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Research Article

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Comparison of antimicrobial resistance pattern of hospital - and community - acquired Methicillin resistant *Staphylococcus aureus*

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ABSTRACT

Methicillin-resistant Staphylococcus aureus (MRSA) is now considered to be a community, state, national and international problem. Patients and the public are increasingly seeing MRSA and rates of MRSA infections as indicators of the quality of patient care. The present study was done to compare the antimicrobial susceptibility profile of the hospital - and community -acquired Methicillin resistant Staphylococcus aureus. Various clinical samples like pus, urine, stool, sputum, blood and other body fluids of patients attending Shri B M Patil Medical College and Hospital were selected for study for a period of one years from June 2012 to June 2013. Samples which yielded Staphylococcus aureus were included in the study. S. aureus was identified by conventional techniques. Antimicrobial susceptibility testing of the isolates were performed by Kirby Bauer disc diffusion method. Detection of the MRSA were done by Oxacillin disc diffusion method. The present study shows that the prevalence of MRSA isolates were more among the elderly people. MRSA isolates were more frequent in male patients. Majority of the isolates were from surgery department. Resistance was more among HA-MRSA isolates when compared to CA-MSSA isolates The most effective agent against MRSA isolates was linezolid, followed by tetracycline and piperacillin/tazobactam. The most effective antimicrobial agent against MRSA isolates were linezolid, followed by tetracycline and piperacillin/tazobactam. Linezolid should be used as reserve drug in treating MRSA infections. Therefore we recommend the use of tetracycline or piperacillin/tazobactam for treating infections caused MRSA isolates.

Key words: community-acquired MRSA, hospital-acquired MRSA, drug resistance

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INTRODUCTION

Staphylococcus aureus was first described by Sir Alexander Ogston in 1882.[1] This centuries-old pathogen still causes significant morbidity and mortality despite huge advances in medical care. Indeed, infections due to *S. aureus* continue to grow in number and complexity as a consequence, ironically, of advances in patient care and of its ability to adapt to a changing environment.[2]

Historically, the development of antimicrobial resistance in *Staphylococcus aureus* has been rapid. Resistance to penicillin in *S. aureus* was noted only a year after its introduction, and, in the early 1950s. Currently, 90%–95% of clinical *S. aureus* strains throughout the world are resistant to penicillin. In 1959, the first antistaphylococcal penicillin—methicillin—was introduced. Within 2 years, the first methicillin-resistant *S. aureus* (MRSA) strain emerged. [3]

Now, MRSA is the most common nosocomial bacterial pathogen isolated in many parts of the world. In the past, community-acquired MRSA (CAMRSA) infections tended to occur in patients with frequent health care contact or, less commonly, in specific groups of patients, such as intravenous drug users. CA-MRSA infections, which were first described in small series of adult and pediatric patients presenting with skin and soft-tissue infections, pneumonia, or bacteremia, have become a significant public health threat in the United States and abroad.[4]

Methicillin-resistant Staphylococcus aureus (MRSA) is now considered to be a community, state, national and international problem. Patients and the public are increasingly seeing MRSA and rates of MRSA infections as indicators of the quality of patient care [5]. The present study was done to compare the antimicrobial susceptibility profile of the CA-MRSA and HA-MRSA in our tertiary care hospital.

EXPERIMENTAL SECTION

Source of data:
The study was conducted in the Department of Microbiology, Shri B.M Patil Medical College Hospital, Bijapur. *Staphylococcus aureus* isolated from various clinical samples that were sent to the microbiology department formed the material for the study.

Method of collection of data: (including sampling procedure)
Various clinical samples like pus, urine, stool, sputum, blood and other body fluids of patients attending Shri B M Patil Medical College and Hospital were selected for study for a period of one years from June 2012 to June 2013.

Statistical analysis :
Data was analyzed by
1) Diagrammatic representation
2) Proper statistical tests like chi square test etc.

Inclusion criterion: Samples which yielded *Staphylococcus aureus* were included in the study.

Exclusion criterion: Samples which did not yield *Staphylococcus aureus* were excluded from the study.

Specimens were screened by preliminary Gram's stain and then inoculated on 10% sheep blood agar and MacConkey's agar. *S. aureus* was identified by conventional techniques .[6-7] Antimicrobial susceptibility testing of the isolates were performed by Kirby Bauer disc diffusion method using following discs. penicillin-G (10 unit); cloxacillin (30µg); cephalexin (30µg); cefuroxime(30 µg) ; tetracycline (30µg) ;erythromycin (15µg) gentamycin (10µg); ciprofloxacin (5µg); pefloxacin (5µg); Cefoperazone /salbactan(75 µg/ 30 µg) pepercillin/tazobactam(100µg/10 µg); amoxicillin/clavulanic acid (20 µg /10 µg); azithromycin(15µg); linezolid (15µg). Finally, the data were recorded and analyzed at the completion of the study as per recommendations of the NCCLS.[8] *S. aureus* ATCC 29213 were used as reference strain for the standardization of antibiotic susceptibility testing.

Detection of the MRSA were done by Oxacillin disc diffusion method [8-10] All the confirmed *S. aureus* strains were subsequently tested for methicillin resistance based on Kirby-Bauer disk diffusion method using oxacillin discs. (1µg) The isolates were considered methicillin resistant if the zone of inhibition was 10 mm or less.[9,10]

RESULTS AND DISCUSSION

Although MRSA was identified in 1961, it was not until the mid 1980s that it became a frequent adversary. The increase in MRSA infections most likely reflects the growing impact of medical interventions, devices, older age, and comorbidities of patients Antibiotic use and overuse probably also contribute to the emergence of resistance [2].

