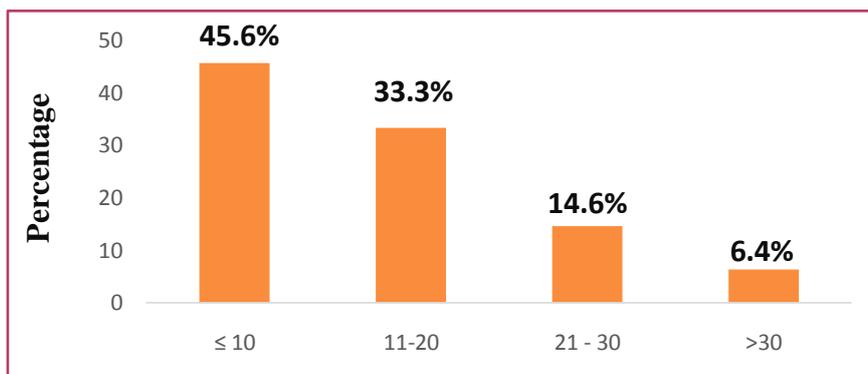
Figure 8: Distribution of patients according to previous history of Diabetic foot ulcer

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.

B. CLINICAL BACKGROUND

| Duration of Diabetes in years	Percentage
≤ 10	45.6
11-20	33.3
21 - 30	14.6
>30	6.4

Table 8: Distribution of patients according to the duration of Diabetes Mellitus

Figure 9: Distribution of patients according to duration of Diabetes Mellitus

In our study population, 45.6% of patients had Diabetes for a duration of less than or equal to 10 years, 33.3% had a duration of 11-20 years, 14.6% had a duration of 21-30 years and 6.4% had a duration of more than 30years.Mean duration was found to be 14.29 years and duration of Diabetes was a significant risk factor for Diabetic foot ulcer.The above results were supported by studies conducted by **Christopher et.al**.
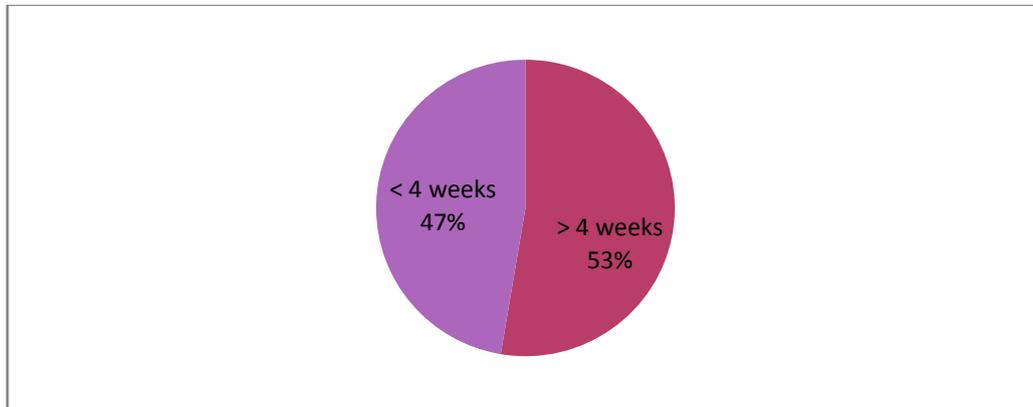
Figure 10: Distribution of patients according to the duration of wound

| Duration of Wound	Percentage
>4 week	52.6
<4 week	47.4

Table 9: Distribution of patients according to the duration of wound

In the study 52.6% had the duration of wound for more than 4 weeks and 47.4% had the duration of wound for less than 4weeks.Wound duration was found to be one of the significant factor statistically associated with MRSA infection with p value 0.000. Above data revealed that majority had a wound duration of more than 4 weeks. These results were supported by study conducted by **Jong Seok Lee et.al**.

