



INCIDENCE OF ANTIBIOTIC RESISTANCE IN METHICILLIN RESISTANT *STAPHYLOCOCCUS AUREUS* IN BURN PATIENTS IN A TERTIARY CARE HOSPITAL, INDIA.

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ABSTRACT

Staphylococcus aureus infection remains an increasing problem of hospital acquired infections in burn patients, among them methicillin resistant *Staphylococcus aureus* poses potential cause of morbidity and mortality. Our study was carried out at the Department of Microbiology at GMC Latur, India. From Jan 2012 to June 2013, to determine the profile of aerobic bacterial infection in burn patients. Total 353 samples from 277 patients were analyzed. *Staphylococcus aureus* was isolated in total 70 samples (18.22%), out of these 43 (61.42%) were Methicillin resistant *Staphylococcus aureus* (MRSA) as determined by cefoxitin disc. Methicillin resistant *Staphylococcus aureus* (MRSA) showed the maximum sensitivity to vancomycin and linezolid. While, MRSA showed the maximum resistant pattern to commonly used antibiotics, was responsible for most nosocomial infection.

KEYWORDS: Methicillin resistant *Staphylococcus aureus*, burn wound infection, Antibiotic sensitivity.



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INTRODUCTION

Infection is the most important problem in the treatment of burns. The bacteriology of burn wounds has been often polymicrobial in nature, and the presence of multidrug-resistant organisms are often associated with more severe clinical manifestations, poor response to antimicrobial therapy, and increased mortality¹. *Staphylococcus aureus* agent is relatively pathogenic to humans and is found on the skin and mucosa of upto 40% of all population². Extensive burn injuries are particularly susceptible to infection as a result of the normal skin barrier and accompanying depression of immune responses. Extended hospitalization and antibiotic therapy have been identified as additional risk factors for MRSA carriage and infection³. PCR is a rapid and sensitive for detecting various genes in genetic materials over conventional susceptibility testing methods. Presence of *mecA* and *femA* in the methicillin resistant isolates confirm the MRSA. PBP2a bind to an altered penicillin binding site, therefore methicillin fails to inhibit synthesis of bacterial cell wall and the cell become resistant to drug⁴. But, the overall results suggest the cefoxitin disk test is a reliable alternative for the *mecA* gene detection and can be useful for those labs which do not have PCR facilities⁵. The scarcity of treatment options and the morbidity and mortality associated with MRSA infection provide a strong argument for implanting strict rules to control the spread of this deadly pathogen within hospital setting⁶. Since the pattern of nosocomial infections by MRSA is different in different hospitals and that keeps changing every year, therefore it is very essential to regularly to monitor the infection trends of this organism in order to improve the patient outcome especially in high risk units like burns⁷. Finally, strict consideration of *S. aureus* infection and proper usage of antibiotic policy are recommended in decreasing the incidence and occurrence of multidrug resistant *Staphylococcus aureus* infection⁸. Therefore, the aim of this study was to find the

prevalence and antibiotic resistance pattern among the isolates from burn wound infections.

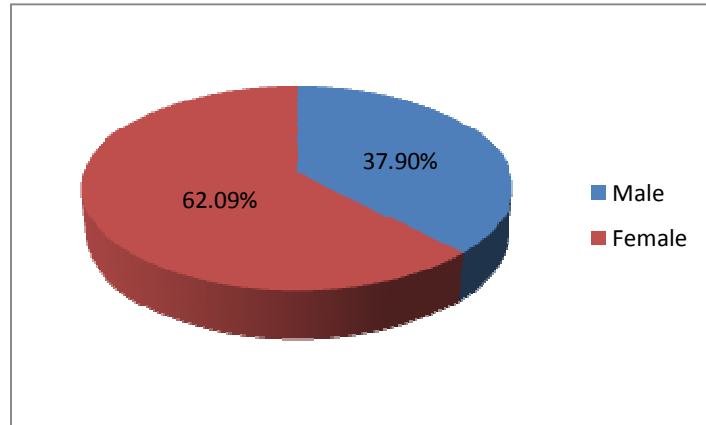
MATERIALS AND METHODS

A cross sectional study was carried out at Government medical college Latur, between Jan 2012 to June 2013. The study was approved by the ethical committee, Government college Latur, India. A total of 706 wound swabs was collected from 277 patients. Samples were collected under all aseptic precaution from the burn inpatient ward by a stick with cotton swab and were immediately transferred to microbiology laboratory for culture and sensitivity. The samples were cultured on the following culture media- MacConkey agar and Blood Agar. The media were incubated at 37°C for 24 hours on 1st day, then on 2nd day colonies were selected and checked for Gram stain after that catalase and coagulase test were done for identifying *Staphylococcus aureus*. MRSA were screened using cefoxitin (30µg) disc by disc-diffusion technique. All *Staphylococcus aureus* isolate were taken and match with 0.5 Mac Farland and inoculated on Muller Hinton agar for sensitivity testing according to modified Kirby-Bauer disc diffusion technique as per CLSI guideline 2012, by using antibiotics Ampicillin(), ciprofloxacin (5µg), Erythromycin (15µg), clindamycin (2µg), Gentamicin (10µg), Linezolid (30µg), cefoxitin (30µg), co-trimoxazole (1.25/23.75µg), Teicoplanin(), vancomycin (30µg). *Staphylococcus aureus* ATCC 25923 was taken as the positive control strain for culture and antibiotic sensitivity test for each batch. Final data were analyzed.

