

# ANTIBIOTIC SUSCEPTIBILITY PATTERNS OF *STAPHYLOCOCCUS AUREUS* IN WOUND INFECTIONS

SNIGDHA ASOK.P.N<sup>1</sup>, SONA SAN<sup>2</sup>, FOUSIYA.K.S<sup>3</sup>, SREEJA.P.A<sup>4</sup>

<sup>1,2,3,4</sup>Department of Pharmacy, Grace College of Pharmacy, Palakkad, Kerala, India

**Email** - snigdhaasok@gmail.com

**Abstract:** To analyse the Gender wise prevalence, and to analyse the antimicrobial sensitivity patterns of *S.aureus* in wound infections. **Methods:** A prospective study, conducted for a period of 5 months, from November 2015 to March 2016. 40 wounds infected with *S.aureus* were included. A Predesigned data collection form including demographic details, diagnosis, antibiogram report, medication chart was used. **Results:** Among the collected cases of wound infections *S.aureus* was found to be most prevalent in males (57.50%) than females (42.50%). *S.aureus* was found to be sensitive to Vancomycin (55 %) and was resistant towards Cotrimoxazole (32.5 %). microorganisms showed resistance to commonly used antibiotics like Cotrimoxazole and Amoxicillin. This indicates the need of periodic surveillance of etiologic agent and antibiotic susceptibility to prevent further emergence and spread of resistant bacteria pathogens.

**Key Words:** Infectious wounds, *S.aureus*, resistance, sensitivity, culture and sensitivity.

## 1. INTRODUCTION:

A wound is a breach in the skin which causes the exposure of subcutaneous tissue following loss of skin integrity and provides a moist, warm, and nutrient environment which helps in microbial colonization and proliferation. The common signs and symptoms are, Malaise, Fever, wound exudation etc.

*Staphylococcus aureus* is a Gram-positive spherical bacterium approximately 1 µm in diameter. Its cells form grape-like clusters, since cell division takes place in more than one plane. It is often found as a commensal associated with skin, skin glands, and mucous membranes, particularly in the nose of healthy individuals. Staphylococci are facultative anaerobes capable of generating energy by aerobic respiration, and by fermentation which yields mainly lactic acid. *Staphylococcus* sp. is catalase-positive, a feature differentiating them from *Streptococcus* sp., and they are oxidase-negative and require complex nutrients, e.g., many amino acids and vitamins B, for growth. *S. aureus* is very tolerant of high concentrations of sodium chloride, up to 1.7 molar. Another feature of the *Staphylococcus* genus is the cell wall peptidoglycan structure that contains multiple glycine residues in the crossbridge, which causes susceptibility to lysostaphin. *S. aureus* produces coagulase which interacts with prothrombin in the blood causing plasma to coagulate by converting fibrinogen into fibrin.

## 2. SENSITIVITY TESTING:

It is a microbiological test to determine the susceptibility pattern of isolated organism to antibiotics. It is otherwise known as antibiotic susceptibility testing. It is usually carried out to determine which antibiotics are most successful in treating the infection. 2 Types of antibiotic sensitivity testing includes Disk diffusion or Kirby–Bauer antibiotic testing and Tube dilution method.<sup>[3]</sup>

## 3. MATERIALS AND METHODS:

The study was conducted in Karuna Medical College, Chittur, Palakkad.

The study was conducted over a period of six months from November 2015 to April 2016.

### Study Design:

The study is designed as a prospective study. A Predesigned data collection form including demographic data, Present and past medical conditions, present and past medications, signs of infection, identified infectious organism, medication chart and Antibiogram report etc.

### Study population:

A total of 40 subjects were included in the study.

### Study criteria:

**Inclusion Criteria:** Patients with *S.aureus* wound infections.

**Exclusion Criteria:** Pregnancy and obstetrics, paediatrics, wounds infected with other microorganisms and wounds associated with burns.

**Study procedure:**

A prospective study was carried out for a period of 5 months after obtaining permission from the ethical committee, Grace College of pharmacy, Palakkad. The patients with *S.aureus* wound infections were included in our study. Data collection was carried out in predesigned data collection form which contains demographic data, Present and past medical conditions, present and past medications, signs of infection, identified infectious organism, medication chart and Antibigram report. The pus was collected from wound site to perform the Culture and Sensitivity test. It was analysed to determine the organism, sensitivity and resistance pattern. To find out the most effective agent to treat *S.aureus* wound infections, the percentage resistance and sensitivity is determined.

**Parameters for Evaluation:**

1. Distribution of *S.aureus* in wound infections with respect to Gender.
2. To determine the Antimicrobial sensitivity and resistance pattern of *S.aureus* in wound infections.

