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Original Article

A Retrospective Study of Prevalence and Antibiotic Susceptibility of Methicillin-Resistant Staphylococcus in a Tertiary Care Hospital

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Abstract

Introduction: Nosocomial infection is a major problem globally. Methicillin-resistant Staphylococcus remains one of the most important causes of nosocomial infections worldwide. *Staphylococcus aureus* produces a wide range of infections from soft skin infections to fatal septicemia. Methicillin-resistant Staphylococcus strains or multidrug-resistant *S. aureus* emerged in the past decade as a cause of nosocomial infections responsible for rapidly progressive, fatal diseases including pneumonia, necrotizing fasciitis, endocarditis, osteomyelitis, severe sepsis, and toxinoses such as toxic shock syndrome. The prevalence of Methicillin-resistant Staphylococcus (MRS) has increased in India, of many which are resistant to antibiotic treatment.

Purpose: The purpose of this study was to know the prevalence of MRS in swab samples.

Material and Methods: This was a retrospective study conducted from January 2021 to December 2021 in a tertiary care hospital. All isolates were identified in patients and data provided by the Clinical and Laboratory Standards Institute guidelines and antibiotic susceptibility pattern considered by Kirby–Bauer disk diffusion method. Culture testing was done that AST was done by Kirby–Bauer disk diffusion method as per CLSI.

Results: In our study, we have 115 (13.12%) Staphylococcus strains isolated from 833 swab samples, Out of 115 *S. aureus* isolates, 83 (72.17%) were methicillin-resistant *S. aureus* in our labs. Although, the majority of the MRSA isolates were resulted in gynecology ward swab samples. However, in antibiotic susceptibility pattern in our study, it was found that highest resistant to ciprofloxacin, moderate level resistant to cotrimoxazole, tetracycline, erythromycin, and clindamycin and least resistant to vancomycin and linezolid.

Conclusion: High rate of MRS isolation is a threat, and so, the importance of Isolation of MRSA patients and carriers in the hospitals, regular surveillance of hospital associated infections including monitoring antibiotic sensitivity pattern and strict drug policy for antibiotics, may be helpful for reducing the incidence of these infections.

Key words: Methicillin-resistant Staphylococcus, Nosocomial infection, Pneumonia, Toxic shock syndrome, Aspartate aminotransferase

INTRODUCTION

Staphylococcus aureus is considered to be one of the most clinically important staphylococcal pathogens are affecting humans, have acquired resistance to different types of antibiotics, and are a leading cause of hospital and community acquired infections, manifesting from minor skin diseases to life-threatening infections.[1] Methicillin-resistant *S. aureus* (MRSA) was first time described in 1961, reported after 1 year of introduction of methicillin and has now emerged as one of the most important nosocomial pathogens, especially in the past two decades.[2,3] The percentage of hospitals isolating MRSA in the developed countries has increased from 2% to 30%.[4] Moreover, half of *S. aureus* in different states of India are methicillin-resistant (multidrug resistant), which are the

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major therapeutic challenge.[5] MRSA is highly prevalent in hospitals worldwide in which high rates (>50%) were reported in Asia, Malta, North and South America country. The incidence of MRSA varies according to the different region, 25–50%. MRSA is now one of serious concern for current therapeutic options for MRSA which is few expensive, limited drugs now available such as vancomycin, linezolid, teicoplanin, daptomycin, and streptogramin.[6,7] Another recently alarming sign has been that emergence of resistance to Vancomycin, although at a low level has been reported. Glycopeptides and linezolid continue to remain the mainstay of treatment for MRSA.[8] Both endemic and epidemic MRSA in infections happen globally as infected and colonized patients in hospitals mediate the dissemination of these isolates and hospital staffs assist further transmission.[9] Although many studies have been done in different regions on the prevalence and antibiogram of Staphylococcus, many of these studies have concentrated only on MRS. Our study has been carried to conduct to determine the prevalence of MRSA and antibiotic susceptibility pattern of *S. aureus*.

