

Susceptibility Pattern of Methicillin Resistant Staphylococcus Aureus (MRSA) among All Clinical Isolates in a Tertiary Care Hospital in Eastern India

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ABSTRACT

Introduction: Methicillin resistant *Staphylococcus aureus* (MRSA) from the late 1960s till date has emerged as a significant cause of morbidity and mortality and leading cause in both community and hospital acquired infections. This present study is an initiative to assess the burden of Methicillin resistant *Staphylococcus aureus* (MRSA) and to study their susceptibility pattern among all clinical isolates in this tertiary care hospital of eastern India, thus providing a national level initiative to highlight emerging trends of antimicrobial resistance among clinical isolates of *Staphylococcus aureus*.

Aims & Objective: Aim of the present study is- 1. to know the prevalence of MRSA among *Staphylococcus aureus* isolates from all clinical specimens, 2. to study the susceptibility pattern of the MRSA isolates

Methodology: The present study was done retrospectively in the Department of Microbiology, Nil Ratan Sircar Medical College & Hospital, Kolkata, from January 2019 to January 2020 (13 months). A total of 859 isolates of *Staphylococcus aureus*, isolated from various clinical specimens were included in the study. A total of 859 isolates of *Staphylococcus aureus*, isolated from various clinical specimens were included in the study. Following identification of *Staphylococcus aureus* isolates antibiotic susceptibility was performed by Kirby Bauer disc diffusion technique using CLSI recommen-

dations. Cefoxitin (30µg) was used for testing Methicillin resistance.

Results And Discussion: A total of 859 isolates of *Staphylococcus aureus*, out of which 403(46.9%) isolates were phenotypically Methicillin resistant. The prevalence of MRSA in our study is 46.9% which is an alarming figure.

Key words: *Staphylococcus aureus*, MRSA, Cefoxitin

INTRODUCTION

Staphylococcus aureus is one of the major pathogen in clinical practice and is responsible for a wide variety of diseases including relatively benign skin infections such as folliculitis, furunculosis and life threatening conditions such as erysipelas, deep seated abscesses, osteomyelitis, pneumonia, sepsis, endocarditis etc. (Mandells)¹.

Methicillin resistant *Staphylococcus aureus* (MRSA) first emerged as a serious infectious threat in the late 1960s as the bacterium developed resistance to Methicillin (Washer and Joffe, 2006).² Methicillin-Resistant *Staphylococcus aureus* is the strain of *S.aureus* that is resistant to the isoxazolyl penicillins such as methicillin, oxacillin and flucloxacillin. MRSA are cross-resistant to all currently licensed β -lactam antibiotics. (Nathwani D et al).³

MRSA infections in hospital have obviously imposed a high burden on health care resources as well as significant cause of morbidity and mortality (Boucher and Corey, 2008)⁴. *Staphylococcus aureus* continues to be a dangerous pathogen for both community acquired and hospital acquired infection (IJMR 2013).⁵ MRSA is endemic in India, incidence varying from 25% in western part of India (Patel 2010)⁶ to 50% in South India (Gopala Krisnan 2010)⁷ and 58.33% in central India (S Mantri Rupali 2014)⁸. Similar reports from the eastern parts of the country are scarce.

Therefore this present study is an initiative to assess the burden of Methicillin resistant *Staphylococcus aureus* (MRSA) and to study their susceptibility pattern among all clinical isolates in this tertiary care hospital of eastern India, thus providing a national level initiative to highlight emerging trends of antimicrobial resistance among clinical isolates of *Staphylococcus aureus*.

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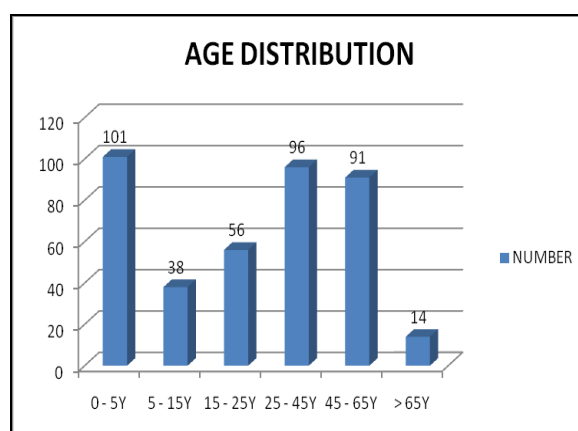
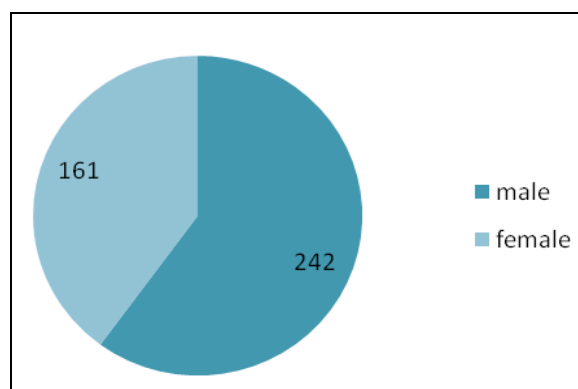
MATERIALS & METHOD

