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Prevalence and antibiotic susceptibility pattern of *Staphylococcus aureus* Isolated from wound and skin samples

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Abstract: *Staphylococcus aureus* is a major bacterial pathogen responsible for wound and skin infections. This study investigates the prevalence and antibiotic susceptibility pattern of *S. aureus* isolated from wound and skin samples. A total of 30 skin swabs and 30 wound swabs were collected and analysed using standard microbiological techniques. The prevalence of *S. aureus* was found to be 60% of skin isolates and 40% of wound isolates among the tested samples. Antibiotic susceptibility testing revealed high resistance to ampicillin and sensitivity to gentamicin in both. The findings emphasize the need for continuous surveillance of antimicrobial resistance patterns to guide effective treatment strategies and reduce the spread of resistant strains.

Key Words: Prevalence, Antibiotic Resistance, *S.aureus.*

1. INTRODUCTION :

Staphylococcus aureus is a versatile pathogen capable of causing a wide and a range of human diseases. It is a significant human pathogen that causes wound infection, soft tissue infection and produces the pus. It belongs to the family *Micrococcaceae,* gram positive cocci having grape like cluster arrangement of 0.5-1.5 um diameter, aerobic, facultatively anaerobic, beta-hemolytic, fermentative, oxidase negative, non-sporing, non-motile, non-capsulated, yellow zone formation around the colonies on MSA and oil paint appearance on NA slopes (Maharajan, et al., 2021).

Staphylococcus aureus is considered to be a major pathogen that colonises and infects both hospitalised patients with decreased immunity, and healthy immuno-competent people in the community. This bacterium is found naturally on the skin and in the nasopharynx of the human body. It can cause local infections of the skin, nose, urethra, vagina and gastrointestinal tract, most of which are minor and not life-threatening (Shulman and Nahmias, 1972).

The virulence of S. aureus is multifactorial and due to the combined action of several virulence determinants. This is except toxic syndromes such as toxic shock syndrome, SSSS, and staphylococcal food poisoning, which are caused by toxic shock syndrome toxin, exfoliative toxins A and B, and different staphylococcal enterotoxins, respectively. The virulence of the bacteria is further regulated by extracellular and cell wall components that are expressed during different stages of infection for example during avoidance of host defense, growth and cell division, and spread of the bacteria.

Wound infection is a common problem during injury, mainly in the case of children Injuries in the children may be due to falls followed by burns, cuts and animal bites which causes both financial and psychological strain on the family because it drags the patient to the health care facilities. Wound infection account for 70-80% mortality and also an important cause of morbidity among surgical patients and 75% of mortality following burn injuries. The common organism responsible for pus formation or wound infection are: Coagulase negative S. aureus (CONS). *S.aureus* (Maharajan et al.. 2021).

2. Material and Methods

Collection of Samples:

Multiple wounds & healthy person skin surface samples were collected from Government Medical College, Akola. The wound samples collected were specially from the patients suffering from wound infection. Around 30 wound samples & 30 healthy person skin surface samples were collected. The sample was collected using the sterile cotton swab. The swab, medium and the test tubes were sterilized by autoclaving. The Nutrient broth medium was used for the transport and storage of sample in test tube. Sample were collected and taken to lab by following all required precautions.

Isolation and identification of *Staphylococcus aureus* from samples:

All the samples were enriched in trypticase soya broth and transferred to selective media. Incubation of loop full of each enrich culture was streaked on Nutrient agar and Mannitol salt agar as per requirement of test organism. All plates were incubated at 37°C for 24 hrs. Typical colonies from selective media were selected and then subjected for the conventional biochemical analysis for the organism as imvic test, sugar fermentation test, oxidase, catalase, urease, coagulase, fermentation. The biochemical characters of all the culture tested were analysed and compared with the standard literature for identification of genus as per Berge's manual of systemic bacteriology.

Determination of antibiotic susceptibility of isolates:

The antibiotic sensitivity test was done following the disk diffusion method. Using a sterile loop, 4-5 colonies were suspended in 2 mL of sterile nutrient broth. The bacterial suspension's turbidity was adjusted. The bacteria were then inoculated into the Mueller Hinton agar plate by using a sterile swab. The plates were left at room temperature for about 5 minutes. The following antibiotics were used, Ampicillin (AMP 10 mcg), Gentamycin (GEN 10 mcg), Erythromycin (E 15 meg), Ciprofloxacin (CIP 5 mcg), Chloramphenicol (C 30 mcg), and Amoxyclav (AMC 30 mcg) using sterile forceps, the antibiotic discs were place and fixed on the surface of cultivated agar. Finally the plates were inverted and incubeted at 37 degree Celsius for 24 hours.

Multiple Antibiotic Resistance index (MAR)

The MAR index of an isolate is defined as a/b, where a represents the number of antibiotics to which the isolate was resistance and b represents the number of antibiotics to which the isolates was subjected to.