RESULTS

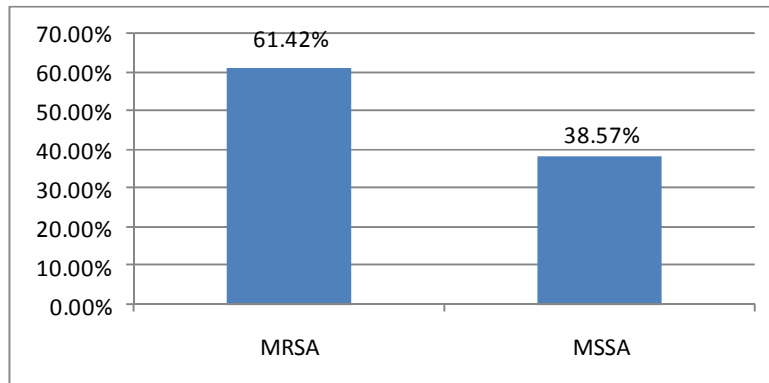
In the present study, a total of 706 wound swabs was taken from 277 patients, 172 females and 105 males.

Figure 1
Distribution of sex among the patients



Out of 353 swabs were collected for culture out of which 294 samples (83.28%) showed growth of pathogenic bacteria. In which 384 organisms were isolated, out of which 70 were *Staphylococcus aureus*. Therefore, overall prevalence of *Staphylococcus aureus* was 18.22%. Out of the total 70 isolated *Staphylococcus aureus*, 43 were found to be methicillin resistant *Staphylococcus aureus* (MRSA). So incidence of MRSA found to be 61.42%.

Figure 2
Distribution of percentage of MRSA and MSSA in isolates.



Determination of antibiotic susceptibility

We also evaluated the antibiotic susceptibility pattern between MRSA and MSSA , we determined different sensitivity pattern among them. MRSA shows the maximum sensitivity to vancomycin (100%) and linezolid (100%) followed by clindamycin (88.37%), teicoplanin (53.48%).MSSA shows maximum sensitivity to vancomycin (100%), linezolid (100%) and teicoplanin (100%) followed by clindamycin (92.59%), erythromycin (74.07%).

Table No 1
percentage of sensitivity pattern among methicillin resistant and methicillin sensitive *Staphylococcus aureus*.

organism		CIP	E	CD	GEN	LZ	COT	AMP	VA
MRSA n=43	No.	10	11	38	0	43	0	0	43
	%	23.25%	25.58%	88.37%	0%	100%	0%	0%	100%
MSSA n=27	No.	16	20	25	14	43	13	8	43
	%	59.25%	74.04%	92.59%	51.85%	100%	48.14%	29.62%	100%

DISCUSSION

In the present study, 43 out of 70 (61.42%) of the *Staphylococcus aureus* isolated were found to be MRSA. Ekrami A et al in 2010, found 60% of MRSA in their study⁵. In another study from India, done at VMMC & Safdarjung Hospital, New Delhi reported an upward trend of MRSA isolates in recent year between 60-69%⁷. Bhat VG et al, in their study reported 57 % of MRSA⁹. While previously Ekrami A et al in 2007, reported the 58% of MRSA in his study¹⁰. In contrast, some studies reported low incidence of MRSA in their studies like, Jefferson Lessa Soares de Macedo (4.7%)¹¹ and Chamania S et al (12%)¹². In one of the study, MRSA prevalence has been found to be 88%¹³. MRSA associated with significant mortality rates. Multidrug resistance and third-degree burn were found to be the risk factors contributing mortality¹. In case of severe burn, the probability of MRSA infection increases, since the patient spends more time in the department, and undergo more frequent dressing². In the present study all the isolates (MRSA &MSSA) were sensitive (100%) to both vancomycin and linezolid^{14,7, 15}. While, in MRSA showed 100% resistant to ampicillin, gentamicin and co-trimoxazole. This is found to be similar in the study of Ashish J¹⁶ and by Sarma JB et al in 2010, noted 100% resistant pattern among erythromycin, trimethoprim, ciprofloxacin, gentamicin and 96% among the co-trimoxazole¹⁷. In another study by Naqvi et al in 2007, reported maximum resistant pattern among ciprofloxacin, gentamicin and clindamycin among the MRSA¹⁸. In our study, most of the drugs is sensitive among the MSSA as compare to MRSA. This is found to be similar to the study of Samy A et al³. Vidhani et al reported that the sensitivity

results of all MRSA isolates were significantly more resistant to antibiotics compared to MSSA isolates ($p < 0.05$)¹⁵. Rajadurai pandi et al in 2006, concluded that 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 (100%)¹⁹. Chaudhary U et al noted 67.64% MRSA were multidrug resistant¹. MRSA infection is more severe than MSSA and it prolongs the duration of the treatment².

CONCLUSION

Significant risk factor for acquisition of MRSA was the duration of hospital stay²⁰. Nosocomial infections continue to pose risks of increased mortality and morbidity in patients. The hands of health care workers (HCWs) play an important role in transmission of this infection²¹. In one study, the sources were traced into the hands and nares of the HCWs and the contaminated dressing trolley which was used for all the patients for the purpose of dressing²². Requirement for newer agents to treat infections caused by gram positive organisms is being increasingly felt as resistance to existing agents emerge and spread around the world. This is true particularly for infections due to methicillin resistant *Staphylococcus aureus*(MRSA)¹⁴. In our study, it is noted that the most of the MRSA is resistant to most of the commonly used antibiotics as compared to MSSA. So continuous monitoring of burn patients for MRSA and multidrug resistant is mandatory.

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