Original Research Paper

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PREVALENCE AND SUSCEPTIBILITY PROFILES OF METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS (MRSA) AMONG HOSPITAL ACQUIRED VS COMMUNITY ACQUIRED INFECTIONS.

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ABSTRACT **Background:** Staphylococcus aureus remains a dangerous pathogen for both hospital-acquired and community-acquired infections. Staphylococcus aureus is a commensal organism present in up to 80% of healthy individuals. It is the most common cause of SSTIs and nosocomial infections, necrotizing pneumonia, septic arthritis, endocarditis, and osteomyelitis. Penicillin-resistant strains of Staphylococcus aureus began to outnumber penicillin-susceptible strains in hospitals, and then in the community. Hence, there is a need to stop its prevalence. **Aim & Objectives:** Th present study aims to determine the prevalence of community-acquired, and hospital-acquired MRSA, along with the evaluation of the antimicrobial susceptibility pattern of MRSA. **Materials and Methods:** It is a prospective study of 6 months, conducted at Guntur Medical College. A total of 150 Staphylococcus aureus isolates were taken, 100 Hospital Acquired Infections (HAI) and 50 Community-Acquired Infections (CAI). In-Patients who were admitted were included along with the 1st time attending outpatients. An informed consent form was taken from the participants. Ethical approval was taken before the initiation of the study **Results:** Out of 150 Staphylococcus aureus isolates, 41 MRSA isolates were identified. Out of 41 MRSA isolates 85% (n=35) were from HAI and 14.6% (n=6) were from CAI. MRSA isolates were more prevalent in pus (39%) followed by urine (19.5%), wound swab (12.2%), sputum, throat swab (9.8%) blood (4.9%), and least in CSF (2.4%) and Pleural fluid (2.4%). Out of 41 MRSA isolates identified 56% (n=3) were males and 44% (n=18) were females. Out of 35 HAI – MRSA isolates 32.7% (n=19) were males and 38% (n=16) were females. Out of 6 CAI observed MRSA isolates 12.5% (n=4) were males and 11% (n=2) were females. In both HAI and CAI – MRSA isolates 31 to 50 years of age group were prevalent. The highest Resistance was observed towards Erythromycin followed by Co-trimoxazole and Ciprofloxacin. The highest Susceptibility was observed towards Vancomycin followed by Linezolid. **Conclusions:** It can be concluded that to prevent the spread of MRSA and the emergence of MDR, strict aseptic techniques in hospitals, treatment of patients and carriers, screening of hospital staff, antibiotic stewardship, and a treatment plan must be implemented immediately.

KEYWORDS : Methicillin resistant Staphylococcus aureus (MRSA), Skin and Soft tissue infections (SSTIs), Hospital, Community

INTRODUCTION

Staphylococcus aureus remains a dangerous pathogen for both hospital-acquired and community-acquired infections[1]. It is the most common cause of SSTIs. Almost 75 to 80% of healthy individuals will have it regularly. It is responsible for pneumonia, arthritis, endocarditis, osteomyelitis, etc., along with SSTIs[2]

Before the advent of antibiotics, the mortality rate due to S. aureus, due to bloodstream infections was higher in percentage but it dramatically reduced after the discovery of Penicillin[3].

Penicillin-resistant strains began to outnumber penicillin-susceptible strains in hospitals, and then in the community. Antibiotics that were effective against penicillinase-producing strains, such as Methicillin, became the standard treatment for skin and soft tissue infections, as well as for other S.aureus-related infections.[4]

Although MRSA has become common in healthcare settings and communities, the proportion of Staphylococcus aureus that is Methicillin- resistant is higher. MRSA was discovered to have a higher prevalence in patients, though the prevalence rate varies globally.[5]

MATERIALS AND METHODS

Study design

It is a prospective study of 6 months, conducted at Guntur Medical College. A total of 150 Staphylococcus aureus isolates were taken, 100 Hospital Acquired Infections (HAI) and 50 Community-Acquired Infections (CAI). An informed consent form was taken from the participants. Ethical approval was taken before the initiation of the study.