Wagner's classification	Percentage
Grade 2	4.7
Grade 3	38
Grade 4	47.4
Grade 5	9.9

Table 10: Distribution of patients according to the Wagner classification of Diabetic foot ulcer
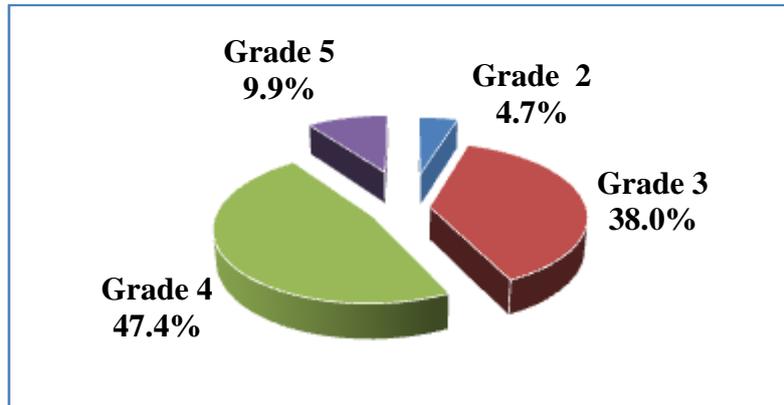
Figure 11: Distribution of patients according to Wagner's classification of diabetic foot ulcer

In the study it was found that majority of patients (47.4%) belongs to grade 4, 38.0% belongs to grade 3, 9.9% belongs to grade 5 and 4.7% belongs to grade 2 of Wagner's classification.
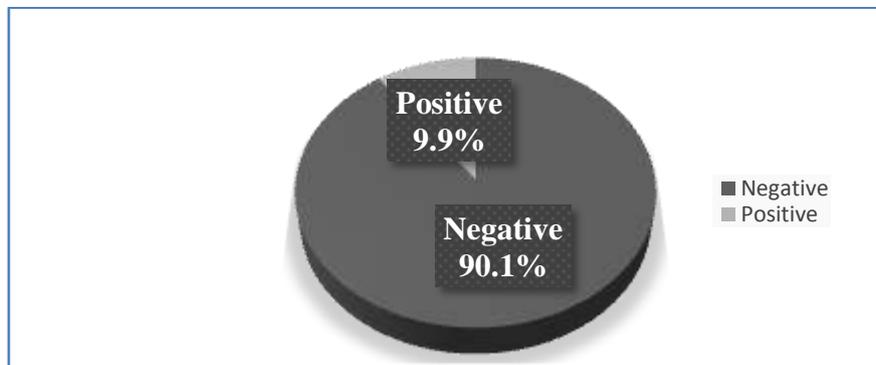
Figure12: Distribution of patients according to the proportion of MRSA

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.

MRSA	Percentage
Negative	90.1
Positive	9.9

Table 11: Distribution of patients according to the proportion of MRSA

Bacteria	Percentage
Klebsiella	23.8
Pseudomonas	27.6
MRSA	9.9
MSSA	21.8
E.coli	6.3
Proteus	6.3

Table 12: Distribution of patients according to the bacteriological profile

From the table 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
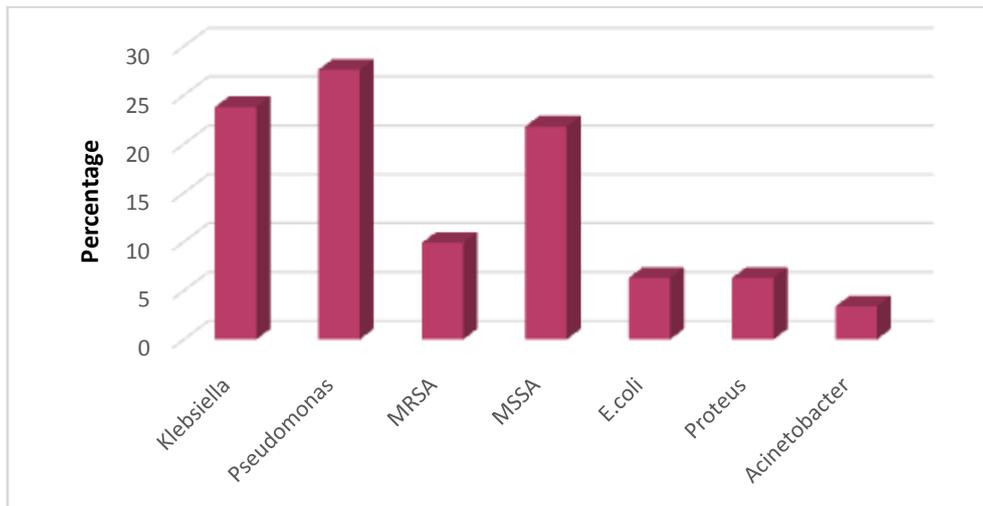
Figure 13: Distribution of patients according to the bacteriological profile

In our study gram positive bacilli were more prevalent than gram positive cocci.The commonmost isolate was Pseudomonaaeruginosa (27.6%), followed by Klebsiella(23.8%), E.Coli (6.3%) ,Proteus (6.3%) andAcinetobacter (3.4%).Among gram positive Staphylococcus was the common most organism isolated and these results were supported by study conducted by **PriyankaPatilet,.al**.