3. Results and discussion :

In the study a total of 60 samples including 30 wound swabs and 30 skin swabs from the healthy person from hospital were collected. From total 60 samples 30 (50%) samples showed the presence of Staphylococcus aureus (Table no. 1). The highest incidences (60%) of isolation of Staphylococcus aureus was found amongst the skin swabs collected from individuals visiting or working in the hospital environment. While about 40%. Of Staphylococcus aureus were found to be present from wound swabs. (fig 1)

The present results are comparable with other studies as. Obiazi et.al, (2007) also reported the 48% of Staphylococcus aureus from wound swab can be attributed to the level. Of contamination arising from the habit of some of the volunteers to treat their wound aseptically before seeking appropriate medical attention. Sharma et al., (2017) also reported 35% of Staphylococcus aureus from burn wound samples. In the study high rate of isolation of Staphylococcus aureus was found to Staphylococcus aureus from skin swabs this is in concordance with Obiazi et al., (2007) who reported least 8.0% of Staphylococcus aureus isolation from healthy skin of volunteers.

The total 30 isolates were then identified by Cultural, Morphological and Biochemical Characteristics

The 30 isolates were then subjected to antibiotic susceptibility testing. It was found that among wound isolates 100 % resistance showed towards amoxyclave followed by chloramphenicol & ciprofloxacin to which 77% of resistance were shown by isolates, Towards ampicillin & erythromycin isolates showed 75% of resistance. While for gentamicin 50% isolates showed resistance (Table no. 2).

Similarly the antibiotic susceptibility was also checked for skin isolates (Table no.3). It was found that among skin isolates 94.45% resistance showed towards ampicillin. While for amoxyclave 88.87% isolates showed resistance.

Towards erythromycin isolates showed 33.38% of resistance. While for chloramphenicol ciprofloxacin and gentamicin no resistances was shown by isolates.

The present results are comparable with other studies as Maharajan et al., (2021) who also reported higher level of resistance of Staphylococcus aureus where ciprofloxacin showed 68% while for erythromycin showed 55% while gentamicin and chloramphenicol showed 10% & 4% lower resistance among wound isolates. Obiazi et al., (2007) reported the highest susceptibility of 80% occurred in the skin isolates with gentamicin while the least occurred in with clinical isolates with ampicillin. Obiazi et al., also reported the susceptibility of gentamicin to skin isolates was the highest 86.7%. This least pattern of susceptibility was observed in ampicillin with skin isolates only.

Multiple Antibiotic Resistance index of the skin isolates ranged from (0 to 0.33) and wound isolates ranging between the (0.5 to 1). It indicates that all the isolates may be hospital acquired. MAR Index analysis reveals that all the 30 isolates had a high MAR index value expected sk5 (Table no. 4).

The results are comparable with other studies as Udeani et al., (2016) showed Multiple Antibiotic Resistance index of the isolates ranged from 0.33 to 0.77. Itndicatall MRSA isolates were hospital acquired also the Subramani and Vignesh (2012) reported the MAR index analysis reveals that all the four isolates had a very high MAR index value (>0.2) Bacteria having MAR Index > 0.2 originated from environment where several antibiotic are used.

Table no. 1 : Prevalence of *Staphylococcus aureus* isolated from samples

Sr. No	Sample	No. Of sample	No. Of Isolates obtained	Percent occurence (%)
1	Wound swab	30	12	40%
2	Skin swabs	30	18	60%
Total		60	30	100%

- **Fig 1 : Frequency Distribution of *Staphylococcus aureus* obtained from samples**

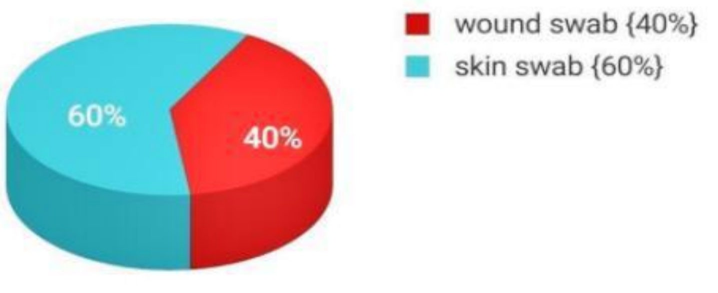


Table no. 2 : Antibiotic susceptibility pattern of wound isolate

Sr. No.	Antibiotic	Susceptibility		Resistance	
		No.	Percentage (%)	No.	Percentage (%)
1	Ciprofloxacin	4	33%	8	77%
2	Gentamicin	6	50%	6	50%
3	Erythromycin	3	25%	9	75%
4	Chloramphenicol	4	33%	8	77%
5	Ampicillin	3	25%	9	75%
6	Amoxyclav	0	00%	12	100%

