Original Research Article

Prevalence and Antimicrobial Susceptibility Pattern of Methicillin Resistant *Staphylococcus aureus* in a Tertiary Care Hospital

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A B S T R A C T

MRSA has now become an important cause of hospital-acquired infections leading to high morbidity and mortality. Further, it adds an inestimable human suffering, which could be minimized by taking proper infection control precautions. A retrospective study was conducted over a period of three months in which a total of 236 staphylococcal strains were isolated from pus samples. All isolates were identified by standard microbiological techniques and antimicrobial susceptibility pattern was determined. Testing for methicillin resistance was performed using the cefoxitin disc diffusion method recommended by the Clinical and Laboratory Standard Institute (CLSI). Out of 236 isolates, 193 (81.7%) were *Staphylococcus aureus* out of which 62% (119) were MRSA. Multidrug resistance (MDR) was seen in 67% of MRSA. Among MRSA, least sensitivity was seen with ciprofloxacin and maximum sensitivity was seen with linezolid and vancomycin. The present study emphasizes the need for antimicrobial stewardship to decrease the current scenario of increasing antimicrobial resistance in *Staphylococcus aureus* strains prevalent in hospitals. Also it is important to monitor the hospital and screen the samples for MRSA.

Introduction

Staphylococcus aureus is an important pathogen affecting humans and is a leading cause of hospital and community acquired infections, manifesting from minor skin diseases to life-threatening infections and bacteremia.

Further, it has acquired resistance to various antibiotics placing an addition burden on the patient care budget due to prolonged hospital stays (Tiwari *et al.,* 2009; Al-Baidani *et al.,* 2011)

Methicillin resistant *Staphylococcus aureus* (MRSA) was first described in 1961, reported after one year of introduction of methicillin and has emerged as one of the most important nosocomial pathogens specially in the last two decades (Maple *et al.,* 1989). The prevalence of MRSA is increasing globally ranging from 23.3% to 73% (Diekema *et al.,* 2001).

The source of infection for MRSA is both the patients and the carriers. The major risk factors are prolonged hospital stay, admission in intensive care units and injudicious use of antibiotics (Collier *et al.,* 1998).

MRSA has now become an important cause of hospital-acquired infections leading to high morbidity and mortality which could be minimized by taking proper infection control precautions (Duckworth, 2003). Current therapeutic options for MRSA are limited to a few expensive drugs like vancomycin, linezolid, teicoplanin, daptomycin and streptogramins. Glycopeptides and linezolid however continue to remain the mainstay of treatment for MRSA (Assadullah *et al.,* 2003).

Hence it was determined to assess the prevalence of MRSA in pus samples from various infections and to study their antibiotic susceptibility pattern. This may throw light on the nature of infections, prevalence of MRSA, need of antibiogram for appropriate management and the importance of control measures to prevent their spread.

Materials and Methods

A retrospective study was conducted over a period of three months in a tertiary care hospital in North India. All isolates were identified by standard microbiological techniques and antibiotic susceptibility pattern was determined by Kirby Bauer disc diffusion method as per Clinical and Laboratory Standards Institute (CLSI) guidelines. Testing for methicillin resistance was performed using the cefoxitin disc diffusion method recommended by the Clinical and Laboratory Standard Institute (CLSI). *Staphylococcus aureus* ATCC 25923 was used as the control strain. (CLSI, 2018). The data obtained was recorded on Microsoft excel (2007 version) and analyzed. The results were explained in frequency (number) and in percentage (%).

Results and Discussion

A total of 236 staphylococcal strains were isolated from pus samples. Out of those, 193(81.7%) were *Staphylococcus aureus* out of which 62% (119) were MRSA (Fig. 1). Multidrug resistance (MDR) was seen in 67% of MRSA (Fig. 2). Among MRSA, least sensitivity was seen with ciprofloxacin and maximum sensitivity was seen with linezolid and vancomycin (Table 1).

MRSA is a persistent and ever growing problem for healthcare institutions. The prevalence of MRSA varies in different parts of India and is not uniform. The present study showed a high prevalence of MRSA which correlates with study done by Vidhani *et al.,* that showed incidence of 51.6%, whereas Kulakarni *et al.,* reported a higher incidence of 70.3% (Vidhani *et al.,* 2011; Kulkarni *et al.,* 2013). However, Rajaduraipandi *et al.,* and Majumdar *et al.,* reported a low prevalence of 31.1% and 23.6% respectively which is comparatively less than that reported in the present study (Rajaduraipandi *et al.,* 2006; Majumdar *et al.,* 2001).