The present study was done retrospectively in the Department of Microbiology, Nil Ratan Sircar Medical College & Hospital, Kolkata, from January 2019 to January 2020 (13 months). The data included patient profile, source or specimen of the isolate and the antibiotic susceptibility profile. A total of 859 isolates of *Staphylococcus aureus*, isolated from various clinical specimens were included in this study. Following identification of *Staphylococcus aureus* isolates antibiotic susceptibility was performed by Kirby Bauer disc diffusion technique using CLSI recommendations. Cefoxitin (30µg) was used for testing Methicillin resistance. The other antibiotic tested

included Penicillin (10units), Gentamicin (10µg), Co-trimoxazole (1.25/23.75 µg), Ciprofloxacin, Amoxycylav, Clindamycin, daptomycin, Erythromycin, Gentamicin, levofloxacin, Linezolid, Teicoplanin, Tigecycline, Vancomycin. Disc from Himedia (Mumbai) was used. Inoculum was prepared by making a direct saline suspension of isolated colonies selected from 18-24hr blood agar plate. Turbidity of the suspension was adjusted to achieve a turbidity equivalent to 0.5Mc Farland Standard as per CLSI guidelines. *Staphylococcus aureus* ATCC 25923 was used as the quality control strain for disc diffusion.

RESULTS

A total of 859 isolates of *Staphylococcus aureus* from different clinical specimens were found in a period of 13 months, out of which 403(46.9%) isolates were phenotypically Methicillin resistant.



Demographic characteristics of MRSA isolates were as follows: Among the MRSA isolates, 242(60%) were male

patients and 161(40%) where female patients. The age group varied from neonate to >65 years, with majority of infections ranging in 0-5 years, followed by 26-45 years age group.

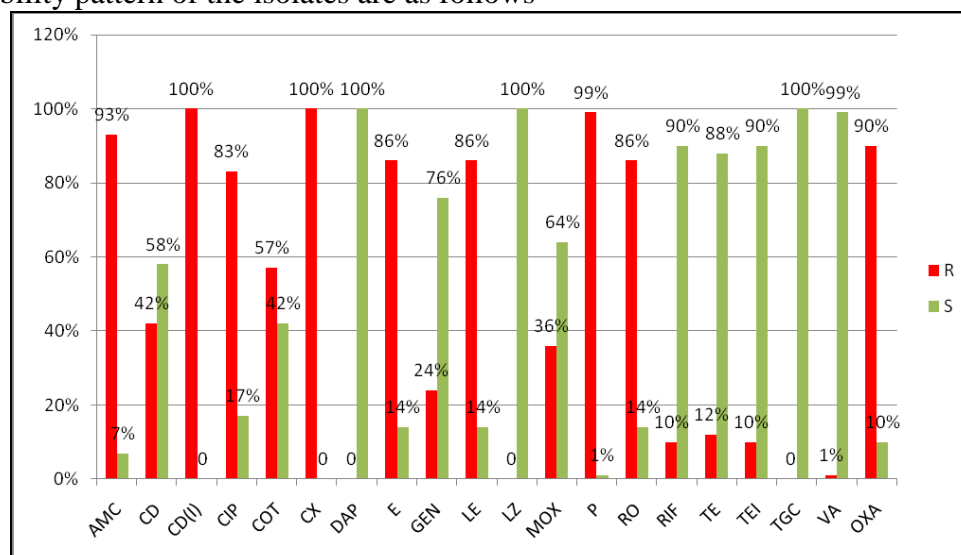
Department	Indoor	Outdoor
Medicine	5	2
Pediatrics	89	31
Surgery	65	0
Chest	15	0
Critical care Unit	14	0
Orthopaedics	19	17
Emergency	3	0
ENT	5	13
Eye	8	0
Obstetrics & Gynaecology	17	2
Haematology	35	0
Neurosurgery	7	0
Urology	2	3
Radiotherapy	2	2

The distribution of the MRSA isolates from the indoor and outdoor departments of the hospital were as follows

From the above findings it is seen that majority of MRSA isolates were from the inpatient departments. Pus was the predominant source of MRSA isolates followed by blood.