	Grade 2	Grade3	Grade4	Grade 5
Pseudomonas	89.5%	15.8%	25.1%	5.3%
Klebsiella	3.5%	6.14%	10.5%	1.2%
Staphylococcus	_	2.9%	42.7%	1.2%
E.coli	_	3.5%	2.3%	_
Proteus	_	2.3%	1.8%	_
Acinetobacter	_	2.3%	3.5%	2.3%
MRSA	_	1.8%	5.8%	1.8%

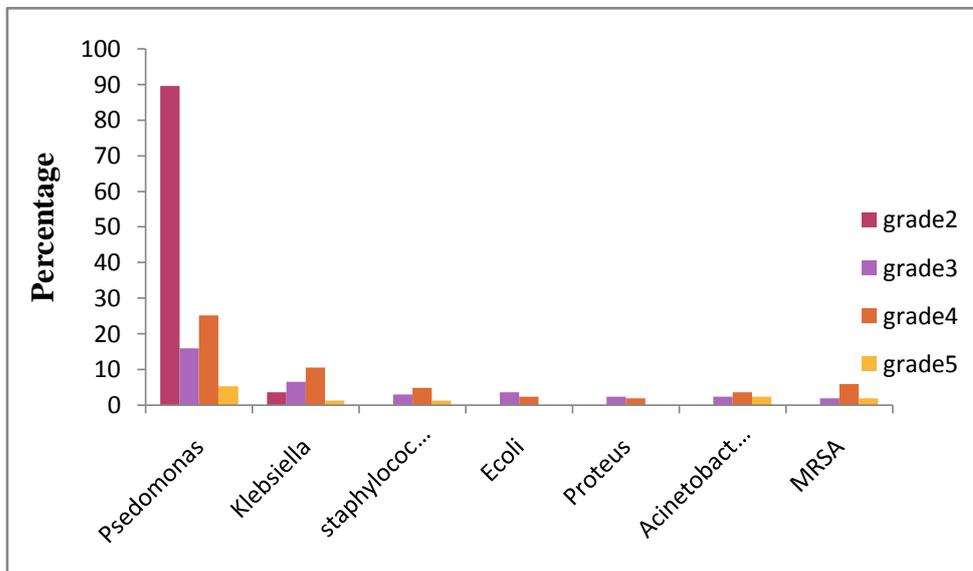**Table 13: Distribution of organisms according to the Wagner's classificion**

Figure 14: Distribution of organism based on Wagner's classification

Above data shows that most of the organisms belongs to grade 4 followed by Grade3, Grade 5 and Grade2 of Wagner's classification.
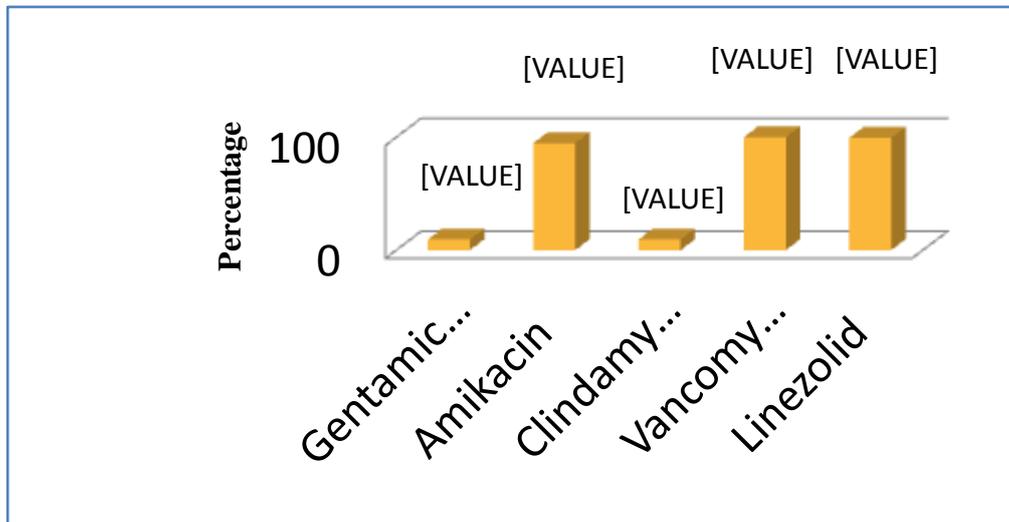
Fig14: Distribution based on sensitivity pattern of MRSA

