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# Methicillin Resistant Staphylococcus Aureus and Their Antibiotic Resistance Pattern Among Clinical Samples in a Tertiary Care Hospital in Rural South India

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**ABSTRACT:** ***Background*- Methicillin Resistant Staphylococcus aureus (MRSA) is an important causative agent of infections with multiple drug resistance. They are also one of the important organisms causing nosocomial infections.**
***Objective*-To study the prevalence of MRSA infections among different clinical conditions, To know the antibiotic susceptibility patterns of the isolates. Also to know the changes in the antibiotic susceptibility patterns over the years**
***Materials and Methods*-This study was done using various clinical samples, which included Pus, Blood, Urine, Sputum and synovial fluid obtained from patients. Staphylococcus Aureus isolated from the above specimens were identified by Tube coagulase, Urease production and Mannitol fermentation test according to the Central Laboratory Standards (CLSI) guidelines**
***Results*-Of the isolates 318 (30.57%) were community acquired and 140 (69.43%) were hospital acquired strains. There was a change noted in the antibiotic sensitivity pattern, for the first two years of the study we isolated organism which were more sensitive to chloramphenicol but later on the sensitivity to chloramphenicol decreased but at the same time increase in tetracycline sensitivity was observed.**
***Conclusion*- Staphylococcal infections especially MRSA poses a great health threat to all individuals including patients and health care workers. Hence there is a strict need for the development of antibiotic policy for each and every clinical set up. Most of the wound infections with MRSA can be treated with local dressing rather than systemic antibiotics**

**Keywords:** Antibiotic sensitivity; Community acquired; Hospital acquired; Methicillin resistant and Staphylococcus aureus.

**INTRODUCTION:** Methicillin Resistant Staphylococcus aureus (MRSA) were first isolated in 1961 in United Kingdom, since then they have emerged as important causative agents of community and hospital acquired infections. Initially they were considered to be nosocomial pathogens, however community acquired MRSA have also emerged. Inappropriate use of antibiotics and also prolonged hospitalisation are among the major risk factors associated with MRSA infections (Cookson B. et al., 1997)

The health care associated and community acquired MRSA are known to carry different genetic markers resulting in distinct antibiotic sensitivity patterns. MRSA strains are resistant to Beta lactam antibiotics including Penicillin, cephalosporin with the exception of newer Cephalosporins (Vidya Pai et al. 2010). They are susceptible to Vancomycin, Linezolid and Tiecoplanin. This pattern of resistance limits the treatment options and also increases the treatment cost for the patients. In addition MRSA strains expressing functional 'erm' gene which confers resistance to clindamycin and erythromycin. MRSA infections lead to increased morbidity and mortality in the patients.
Since there is insufficient information about the antibiotic susceptibility patterns of MRSA isolated from rural patients of this region (South Karnataka), this study hopes to fill this knowledge gap, which could guide the treating clinicians & reduce patient suffering. Here we report the prevalence of MRSA infections among different clinical conditions, the antibiotic susceptibility patterns of the isolates. We have also analysed the changes in the antibiotic susceptibility patterns over the years and antibiotic treatment practices at Devaraj Urs Medical College Hospital and Research Institute serving mainly for patients coming from rural area.

**MATERIALS AND METHODS:** A prospective observational study was done using various clinical

samples which included Pus, Blood, Urine, Sputum and synovial fluid obtained from patients admitted at Sri Devaraj Urs College Hospital and Research Institute from January 2011 to December 2014.

Staphylococcus Aureus isolated from the above specimens were identified by Tube coagulase, Urease production and Mannitol fermentation test according to the Central Laboratory Standards (CLSI) guidelines (Wayne et al, 2011) Among the isolates of Staphylococcus aureus, MRSA were detected by their resistance to Cefoxitin 30µg on Mueller Hinton agar by disc diffusion method(Wayne et al, 2011). MRSA thus identified was subjected to Tetracycline (30µg), Ciprofloxacin (5µg), Erythromycin (15µg), Clindamycin (2µg) Chloramphenicol (30µg), Amikacin (30µg), Vancomycin (30µg), Linezolid (30µg) discs to know the pattern of susceptibility by the disc diffusion method (Winn W Jr et al, 1997).

The patients whose samples were analysed were interviewed following an informed consent for demographic details and their clinical case sheets were utilised for other relevant information.

**RESULTS AND DISCUSSION:** During the study period between January 2011 to December 2014, 458 MRSA were isolated of which 318 (30.57%) and 140 (69.43%) were community and hospital acquired respectively.

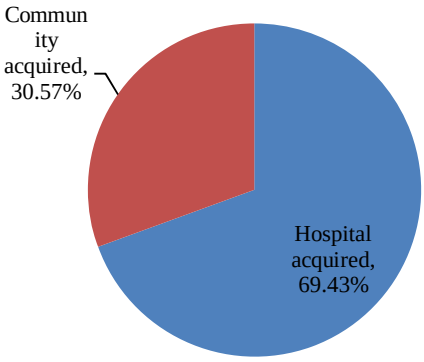


**Figure 1: Percentage of community acquired and hospital acquired MRSA isolates.**

Among the total number of MRSA isolated from clinical samples 69.43% were hospital acquired strains. One reason might be that in our study most of the MRSA were isolated in pus sample collected from wound post-surgery or due to instrumentation or dressing.