Specimen type	Number	Percentage
Pus	190	47%
Blood	100	24%
Wound swab	61	15%
Body fluids	10	2.48%
Central line tip	14	3.5%
Urine	5	1.2%
Nasopharyngeal swab	13	3.2%
Cerebrospinal fluid	1	0.2%
High vaginal swab	4	0.9%
Sputum	5	1.2%

Susceptibility pattern of the isolates are as follows-



DISCUSSION

Among the Gram positive pathogens, MRSA continues to cause skin and soft tissue infections in the community as well as invasive infections in the hospitalised patients. In a recent Europe wide survey the prevalence of MRSA was 22.5% (Sader HS et al)⁹ The proportion varied from 0.4% in Sweden to 48.4% in Belgium. Similar studies in the US also showed a rising trend of MRSA (Tracy LA et al)¹⁰. The MRSA prevalence in a study spanning Northern and Western India was 41%, 50% respectively 40-50% in South India (Gopala Krisnan 2010)⁷ and 58.33% in central India(S Mantri Rupali 2014)⁸.

The prevalence of MRSA in our study is 46.9% which is an alarming figure.

According to standard literature, (Mandells)¹ higher incidence of MRSA infection occurs in the extremes of ages. This is in concordance to our study where maximum isolates of MRSA were from 0-5 age group.

Analyzing the gender wise distribution data, in Mandell's¹ it has been observed that, incidence of MRSA infection is higher in males 242(58.14%) than females 161(41.86%). Similar observation was reported in standard literature and also in works done by B.

Sashirekha et al. (2012)¹¹, Mathanraj Set al.(2009)¹² and Kumar M et al.(2015)¹³.

In the present study, out of different types of specimens, highest number of MRSA was isolated from pus 190(47%) and followed by blood 100(24%). Similar observations were made in the works done by Qureshi A et al.(2012)¹⁴, SM Sadaka et al. (2009)¹⁵, Mathews AA et al.(2010)¹⁶ and Mallu P et al.(2007)¹⁷. Pillai MM et al. (2012)¹⁸ reported a high percentage of MRSA isolation (79%) from pus samples. DK Chandrasekhar et al (2012)¹⁹ also reported isolation of 15.8% of MRSA from blood samples. But reports by Joshi S et al (2011)²⁰ showed isolation of higher number of MRSA from blood samples (44% in 2008 and 48% in 2009). Higher isolation of MRSA from surgical samples, in our study may be due to the causative role of *S. aureus* (MRSA) in skin and soft tissue infection.

The antimicrobial susceptibility profile suggested 93% resistance against Amoxy-clav, 100% resistance against inducible Clindamycin, 100% against Cefoxitin, 86% against Erythromycin, 86% against Levofloxacin.99% against Penicillin, 86% against Roxithromycin and 90% against Oxacillin. The isolates were most sensitive to Daptomycin 100%, Linezolid 100% and Tigecycline 100%. 99% sensitive to Vancomycin 90% sensitive to Rifampicin, Tetracycline and Teicoplanin. Gentamicin 76% and Moxifloxacin 64% showed moderate sensitivity.

CONCLUSION

From the present study it can be concluded that MRSA infection is a significant problem in this region of Eastern India having high prevalence of 46.9%. Improper detection and reporting of MRSA may lead to major complications thus hindering proper treatment and cure. False positive reporting of MSSA as MRSA leads to the use of Vancomycin and other antibiotics with high side effects.

This also results in increased health care associated cost and burden, also contributing to the spread of drug resistance. At the same time, reporting MRSA as MSSA may culminate in treatment failure with uninterrupted spread of infection in both hospital and community. So, proper identification of Methicillin resistance is necessary not only for treatment but also for proper preventive measures and epidemiological purposes.

Limitations

The limitation of our study was a small sample size, short duration of study and non-randomization of samples leading to non-uniform distribution different of parameters like age, sex, sample type and departments.

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