This variation might be because of several factors like efficacy of infection control practices, healthcare facilities and antibiotic usage that vary from hospital to hospital.

In our study, the MRSA strains were found to be less sensitive to ciprofloxacin (15%) and show relatively better susceptibility to amikacin (59.4%) which is in correlation with study done by Lakshmi *et al.,* (2013). This decrease in susceptibility to quinolones may be due to the indiscriminate use of these drugs. All the MRSA isolates were found to be susceptible to vancomycin, which may be used as the drug of choice for treating MRSA infections. This is similar to other studies by Lakshmi *et al.,* Kumari *et al.,* and Arthy *et al.,*(Lakshmi *et al.,* 2013; Kumari *et al.,* 2008; Arthy *et al.,* 2008). On the other hand, very few studies have showed decreased susceptibility of MRSA strains to vancomycin (Hiramatsu *et al.,* 1997).
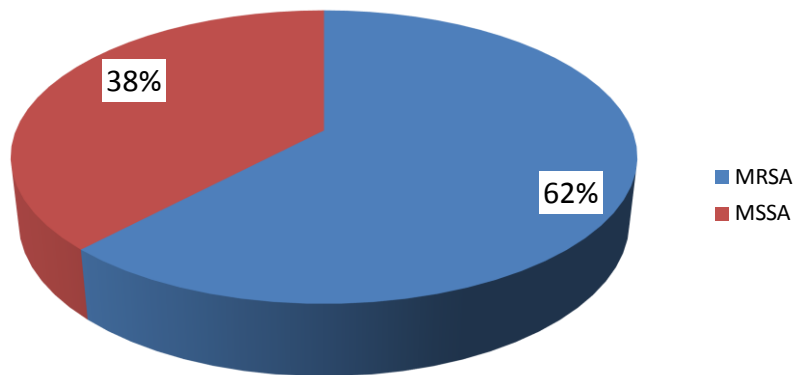
Fig.1 MRSA vs MSSA
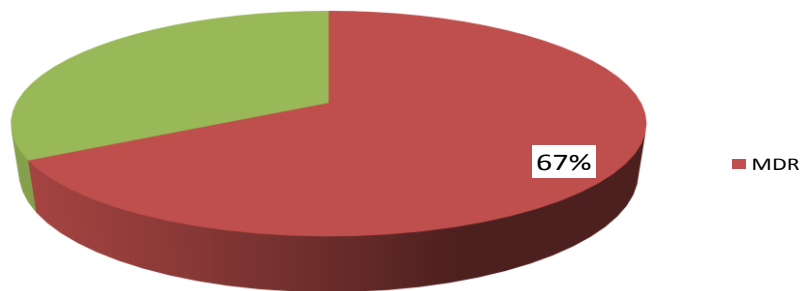

Fig.2 Percentage of MDR strains among MRSA

Table.1 Antibiotic susceptibility pattern of MRSA (n=119) in pus samples

ANTIBIOTIC	SENSITIVITY (%)
Ciprofloxacin	15
Doxycycline	48
Erythromycin	45.5
Clindamycin	46.5
Gentamycin	46.4
Amikacin	59.4
Linezolid	100
Vancomycin	100

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Thus there is a need for antimicrobial stewardship to decrease the current scenario of increasing antimicrobial resistance in *Staphylococcus aureus* strains prevalent in hospitals. Also it is important to monitor the hospital and screen the samples for MRSA. Proper antibiotic policy must be evolved and adhered to. All clinical and para clinical personnels must be educated and trained regarding the control measures in preventing the spread of MRSA. Testing of susceptibility to newer glycopeptides like teicoplanin helps in multidrug resistant cases.

The present study showed high prevalence of MRSA strains and their resistance to widely used antibiotics. Regular surveillance of MRSA will be useful for selecting appropriate antibiotics and to know the changing trends of antibiotic susceptibility pattern which helps in developing hospital antibiotic policy. Continuous efforts of infection teams and healthcare workers are recommended to prevent infections.

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