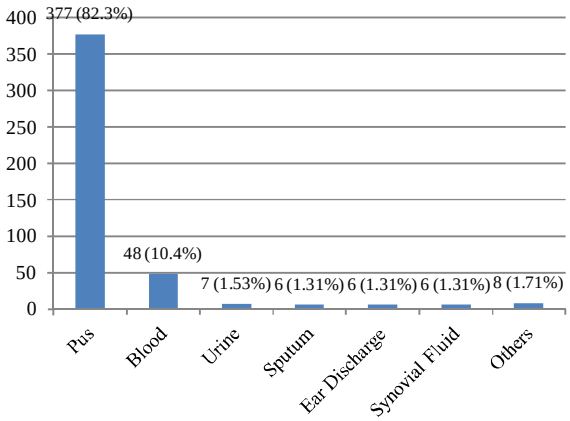


**Figure 2: Isolation of MRSA from different clinical samples.**

Among the total number of MRSA 82.3% of them isolated from pus samples

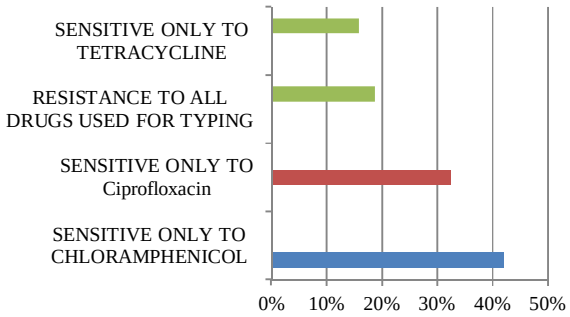


**Figure3: Antibiotic sensitivity of the MRSA strains in our study.**

Study shows that 28.3% of the strains were sensitive only to Chloramphenicol, 18.75% *resistant* to all antibiotics used for typing, 5.8% sensitive only to Tetracycline.

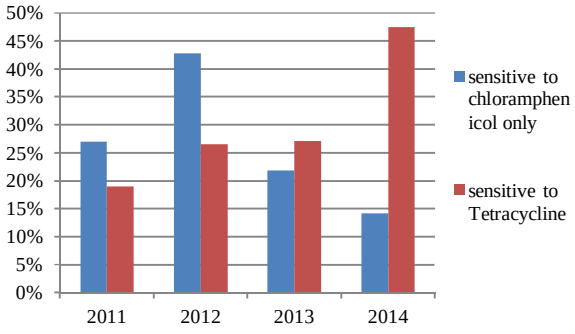


**Figure 4: Year wise change in the major Antibiogram types.**

During 2013-2014 an increase in the Tetracycline sensitivity observed. While in 2011-2012 most of the strains were sensitive only to Chloramphenicol.

The increasing prevalence of MRSA and its limited treatment options makes MRSA a "Super bug". In our set up the prevalence was 62.14% which was similar to other studies conducted in surrounding region. Emergence of MRSA strains are alarmingly increasing from time to time like in a Delhi based hospital, prevalence rate of MRSA was 51.6% in 2011, which was 38.44% in 2008 (Shilpa Arora et al., 2010). This particular study was also conducted to provide data to observe any change in the percentage of prevalence or the antibiotic resistance pattern in future.

Of the MRSA isolates studied 69.43% of the isolates where hospital acquired which is similar to the other studies conducted in south India (L. Y.M. et al., 2014). The resistance pattern of the CA and HA MRSA are different and hence the treatment options also differ (Groom A. V. et al., 2001).

Most of the MRSA strains were isolated were from pus samples followed by blood culture samples. The increased number of isolates in pus samples may be due to the procedures like incision and drainage, dressings etc. which makes it more prone to harbour HA resistance strains. The blood culture samples most of them were from paediatric ICU.

MRSA strains are difficult to treat as they are multi drug resistant and have limited treatment options. MRSA strains are resistant to Beta Lactum group of antibiotics including cephalosporin. In our study 18.75% of the isolates were resistant to all the drugs except for Linezolid and Vancomycin. Of the isolates 42% were sensitive to Ciprofloxacin and 32% were sensitive to Chloramphenicol.

There was a change noted in the antibiotic sensitivity pattern, for the first two years of the study we isolated organism which were more sensitive to chloramphenicol but later on the sensitivity to chloramphenicol decreased but at the same time increase in tetracycline sensitivity was observed.

In our set up these patients with MRSA infection were more commonly started on the following antibiotic drugs empirically before the culture report was given but were then changed to appropriate antibiotics accordingly after the culture report, Empirical drugs used - Ceftriaxone, Amoxycillin clavulinic acid, Pipperacillin tazobactum, Metronidazole, Ciprofloxacin and Gentamicin.

**CONCLUSION:** Staphylococcal infections especially MRSA poses a great health threat to all individuals including patients and health care workers. It can be acquired both from the community or health care facility. It's a global threat as the treatment options are very limited and only a few drugs are available to treat these infections.

Hence there is a strict need for the development, adoption and enforcement of appropriate infection control policies in each and every clinical set up. Formulation of antibiotic policy in a health care facility is also a necessity to minimize the spread of resistance.

In our study most of the MRSA were isolated from the pus sample. In our set up we advised the physicians to treat the patients with local sterile dressing for the wounds with pus discharge. Most of these patients' wounds healed completely without any systemic antibiotics. This method should be followed for all the cases if applicable, that is to minimize the usage of the antibiotics were ever necessary, which will in turn reduce the inappropriate usage of antibiotics and spread of resistance.

Similar studies should be conducted for epidemiological mapping of these infections and also to know their change of trend in the antibiotic sensitivity patterns.

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