Selection Criteria

Inclusion Criteria

- In-Patients admitted in Government General Hospital, Guntur.
- 1st time hospital attending outpatients.

Exclusion Criteria

- Outpatients attending Government General Hospital, Guntur.
- Participants who didn't agree to give consent form.

Study procedure

In this study, the prevalence of MRSA in hospital- and community-associated illnesses was examined.

Staphylococcal strains were collected from the tertiary care hospital laboratory during the study period.

Several clinical samples yielded the isolation of Staphylococcus aureus (pus, blood, cerebrospinal fluid, body fluids, sputum, throat swab, and urine). In accordance with accepted laboratory practices, Staphylococcus aureus was isolated and recognised from clinical specimens.

The phenotypic characteristics on blood agar and Mac Conkey's agar (Hi-Media) incubated at 37°C for 24-48 hours, the Gram reaction, the catalase test, the coagulase test, and the mannitol fermentation were used to identify S. aureus.

As the quality control strain, Staphylococcus aureus ATCC (American Type Culture Collection) 25923 was employed. By utilising cefoxitin disc (30 g) on Muller-Hinton agar, the CLSI-recommended disc diffusion test was used to identify methicillin resistance in S.aureus.

Clinical and Laboratory Standards Institute (CLSI) standards said that

a zone of inhibition 21 mm was regarded methicillin-resistant while a zone of inhibition 22 mm was considered methicillin-sensitive. S.aureus ATCC 43300 (MRSA) was employed for quality control. The Kirby-Bauer disc diffusion method on Mueller-Hinton agar was used to examine the antibiotic resistance profiles of S. aureus isolates against routinely prescribed antibiotics, and the results were interpreted in accordance with CLSI guidelines.

Data analysis

All pertinent clinical information as well as demographic information was documented. Data is represented as frequency (n) and percentages (%), in the form of tables and graphs.

RESULTS

In the present study, out of 150 S.aureus isolates, 41 MRSA isolates were Identified. Out of these, 41 MRSA isolates 85% (n=35) were from Hospital Acquired Infections (HAI) and 14.6% (n=6) were from Community Acquired Infections (CAI). MRSA isolates are more Prevalent in Hospital Acquired Infections (HAI). (Table 1)

MRSA isolates were more prevalent in pus (39%) followed by urine (19.5%), wound swab (12.2%), sputum, throat swab (9.8%) blood (4.9%) and were least in CSF (2.4%) & Pleural fluid (2.4%). (Table 2 & Figure 1) 31 to 40 years of age group was predominant in HAI and 31 to 40 years and 41 to 50 years of age group was predominant in CAI. (Figure 2)

Male gender is in majority in both study groups, HAI (n=58 & n=32). Out of 41 MRSA Isolates 56% (n=23) were males and 44% (n=18) were females. Out of 35 HAI – MRSA Isolates 32.7% (n=19) were males and 38% (n=16) were females. Out of 6 CAI – MRSA Isolates 12.5% (n=4) were males and 11% (n=2) were females. (Table 3) Highest Resistance observed towards Erythromycin followed by Co-trimoxazole and Ciprofloxacin. Highest Susceptibility observed towards Vancomycin followed by Linezolid. (Table 4)

Table-1 Hospital Acquired samples and Community Acquired samples of MRSA Isolates

Isolates	Hospital Acquired Infections (HAI)	Community Acquired Infections (CAI)
S.aureus Isolates	100	50
MRSA Isolates	35(35%)	6(12%)

Table 2 Distribution of MRSA in various clinical samples

Clinical specimen	S. aureus (n=150)	MRSA (n (%))
Pus	48	16 (39%)
Urine	31	08 (19.5%)
Wound swab	17	05 (12.2%)
Sputum	16	04 (9.8%)
Throat swab	09	04 (9.8%)
Blood	23	02 (4.9%)
CSF	01	01 (2.4%)
Pleural fluid	05	01 (2.4%)