Drugs	Sensitivity pattern
Linezolid	94.7
Vancomycin	100.0
Clindamycin	9.4
Amikacin	9.4
Gentamycin	9.4

Table14: Distribution according to the antimicrobial sensitivity pattern of MRSA

From the above data it was found that MRSA is more sensitive to vancomycin followed by linezolid.

Co-morbidities	Percentage
Anemia	96.5
HTN	80.0
DLP	62.0
CAD	49.1
KD	37.4

Table 15: Distribution of patients according to the co-morbidities present
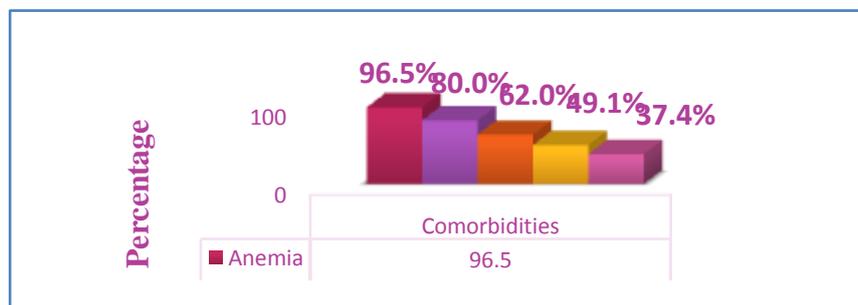
Figure 15: Distribution of patients according to co-morbidities present

Among the study population, 96.5% had Anaemia, 80.0% had hypertension, 62% had Dyslipidemia, 49.1% had Coronary artery disease and 37.4% had Kidney disease were the different co-morbidities present.

V. DISCUSSION

The study **entitled "Proportion of Methicillin resistant Staphylococcus aureus among patients with diabetic foot ulcer and their antimicrobial susceptibility pattern in a tertiary care teaching hospital**" was carried out in the department of General surgery, Govt. Medical College, Thiruvananthapuram for a period of six months. A total of 171 patients who satisfied the inclusion criteria were enrolled in the study.

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±10.4 years. 32.7%were in the age group of 66-75 years and only 8.2% were in the

age above75 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. These results were supported by the studies conducted by **Suryakala et.al**. In their study among 250 patients 64.4% were males and 35.6% were female showed that male population were affected by this disease than female population**.**In males cigarette smoking and peripheral neuropathy was found to be the important factors which differs both populations.

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.

These findings were similar to the findings in the study conducted by**Hibah Alharbi et.al**.in their study out of 300 patients 36.9% had primary 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. This is because the study was conducted in a tertiary care Government hospital were majority of patients were coming from low economic status and government provides them treatment and medication for free of cost.

e. Habit of smoking

Among the study population, 50.9% were smokers and 49.1% were non-smokers. Smoking diminishes tissue perfusion. This happens due to the nicotine present in the cigarette stimulates the sympathetic nervous system to release catecholamines which diminish tissue perfusion and cause hypoxia**.** These results were supported by findings in the study conducted by **Min Liu et.al.**

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..

g. Previous history of diabetic foot ulcer

In the study 62.0% of the patients have relevant family history of the disease and remaining 38.0% do not have any previous history.

h. Duration of Diabetes mellitus

In our study 45.6% of patients had diabetes for a duration of less than or equal to 10 years, 33.3% had a duration of 11-20 years, 14.6% had a duration of 21-30 years and 6.4% had a duration of more than 30years**.** Mean duration was found to be 14.29 years and duration of Diabetes was a significant risk factor for diabetic foot ulcer. The possible explanation might be due to the fact that diabetic patients for long time presumed to be at more risk due to the development of long term Diabetic complications such as Peripheral vascular disease, Neuropathy which could lead to the occurrence of foot ulcer.The above results were supported by findings in the study conducted by **Christopher et.al**

