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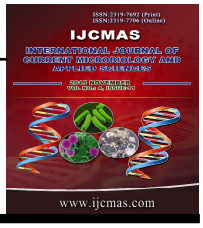

Original Research Article

Prevalence and Susceptibility Pattern of Methicillin Resistant *Staphylococcus aureus* (MRSA) in Pus Samples at a Tertiary Care Hospital in Trivandrum, India

K. H. Harshan[1*] and Sunil Kumar D Chavan[2]

[1]Department of Microbiology, SreeGokulam Medical College and Research foundation, Venjaramoodu, Trivandrum, India
[2]Department of Microbiology, Raja Rajeswari Medical College, Bangalore, India
**Corresponding author*

Keywords

Methicillin Resistant *Staphylococcus aureus* (MRSA), Beta lactams, Health care workers, Hand hygiene

A B S T R A C T

Methicillin resistant *Staphylococcus aureus* (MRSA) is one of the most widespread causes of nosocomial infections worldwide. Recently they have been recovered from community. This study was undertaken to analyse the prevalence of methicillin resistance among isolates at Sree Gokulam Medical College and Research Foundation, Trivandrum and document the current resistance profile of MRSA to the commonly used anti staphylococcal agents. Over a 6 months period we analyzed 205 isolates of *Staphylococcus aureus* recovered from pus samples from hospital and community practices. Antimicrobial susceptibility testing was done according to CLSI guidelines. The prevalence of MRSA was 29.7%. The greatest prevalence of resistance of MRSA along with beta lactams was seen for erythromycin (100%) and clindamycin (73.7%). The prevalence of MRSA is increasing. Most isolates were associated with infected wounds which may have become infected via the hands of health care workers during dressing exercises. Proper hand hygiene procedures may interrupt the spread of MRSA. Most MRSA are resistant to several non beta lactam antibiotics. Frequent monitoring of susceptibility patterns of MRSA and the formulation of a definite antibiotic policy may be helpful in decreasing the incidence of MRSA infection.

Introduction

Staphylococcus aureus is one of the most frequently isolated pathogens in both community and hospital practice. It is the common bacterial agent recovered from skin and soft tissue infections, wound infection and discharges from various sites including ear discharge, vaginal discharge and post operative wound discharges (Alborzi *et al.*, 2000; Bell *et al.*, 2000). Changes in the pattern of antimicrobial susceptibility of *Staphylococcus aureus* has been reported worldwide especially in developing countries making antimicrobial agents increasingly less effective in treating bacterial infections (Bukhari *et al.*, 2004; CLSI, 2014). The older beta lactams,

penicillin and ampicillin are ineffective against more than 80% of isolated strains and resistance to many of the non beta lactam groups such as tetracyclines, gentamicin, erythromycin and clindamycin has gradually increased and reached alarming levels in many parts of the world (Fruit *et al.,* 2001; Giacometi *et al.,* 2000; Hachbarth and Chambers, 1989).

Several mechanisms for the methicillin resistance seen in *Staphylococcus aureus* have been elucidated. The most important is the production of a unique Penicillin binding protein (PBP) that has a low affinity for beta lactam antibiotics and whose effects are determined by several structural genes *mec, mecRI, mecI.* (Krishna *et al.,* 2004; Sarithayadav *et al.,* 2010; Tomasz *et al.,* 1989) Other known mechanisms of methicillin resistance are the production of the usual PBPs with modified affinities for the beta lactam drugs and the hyper production of penicillinase enzyme. MRSA are also resistant to other non beta lactam drugs. Infections with them are life threatening in immune compromised patients. They are often difficult to manage and problematic to eradicate.

This study was taken up to review and document the prevalence of MRSA and its susceptibility pattern. The primary importance is to decrease the prevalence of MRSA by measures like rapid and reliable identification, isolation and treatment of patients and carriers, strict adherence to proper hand washing practices by health care providers.

Materials and Methods

Study period was from January 2015 to June2015. Specimens were derived from patients in the wards and from those attending outpatient clinics at the Sree Gokulam Medical College and Research Foundation, Trivandrum. Specimens included pus from abscess, purulent discharges from wounds, ear, vagina, umbilicus, drain tips, bed sores. Specimens were collected either by aspiration under aseptic precaution or by using sterile swabs. All the specimens were subjected to preliminary tests like gram stain from direct sample and streak culture on 5% sheep blood agar, MacConkey agar, mannitol salt agar. *Staphylococcus aureus* was identified by colony morphology, gram stain, catalase test, tube coagulase test, DNAse test. Anti microbial susceptibility testing was done on Mueller Hinton agar using the disc diffusion test as outlined by CLSI. The following antibiotics were used to determine the antibiogram of the strains.

Methicillin resistance was detected using a 30 µg cefoxitin disc. Zone diameter was read after incubation at 35°C for a full 24 hours. Strains with zone diameter of 22 mm for cefoxitin were regarded as methicillin resistant. ATCC *Staphylococcus* strains 25923 and 29213 were used as quality control. Statistical analysis of data was done using SPSS software.