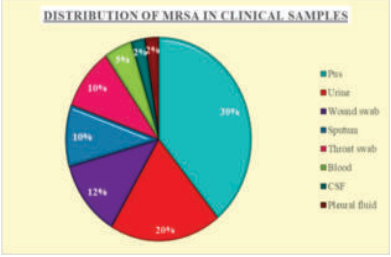

Figure 1 Distribution of MRSA in various clinical samples

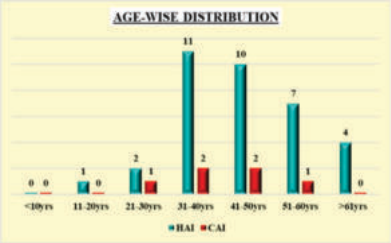

Figure 2 Age-wise distribution of MRSA among HAI and CAI

Table 3 Gender-wise Distribution

Gender	HAI		CAI		Total
	S.aureus	MRSA	S.aureus	MRSA	
MALE	58	19 (32.7%)	32	4 (12.5%)	23
FEMALE	42	16 (38%)	18	2 (11%)	18
TOTAL	100	35 (35%)	50	6 (12%)	41

Table 4 Overall Antibiotic Resistance Profile Of Mrsa Isolated From Hospital And Community Associated Infections

Antibiotic	MRSA	Resistant	Susceptibility
Erythromycin	MRSA	26	15
Gentamicin	MRSA	13	28
Clindamycin	MRSA	14	27
Ciprofloxacin	MRSA	15	26
Co-trimoxazole	MRSA	25	16
Linezolid	MRSA	6	35
Vancomycin	MRSA	5	36

DISCUSSION

Out of 150 S.aureus isolates 100 from Hospital Acquired Infections (HAI) and 50 from Community Acquired Infections (CAI).

Out of 150 S.aureus isolates, 41 MRSA isolates were Identified. Out of these, 41 MRSA isolates 85% (n=35) were from Hospital Acquired Infections (HAI) and 14.6% (n=6) were from Community Acquired Infections (CAI). MRSA isolates are more Prevalent in Hospital Acquired Infections (HAI). Similar results were in the studies done by Preeja PP et al, in the year 2021.[6]

MRSA isolates were more prevalent in pus (39%) followed by urine (19.5%), wound swab (12.2%), sputum, throat swab (9.8%) blood (4.9%) and were least in CSF (2.4%) & Pleural fluid (2.4%). Similar results were in the studies done by CDC, California,[7] and by Rasigade JP et al, in the year 2014[8]

31 to 40 years of age group was predominant in HAI and 31 to 40 years and 41 to 50 years of age group was predominant in CAI. It is in accordance to the study done by Tong SY et al, in the year 2015.[9]

Male gender is in majority in both study groups, HAI (n=58 & n=32). Out of 41 MRSA Isolates 56% (n=23) were Males and 44% (n=18) were Females. It is similar to a study done by DeLeo FR et al, in the year 2009.[10]

Out of 35, HAI – MRSA Isolates 32.7% (n=19) were Males and 38% (n=16) were females. Out of 6, CAI – MRSA Isolates 12.5% (n=4) were males and 11% (n=2) were Females. It is in accordance to the study done by Salgado-Pabón W et al, in the year 2013.[11]

Highest Resistance observed towards Erythromycin followed by Co-trimoxazole and Ciprofloxacin. Highest Susceptibility observed towards Vancomycin followed by Linezolid. Similar results were observed by Le KY et al, in the year 2015.[12]

CONCLUSION

The study reveals that, MRSA is becoming more common in hospital and community settings due to the emergence of MDR. To prevent the spread of MDR & MRSA in hospital settings and the community, as well as the replacement of MSSA by more virulent MRSA, immediate control measures must be implemented.

The current study discovered a high percentage of MRSA isolates (27%) as well as high cross-resistance of the isolates to other antibiotics (Vancomycin and Linezolid in particular).

To prevent the spread of MRSA and the emergence of MDR, strict aseptic techniques in hospitals, treatment of patients and carriers, screening of hospital staff, antibiotic stewardship, and a treatment plan must be implemented.

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