**4. RESULTS:****1 Gender wise distribution of patients.**

Table 1.1 and Figure 1.1 shows the gender wise prevalence of patients with *S.aureus* wound infection among the population in the hospital. In the study, a total of 138 patients were included, of these majority of them was male 57.50% which is contradictory to other similar studies and this may be due to the presence of risk factors in male gender. A 42.50 % of women was also present with *S.aureus* in wounds. [Figure 1.1, Table 1.1]

**TABLE 1.1 Gender wise Distribution**

GENDER	NO OF CASES	%
MALE	23	57.50
FEMALE	17	42.50
TOTAL CASES	40	100

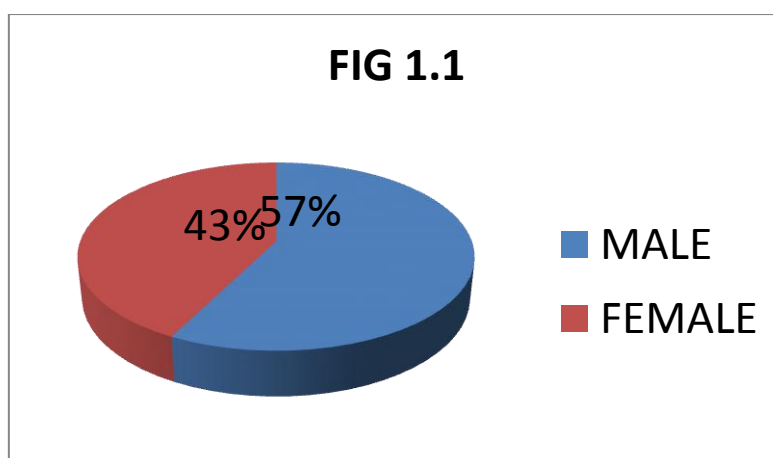
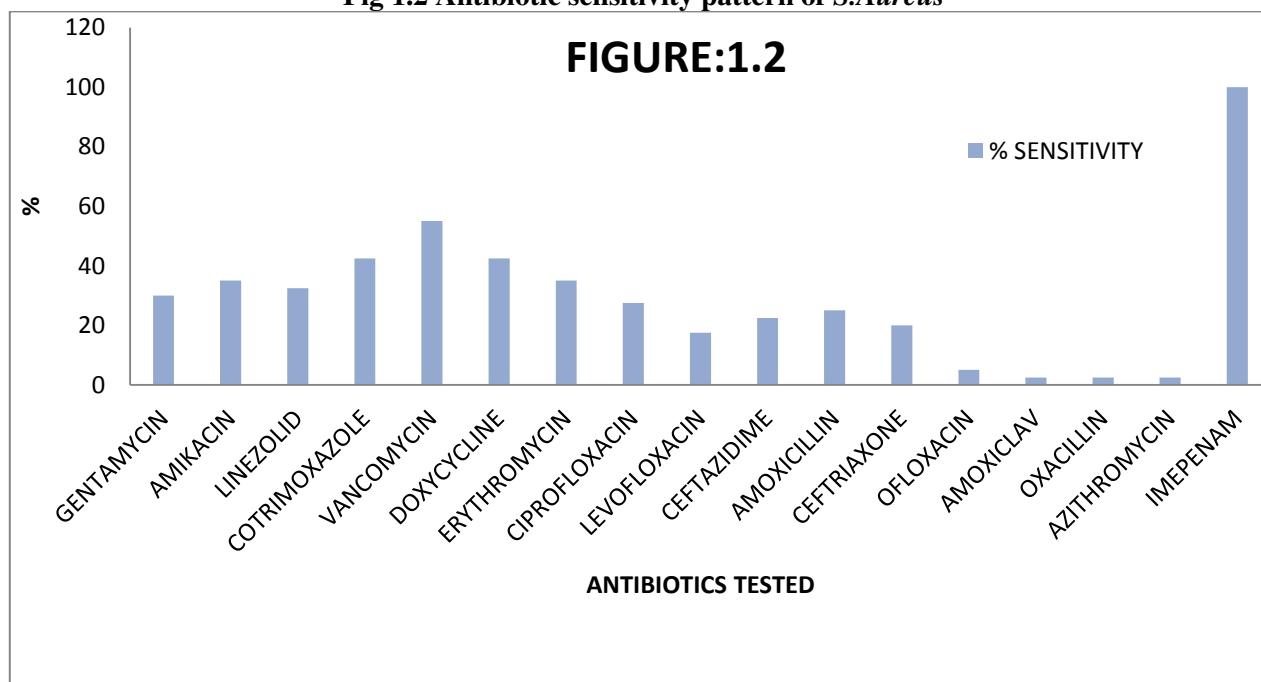
**FIG 1.1 Gender wise Distribution****2 Antibiotic sensitivity pattern of S.Aureus**