MATERIALS AND METHODS

This study was done in January 2021–December 2021 and based on retrospective data of swab sample sent from different wards and OPDs of hospital to microbiology laboratory. *S. aureus* were characterized by their morphology on Gram staining, growth characteristics, and coagulase production.[10]

Screening for MRSA

Methicillin resistance was isolates by disk diffusion method using 30 μg cefoxitin disk. The diameter of the zone was, according to Clinical and Laboratory Standards Institute (CLSI) guidelines. Our isolate was considered to be an MRSA strain if cefoxitin inhibition zone diameter was <22 mm. Since *S. aureus* can be a colonizer, special emphasis on the clinical significance of all the isolates. This was done by correlating with a Gram stained smear examination with the clinical history.[11]

Statistical Analysis

Tables 1 and 2 & Figures 1-6 are prepared from Excel data sheet.

RESULTS

In our study we have 115 (13.12%) Staphylococcus strains isolated from 833 swab samples, Out of 115 *S. aureus* isolates, 83 (72.17%) were methicillin resistant *S. aureus*.

In our study, the majority of the MRSA isolates were resulted in gynecology ward swab samples.

Table 1: Frequency of methicillin-resistant *Staphylococcus aureus* cases from swab sample received from different department and wards

Total swab sample	Total *Staphylococcus aureus*	Total MRSA
833	115 (13.81)	83 (72.17)

MRSA: Methicillin-resistant *Staphylococcus aureus*

Table 2: Comparative study

Prevalence and antimicrobial susceptibility of methicillin-resistant *Staphylococcus* in present study (%)	Prevalence and antimicrobial susceptibility of methicillin-resistant *Staphylococcus* in other study (%)	Publication
83 (72.17)	69 (29.1)	Pai *et al.*[12]
83 (72.17)	58 (32.22)	Bilal Ahmad and Srikanth[9]
83 (72.17)	112 (69.1)	Tiwari *et al.*[13]
83 (72.17)	196 (26.14)	Kumari *et al.*[14]

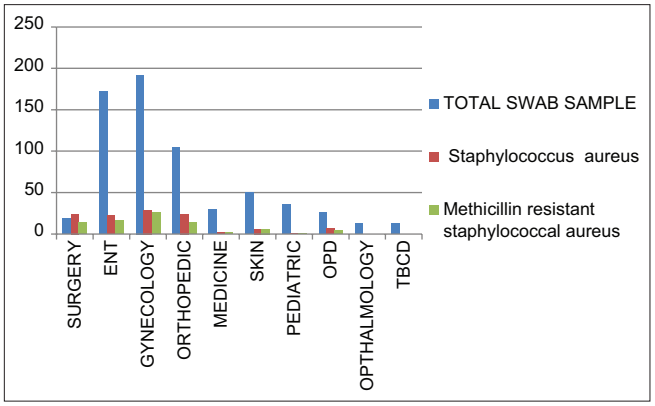

Figure 1: Frequency of methicillin-resistant *Staphylococcus aureus* cases from different department and wards of the hospital

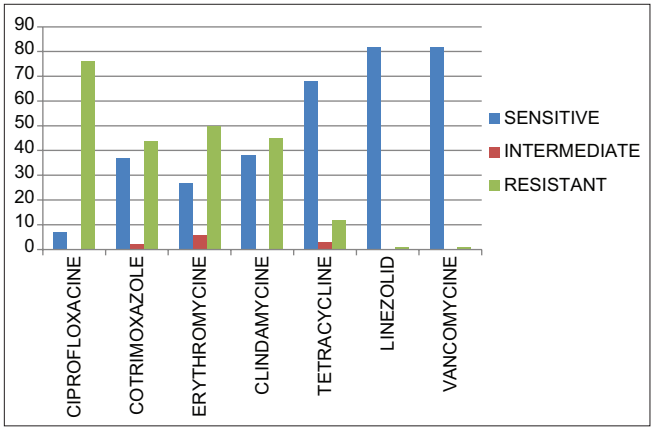

Figure 2: Sensitivity pattern of antibiotics other than beta lactum in methicillin-resistant *Staphylococcus aureus* in swab sample