The present study shows that the prevalence of MRSA isolates were more among the elderly people as shown in Table 1, followed by age group 0f 20-50 years but the difference in the between the age groups were not statistically significant(P value >0 .05) which is in agreement with the study conducted by Madani et al and Benghazi et al.[11,12] MRSA isolates were more frequent in male patients (table 2) when compared with the female patients.

Similar findings were reported by Kali et al and Mathanraj et al [13,14]but some authors [12,15]observed no preference for any gender.

Table 1: Age wise distribution of the MRSA isolates

Age in years	Number of MRSA isolates	Percentage
1-20	12	19.4
21-50	21	33.9
>51	29	46.8
total	62	100

Table 2: Sex wise distribution of the MRSA isolates.

Sex	Number of MRSA isolates	Percentage
Male	43	69.4
Female	19	30.6
Total	62	100

Figure 1: Distribution of MRSA isolates in various clinical departments.

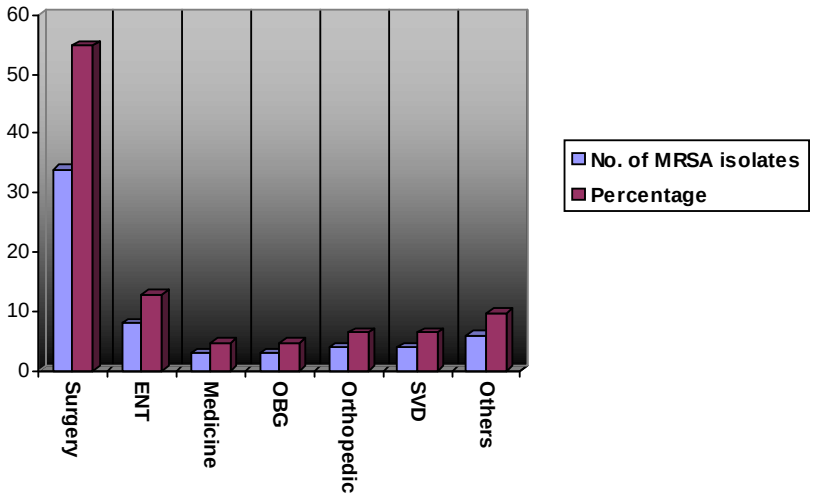

Table 3: Antibiotic resistance pattern of MRSA isolates

Antibiotics	HA-MRSA	CA-MSSA
Penicillin-G	100	100
Eythromycin	49	46.2
Tetracycline	10.2	0
Cephalexin	53.1	53.8
Cloxacillin	40.8	46.2
Pefloxacin	63.3	61.5
Pepercillin/tazobactam	20.4	15.4
Cefoperazone /salbactan	22.4	23.1
Gentamycin	20.4	15.4
Ciprofloxacin	73.5	77
Amoxicillin/clavulanic acid	73.5	69.2
Cefuroxime	42.9	30.8
Azithromycin	51	30.8
Linezolid	4.08	0

In the present study majority of the isolates were from surgery department (Figure 1) and from pus samples which was consistent with suppurative nature of Staphylococcal infections. Similar findings were reported by Akpaka et al. [16] The reasons higher proportion of MRSA cases among surgical patients may be related to the poor

environmental cleaning, operation theatre surveillance and infection control measures of hospitals in Indian setup and also because of high usage of antibiotics as noted by Swanston et al [13,17**].**

Anti-biograms of MRSA (HA-MRSA and CA-MRSA)isolates to 14 anti-microbial agents including linezolid, cephalosporins, aminoglycosides, and fluoroquinolones are presented in (Table 3) .The table revealed high level of resistance among HA-MRSA isolates when compared to CA-MSSA isolates The most effective agent against MRSA isolates was linezolid, followed by tetracycline and piperacillin/tazobactam.

Antimicrobial drug resistance has become a great public health problem worldwide. As incidence of MRSA increased, the efficacies of penicillins and cephalosporins have waned. Essentially, many MRSA strains acquired resistance to both beta lactam and aminoglycosides. Therefore, it is necessary choose suitable antibiotics with respect to their antimicrobial profiles for treating the infections [18]

Antibiotic susceptibility of MRSA isolates revealed that CA-MRSA isolates were less resistant than HA-MRSA(Table 3) isolates to the majority of the routinely used antibiotics. But the difference between them was not statistically significant. Our results are in agreement with study conducted by Tiwari et al [19] which also revealed no significant difference in the antibiotic susceptibility pattern of CA-MRSA and HA-MRSA. Factors responsible for to drug resistance in MRSA are as follows. Antibiotics are available without prescription at drug stores or even at general stores and injudiciously used in communities, animal husbandries, and fisheries. Traditional practitioners use allopathic drugs, and many practitioners who earn by selling medicines prescribe more drugs than necessary[19]. In contrast to the present study, a study conducted by Huang et al.[20] showed significant difference in the antibiotic susceptibility pattern of CA-MRSA and HA-MRSA

CONCLUSION

The most effective antimicrobial agent against MRSA isolates were linezolid, followed by tetracycline and piperacillin/tazobactam. Linezolid should be used as reserve drug in treating MRSA infections. Therefore we recommend the use of tetracycline or piperacillin/tazobactam for treating infections caused MRSA isolates.

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