Table 1.2 and Figure 1.2 show Antibiotic sensitivity pattern of Gram positive organism isolated. Among which, Amikacin was the most effective agent. [Figure 1.2, Table 1.2]

**Table 1.2 Antibiotic sensitivity pattern of S.Aureus**

ANTIBIOTICS	SENSITIVITY	%
GENTAMYCIN	12	30
AMIKACIN	14	35
LINEZOLID	13	32.5
COTRIMOXAZOLE	17	42.5
VANCOMYCIN	22	55
DOXYCYCLINE	17	42.5
ERYTHROMYCIN	14	35
CIPROFLOXACIN	11	27.5
LEVOFLOXACIN	7	17.5

CEFTAZIDIME	9	22.5
AMOXICILLIN	10	25
CEFTRIAZONE	8	20
OFLOXACIN	2	5
AMOXICLAV	1	2.5
OXACILLIN	1	2.5
AZITHROMYCIN	1	2.5
IMEPENAM	1	2.5

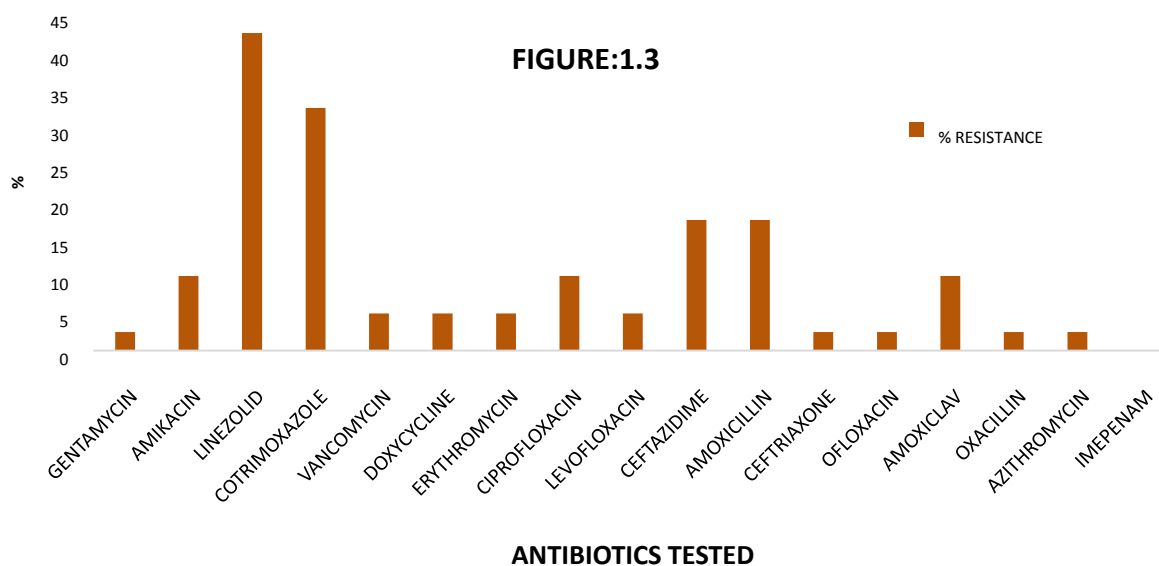
Fig 1.2 Antibiotic sensitivity pattern of *S.Aureus*

### 3 Antibiotic resistance pattern of *S.Aureus*

High amount of resistance is exhibited towards Cotrimoxazole followed by Ceftazidime, Amoxicillin and no resistance was offered towards Imepenam.

Table 1.3 Antibiotic resistance pattern of *S.Aureus*

ANTIBIOTICS	RESISTANCE	%
GENTAMYCIN	1	2.5
AMIKACIN	4	10
LINEZOLID	17	42.5
COTRIMOXAZOLE	13	32.5
VANCOMYCIN	2	5
DOXYCYCLINE	2	5
ERYTHROMYCIN	2	5
CIPROFLOXACIN	4	10
LEVOFLOXACIN	2	5
CEFTAZIDIME	7	17.5
AMOXICILLIN	7	17.5
CEFTRIAZONE	1	2.5
OFLOXACIN	1	2.5
AMOXICLAV	4	10
OXACILLIN	1	2.5
AZITHROMYCIN	1	2.5
IMEPENAM	0	0

Fig 1.3 Antibiotic resistance pattern of *S.Aureus*

## 6. DISCUSSION:

The study was carried out at Karuna Medical College Hospital, Chittur, over a period of 5 months from November 2015 to April 2016.