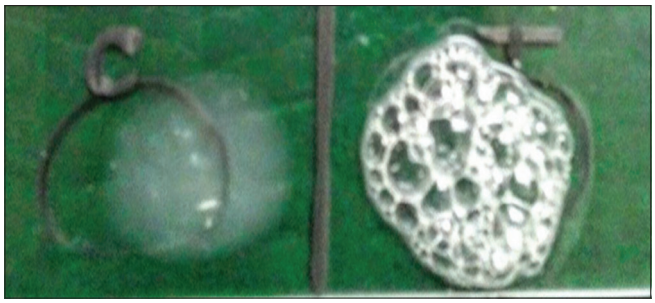

Figure 3: Catalase test

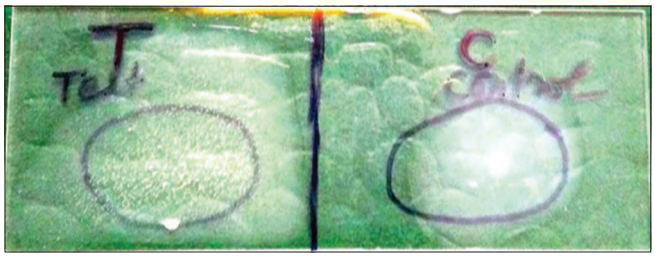

Figure 4: Slide coagulase test

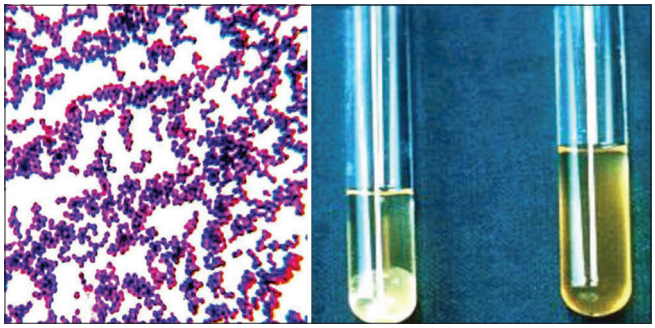

Figure 5: *Staphylococcus aurous* gram staining and tube coagulase test

Figure 6: Antimicrobial susceptibility testing

In antibiotic susceptibility pattern in our study it was found that highest resistant to ciprofloxacine , moderate level resistant to cotrimoxazole,tetracycline,erythromycin and clindamycine and least resistant to vancomycine and linezolid.

DISCUSSION

Methicillin resistance in *S. aureus* is a major problem in hospitals worldwide and is increasingly recovered from community. There is a growing concern about MRSA with reduced susceptibility to vancomycin, which is currently the most extensively used antibiotic for its treatment; in our study, we have 115 (13.12%) Staphylococcus strains isolated from 833 swab samples. Out of 115 *S. aureus* isolates, 83 (72.17%) were MRSA in our laboratories. Although, the majority of the MRSA isolates were resulted in gynecology ward swab samples. However, in antibiotic susceptibility pattern in our study of methicillin resistant *Staphylococcus aureus*, it was found that higher level resistant to ciprofloxacine, moderate level resistant to cotrimoxazole, tetracycline, erythromycin, and clindamycine and least resistant to vancomycine and linezolid.

CONCLUSION

As per our study, >50% *S. aureus* isolates where MRSA which is a major concern the strict of isolation of MRSA patients and carriers in the hospitals, regular surveillance of hospital associated infections, including monitoring antibiotic sensitivity pattern and strict drug policy for antibiotics may be helpful for reducing the incidence of these infections. In our study, vancomycin was the only antibiotic found to give uniform sensitivity (100%). When antimicrobials including, vancomycin is considered for treatment, this inevitably requires the need for *in vitro* susceptibility testing of every isolate of MRSA in the clinical laboratories.

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