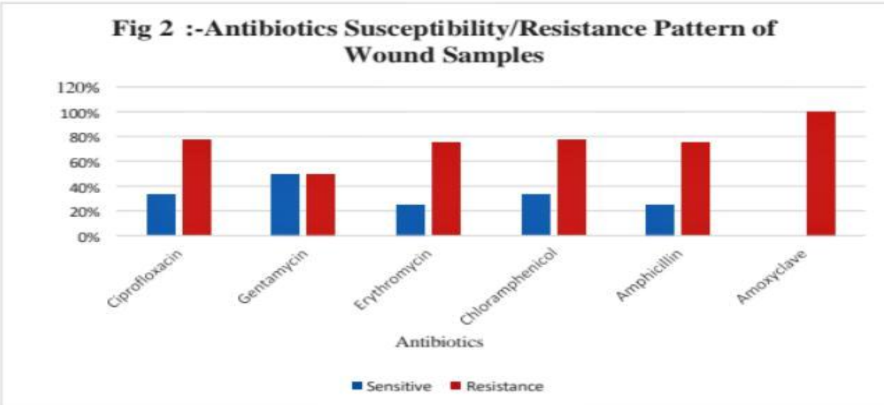


Table no. 3:: Antibiotic susceptibility pattern of skin isolate

Sr. No	Antibiotic	Susceptibility		Resistance	
		No	Percentage (%)	No.	Percentage (%)
1	Ciprofloxacin	18	100%	0	0%
2	Gentamicin	18	100%	0	0%
3	Erythromycin	12	66.63%	6	33.38%
4	Chloramphenicol	18	100%	0	0%
5	Ampicillin	1	5.56%	18	94.45%
6	Amoxyclav	2	11.12%	16	88.87%

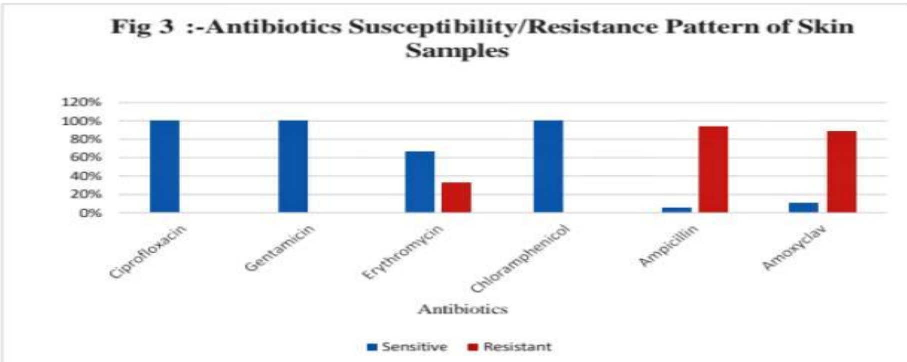
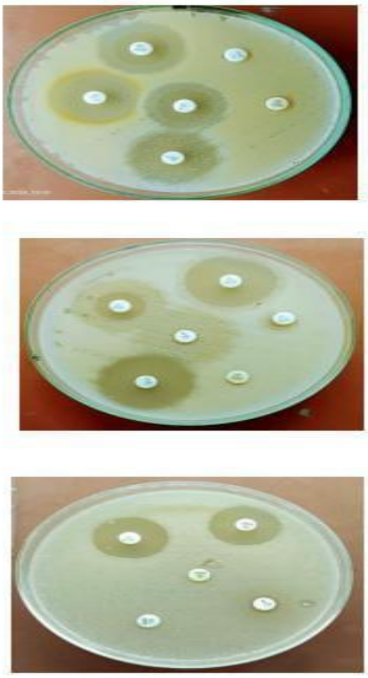


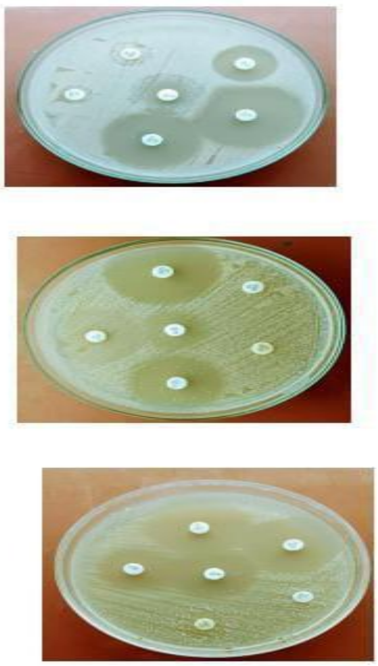
Table no. 4 : MAR index analysis of Isolates

Skin isolates		Wound isolates	
Isolates	**MAR index**	**Isolates**	**MAR Index**
Ssk1	0.16	Sw1	0.66
Ssk2	0.33	Sw2	0.83
Ssk3	0.33	Sw3	0.83
Ssk4	0.33	Sw4	0.5
Ssk5	0	Sw5	0.33
Ssk6	0.33	Sw6	0.66
Ssk7	0.5	Sw7	0.83
Ssk8	0.5	Sw8	1
Ssk9	0.33	Sw9	0.16
Ssk10	0.5	Sw10	0.83
Ssk11	0.5	Sw11	0.83
Ssk12	0.33	Sw12	1
Ssk13	0.5		
Ssk14	0.33		
Ssk15	0.33		
Ssk16	0.5		
Ssk17	0.33		
Ssk18	0.5		

Antibiotic Suscepitibitility Pattern of isolates



Wound Isolates



Skin Isolates

4. Conclusion :

In the present study highest prevalence of isolation 60% was observed among the skin swabs samples for *Staphylococcus aureus*. The *Staphylococcus aureus* isolated from the wound swabs showed high resistance as compared to skin isolates.

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