During the entire period, a total of 40 patients were included of these, 57.50% (n=23) were males as compared to 42.50% (n=17) were female. [Figure 1.1, Table 1.1], Which is contradictory to other studies, the slight difference in the number of males to females with wound infection is due to the social behavior where males are given superiority to the females, and if contacted disease are brought immediately to hospitals in comparison to female for treatment in India and the results are similar to study conducted by Muhammed, A et al.,<sup>[37]</sup>

*S.aureus* was found to be sensitive to Imepenam by 100% and also was found highly sensitive to Vancomycin (55%) followed by Doxycycline 42.5% and Cotrimoxazole 42.5%. [Figure 1.2, Table 1.2].

*S.aureus* was highly resistant towards Cotrimoxazole (32.5%) followed by Amoxicillin and Ceftadizime 17.5%. The sensitivity pattern are similar to that of the results of Reiyе Esayas Mengesha et al.,<sup>[42]</sup> Reham Dwedar et al.,<sup>[35]</sup>, which shows that Vancomycin is most effective agent and with minimal resistance towards *Staphylococcus aureus*. [Figure 1.3, Table 1.3].

## 7. CONCLUSION:

In our study, the antimicrobial susceptibility pattern also reveals the resistance pattern of the organisms towards the drugs tested and it suggest that, most of the gram positive organisms are resistant towards commonly prescribed antibiotics like Amoxicillin, Cotrimoxazole and Ceftriaxone. And Cotrimoxazole, Amoxicillin, and Ceftadizime, was found to be ineffective for the gram negative microorganism. No resistance was offered by gram positive organisms towards Imipenem because it was prescribed in a few cases only. This could be explained by low prescription of Imipenem for infected patients. This suggests the need to avoid excessive antibiotic therapy that promotes resistance. Although we can not specify an appropriate treatment regimen, considering the results it can be suggested that, for *Staphylococcus aureus*, Imipenem, Vancomycin, Doxycycline, and Amikacin can be used but empirical therapy with Imipenem, Vancomycin, should be avoided.

## REFERENCES:

1. KAHSAY et al. *Isolation and Antimicrobial susceptibility pattern of staphylococcus aureus in patients with surgical site infection at Debre Markos Referral Hospital, Amhara region, Etiopia*. JAMS. 2014; 72: 22

2. C. MANIKANDAN et al. *Antibiotic susceptibility of bacterial strains from wound infection patient in Pattukkottai, Tamilnadu, India*, INTERNATIONAL JOURNAL OF CURRENT MICROBIOLOGY AND APPLIED SCIENCES.2013;2(6):195-203
3. Baron EJ et al., Specimen collection, transport and processing: Bacteriology .Manual of Clinical Microbiology 10 th edition.2011; 228-271.
4. Bowler PG et al., Wound microbiology and associated approaches to wound management. Clin Microbiol Rev (2001) 14: 244-269.
5. Text book of Pharmacotherapy of Joseph T. Dipiro., Page no. 1900 -1905
6. NEELIMA et al. *Bacteriological profile of wound infection in rural hospital in R.R district*, INTERNATIONAL JOURNAL OF MEDICAL RESEARCH AND HEALTH SCIENCES.2013;2(3):469-473
7. AZENE .M.K et al. *Bacteriology and Antibiogram of pathogens from wound infections at Dessie laboratory, North east Ethiopia*. TANZANIAJOURNAL OF HEALTH RESEARCH.2011;13(4):6-10
8. AISHA MOHAMMED et al. *Incidence and antibiotic susceptibility pattern of bacterial isolates from wound infections in a tertiary care hospital in Nigeria*, TROPICAL JOURNAL OF PHARMACEUTICAL RESEARCH.2013;12(4):617-621
9. LATEEF .O.A et al. *Prevalence of bacterial pathogens in infected wound in tertiary hospital; any change in trend*, JOURNAL OF THE NATIONAL MEDICAL ASSOCIATION. 2013;95(12):1189-1195
10. TAIWO.S.S et al. *Invitro antimicrobial susceptibility pattern of bacterial isolates from wound infection in university of Ilorin teaching hospital*, AFRICAN JOURNAL OF CLINICAL EXPERIMENTAL MICROBIOLOGY.20012;3(1):6-10
11. HARSHMOHAN: *Textbook of Pathophysiology*, 6<sup>th</sup> edition;167-170
12. Pharmacotherapy Hand book 6th edition by Barbara. G.well. Pharm D et al; Hill medical Publications, Skin and soft tissue infection chapter 45, page no.463 to 464.