Results and Discussion

During the 6 months study period, a total of 620 purulent samples were received to the Microbiology laboratory. Out of 620 samples, *Staphylococcus aureus* was isolated from 205(30%) samples. Out of 205 *Staphylococcus aureus* isolated, 61(29.7%) were methicillin resistant and 144(69.3%) were methicillin sensitive.

416 (67%) of samples were received from Surgery and Orthopaedics Department (wards and OPD). Remaining 104(33%) samples were received from various other departments.

Ninety one (44.3%) of *Staphylococcus aureus* were isolated from Surgery Department, followed by 46(22.4%) from Orthopaedics Department, 21 (10.2%) each from OBG and ENT department, 12(6%) from Paediatrics, 10(4.8%) from ICU.

Twenty nine (47.5%) of MRSA were isolated from Surgery department, followed by 16(26.2%) from Orthopaedics, 5(8%) each from ENT and OBG Department, 4(6.5%) from Paediatrics Department. One case of MRSA was isolated from MICU and Dermatology respectively.

Staphylococcus aureus isolated showed 97.5% of resistance to penicillin, followed by 46.3% to erythromycin, 29.7 % to amoxyclav, cephalexin, cloxacillin and gentamicin respectively. *Staphylococcus aureus* were 100% sensitive to vancomycin, linezolid, teicoplanin, rifampicin respectively. 97.5% and 99% sensitivity was seen to amikacin and netilmicin respectively. All the 61 MRSA isolated showed 100% resistance to penicillin, amoxyclav, cephalexin, cloxacillin, erythromycin, gentamicin respectively. MRSA showed 77% resistance to tetracycline, 73.7% to clindamycin, 54% to cotrimoxazole. MRSA were 100% sensitive to linezolid, vancomycin, teicoplanin, rifampicin. MRSA were 91 % sensitive to amikacin and 97% sensitive to netilmicin.

Table.1 Samples received from various departments

Department	No of samples
Surgery	263
Orthopaedics	153
Ophthalmology	10
Obstetrics & Gynaecology(OBG)	53
Paediatrics	34
Otorhinolaryngology (ENT)	50
ICU (medical, surgical)	47
Dermatology	10
Total	620

Table.2 Department wise distribution of *Staphylococcus aureus* isolated

Department	No of strains
Surgery	91
Orthopaedics	46
Ophthalmology	01
Obstetrics &Gynaecology	21
Paediatrics	12
ENT	21
ICU	10
Dermatology	03
Total	205

Table.3 Department wise distribution of MRSA

Department	MRSA	MSSA
Surgery	29	62
Orthopaedics	16	30
optholomology	-	01
Obg	05	16
paedeatrics	04	08
Ent	05	16
Icu	01	09
Dermatology	01	02
Total	61	144

Table.4 Sensitivity pattern of *Staphylococcus aureus* isolated

Antibiotics	Resistant	Sensitive
Penicillin	200	05
Amoxyclav	61	144
Cephalexin	61	144
Cloxacillin	61	144
Cefoxitin	61	144
Erythromycin	95	110
Clindamycin	09	196
Gentamicin	61	144
Amikacin	05	200
Netilmicin	02	203
Linezolid	-	205
Vancomycin	-	205
Teicoplanin	-	205
Rifampicin	-	205
Tetracycline		
Cotrimoxazole		

Table.5 Sensitivity pattern of MRSA isolated

Antibiotics	Resistant	Sensitive
Penicillin	61	-
Amoxyclav	61	-
Cephalexin	61	-
Cloxacillin	61	-
Cefoxitin	61	-
Erythromycin	61	-
Clindamycin	45	16
Gentamicin	61	-
Amikacin	05	56
Netilmicin	02	59
Linezolid	-	61
Vancomycin	-	61
Teicoplanin	-	61
Rifampicin	-	61
Tetracycline	47	14
Cotrimoxazole	33	28

The present study has shown a prevalence of 29.7% MRSA which is slightly higher than the previous studies conducted in other parts of the country. Similar patterns have been seen worldwide as evident from the many recorded surveillance studies. The different rates among MRSA from different countries may be attributed to variations in patient populations, the biological characteristics of the strains, infection control practices. 8% of isolates were community acquired. One reason for community acquired maybe lateral dissemination of MRSA from discharged patients diagnosed with MRSA and discontinuation of therapy. The magnitude of surgical wound infection problem maybe increasing because many of the causative organisms have started to develop some form of drug resistance to currently used antibiotics. It is essential to give special attention in reducing surgical site infections.

In conclusion, the study has shown that the prevalence of MRSA infections is high in comparison to studies done earlier. The principal source may have been the hands of health care professionals during wound dressing exercises. Although a protocol exists for the management of infected patients and colonised health care providers, it is rarely implemented. The protocol requires the physical separation of infected patients and their health care providers from uninfected patients, therapy for eradicating MRSA, stringent environmental disinfection of areas harbouring MRSA and the application of barrier isolation precaution measures including strictly enforced hand hygiene to interrupt spread patterns. MRSA is a well known cause of hospital infection and in India community acquired MRSA strain is now an emerging pathogen. This fact should be borne in mind when standard regimens fail, although existing data do not justify empirical use of anti MRSA drugs in treatment. An antibiotic policy and the monitoring of susceptibility patterns of MRSA may also help in decreasing the prevalence of MRSA and antibiotic resistance.

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