B. **CLINICAL BACKGROUND**

a. Duration of wound

In the study, 52.6% had duration of wound for more than 4 weeks and 47.4% had duration of wound for less than 4weeks. Wound duration is a significant factor statistically associated with MRSA infection. The above data reveals that majority had wound duration of more than 4 weeks. The results were supported by findings in the study conducted by **Jong Seok Lee et.al**.In their study univariate analysis revealed that wound duration was the only statistically significant factor associated with MRSA infection.

b. Wagner classification of foot ulcer

In this study it was found that majority of patients (47.4%) belongs to Grade 4 of Wagner classification, 38.0% belonging to Grade 3 classification, 9.9% belongs to Grade 5 classification and 4.7% belongs to Grade 2 classification.These results were supported by findings from the study conducted by **Mishah Mehraj et al**. In their study among 145 patients 34% belongs to grade 4 ulcer, followed by Grade 2(2%), Grade 3(16%) and Grade 5 (10%).

Wagner's classification of diabetic foot ulcer:

Grade 0 – There is no open lesion but potential breakdown with high pressure deformities and sensory neuropathy.

Grade 1 – The lesion is superficial through the skin only with or without underlying bony prominences.

Grade 2 – There is deep penetrating to tendon, joint or bone.

Grade 3 – There is deep abscess formation with plantar surface and tendon sheath infection with osteomylitis or septic arthritis.

Grade 4 – Gangrene is present locally in the toes or more diffuse over forefoot.

Grade 5 – Gangrene has spread and involves the hind foot requiring a higher amputation.

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**.

e. Classification of organism based on the Wagner's grade of foot ulcer

In our study, most of the organisms belongs to Grade 4 followed by Grade 3, Grade 5 and Grade 2 of Wagner's classification.These results were supported by studies conducted by Estrella et al. In their study polymicrobial infection from Grade 4 were found to be common in diabetic patients.

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. This is due to the acquisition of a non-native mecA gene encoding a PBP2a with low affinity for ß lactem.These results were similar to the finding from the study conducted by **Sreekumary et al**. In their study MRSA was sensitive to Vancomycin (100%), Linezolid (66.6%), Amikacin (14%) and Gentamycin (7.40%).

g. Co-morbidities present

From the above data shows that 96.5% had Anaemia, 80.0% had Hypertension, 62% had Dyslipidemia, 49.1% had Cardiac disease and 37.4% had Kidney disease were the different co-morbidities present. Anaemia has been severely reported complication of Diabetes Mellitus. According to previous studies protein of RBC membrane undergo non enzymatic glycosylation due to increased oxidative stress in diabetes and reduce Hb, RBC, and PCV lead to haemolysis and anemia.This study results were supported by study conducted by Wright et al. Their study showed a high incidence of anaemia (59.3%) in patients with severe dfu. In our study in addition to anemia other co-morbidities were Hypertension, Dyslipidemia, and CAD and Kidney disease. Previous studies shows that Hypertension and Dyslipidemia were associated with substantially increased cardiovascular disease and retinopathy.These results were similar to those findings from the studies conducted by **Hamza Mohammad et al.**

VI. 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. The findings of this study are important, especially for patient management as well as in the development of antibiotic policies. The rise of the resistant organisms is disconcerting because this will lead to limited choice of antibiotics in the treatment of such organisms. So without doubt proper management with correct antibiotic is of important in preventing the resistance. It is necessary for the clinician to be aware of the antibiotic susceptibility pattern of organisms and its management**.**

Antibiotics, Antidiabetics, Analgesics, Antiplatelets and vitamin supplements were most frequently prescribed drugs. Most of the patients have co-morbid conditions and requires more than one antibiotics, vitamin supplements, anti-diabetics and analgesic drugs for their therapy. The clinical pharmacist who plays an important role in patient counseling about diabetic foot care and selecting the antibiotics which are rational.

Patient education regarding diabetic foot care is associated with reduced foot ulcers. Foot ulcers and amputations can be reduced by increasing awareness about foot care. 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. Appropriate usage of antibiotics based on local antibiogram pattern can certainly help the clinician in reducing the burden of diabetic foot infections which ultimately reduces the rate of amputations.

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