

PREVALENCE AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS IN TERTIARY CARE TEACHING HOSPITAL, WESTERN INDIA

Purav Patel¹, Neeta Khandelwal², Payal Raval¹, Bhaumik Patel¹, Sumeeta Soni², Mahendra Vegad²

¹ Department of Microbiology, GMERS Medical College and Hospital, Dharpur-Patan, Gujarat, India

² Department of Microbiology, BJ Medical College and Civil Hospital, Ahmedabad, Gujarat, India

Correspondence to: Purav Patel (drpurav84@rediffmail.com)

DOI: 10.5455/ijmsph.2013.280920131

Received Date: 18.08.2013

Accepted Date: 16.01.2014

ABSTRACT

Background: Methicillin resistant Staphylococcus aureus (MRSA) infection traditionally has been associated with healthcare settings, colonizing patients with underlying debilitating health conditions. Now a day, Hospital management has become increasingly aware of issues related to MRSA infections in the patient population.

Aims & Objective: To know the prevalence of MRSA amongst hospitalized as well as OPD based patients and to find out and compare the antibiotic resistance patterns of Methicillin resistant and Methicillin sensitive S. aureus.

Material and Methods: Total of 534 Staphylococcus aureus isolated from various clinical specimens using the standard procedures during June 2010 to June 2011. Screening and confirmation of MRSA isolates were done by standard methods recommended by Clinical and Laboratory Standards Institute (CLSI). CDC definition was used to classify hospital and community Acquired Methicillin-Resistant Staphylococcus aureus. Antibiotic susceptibility test was done using Kirby-Bauer disk diffusion method. Detailed information regarding duration in hospital stay, ward, unit and clinical history were collected.

Results: Out of 534 Staphylococcus aureus recovered from different clinical samples, 152 (28.46%) were found to be Methicillin resistant. 113 out of 152 isolates (74.34%) were Hospital acquired MRSA (HA-MRSA) while 39 out of 152 isolates (25.66%) were Community acquired MRSA (CA-MRSA). The antibiotic susceptibility result shows that MRSA isolates were resistant to multiple antibiotics than MSSA isolates. All isolated MRSA were sensitive to Vancomycin.

Conclusion: Measures to control the emergence and spread of MRSA are needed to be improved because there are fewer options available for the treatment of MRSA infections. Thus, together with good professional practice and routine infection control precautions constitute the major measures in controlling and preventing MRSA.

Key-Words: Methicillin Resistant Staphylococcus Aureus (MRSA); Antibiotic Resistance; Infection Control; Prevalence

Introduction

Staphylococcus aureus commonly found on the skin and/or in the noses of healthy people. Although it is usually harmless at these sites, it may occasionally get into the body (e.g. through breaks in the skin such as abrasions, cuts, wounds, surgical incisions or indwelling catheters) and cause infections. Methicillin resistant Staphylococcus aureus (MRSA) infections are a major problem in hospitals now a days. As with ordinary strains of Staphylococcus aureus, some patients harbour MRSA on their skin or nose without harm (such patients are said to be 'colonised'). Individuals colonized with MRSA may also serve as a 'reservoir' of MRSA that may spread to other patients.^[1] In recent years increasing numbers of cases of MRSA infection in the community have been seen in many countries around the world. Because of the ability of staphylococci to acquire antimicrobial resistance over time, MRSA will continue to be a problem in the future. The strains of MRSA found in patients in the community are distinct from those strains seen in hospitals and it now called 'community-associated MRSA (CA-MRSA) which has

evolved independently of hospital acquired MRSA (HA-MRSA).^[2]

Materials and Methods

The present study has been conducted in tertiary care teaching hospital in western India. This study comprised of total 534 Staphylococcus aureus isolates from various clinical specimens during June 2010 to December 2011. All the samples were processed according to standard protocol.^[3] Screening and confirmation of MRSA isolates were done by standard methods recommended by Clinical and Laboratory Standards Institute (CLSI).^[4] In this study cefoxitin (30 µg) disk diffusion test was done as a part of screening method. Confirmations of all the MRSA isolates in screening method were done by using Ezy MIC Oxacillin (0.016-256 mcg/ml) strip. All the MRSA isolates were categorized into Hospital acquired MRSA (HA-MRSA) and Community acquired MRSA (CA-MRSA) according to CDC definition.^[5] Standard strains Staphylococcus aureus ATCC 25923 and MRSA strain ATCC 43300 were used as negative and positive control respectively. The diameter of the zone

of inhibition of growth was recorded and interpreted as susceptible or resistant by the criteria of CLSI. All MRSA isolated strains was tested for vancomycin susceptibility by Ezy MIC Vancomycin (0.016-256 mcg/ml) strip.

Results

Out of total 1436 staphylococcus spp. were isolated, 534 were confirmed as *S. aureus* by the means of various biochemical tests. Out of 534 *Staphylococcus aureus* recovered from different clinical samples, 152 (28.46%) were found to be Methicillin resistant. 113 out of 152 isolates (74.34%) were Hospital acquired MRSA (HA-MRSA) while 39 out of 152 isolates (25.66%) were Community acquired MRSA (CA-MRSA) according to CDC definition. Mean age of these patients was 38.31 years. MRSA infection rate was higher in extreme age group e.g. Pediatric and Geriatric age group. MRSA infection was most common in skin & soft tissue (72.37%) followed by blood stream (17.76%), Respiratory tract (4.61%) and CSF (2.63%). (Table 1)

Out of total 152 isolates, 103 (67.76%) were from Orthopedic/ Surgery unit while 49 (32.24%) were from Medicine/ Pediatric unit. Higher numbers of MRSA were isolated from surgical unit. For all confirmed isolates, oxacillin MIC value was noted. For majority of MRSA isolated (77.63%), Oxacillin MIC value was > 256 mcg/ml (Table 2). There was quite difference between resistance patterns of all isolates. Resistance to other antibiotics were more encountered in MRSA strains in comparison to MSSA strains. Among all MRSA isolates, resistance rate to various antibiotics was higher in HA-MRSA strains than CA-MRSA strains. All isolated MRSA were sensitive to Vancomycin. MRSA strains showed good sensitivity to Linezolid. Among MRSA isolates, resistance rate was lower for higher generation quinolones and chloramphenicol as compare to other antibiotics. (Table 3)

Table-1: Site wise Distribution of MRSA Isolates

Site	Total MRSA	%
Skin and Soft Tissue infection	110	72.37
Blood stream Infection	27	17.76
Respiratory tract Infection	7	4.61
CSF	4	2.63
Others	4	2.63
Total	152	100

Table-2: MIC of Oxacillin for MRSA Isolates

MIC value (mcg/ml)	No. of isolates	% of isolates
0.016 - 2	0	0
4 - 16	1	0.66
16-64	3	1.97
64-128	7	4.61
128-256	23	15.13
> 256	118	77.63

Table-3: Antibiotic Resistance Profile of All Isolates during the Study

Antibiotic	Strength (µg)	Resistance Rate (%)		
		MSSA	CA-MRSA	HA-MRSA
Ciprofloxacin	5	16.75	67.26	61.54
Levofloxacin	5	3.93	21.24	12.82
Linezolid	30	0.00	3.54	2.56
Azithromycin	15	35.60	84.07	66.67
Co-trimoxazole	25	25.65	82.30	64.10
Tetracycline	30	12.83	70.80	51.28
Gentamycin	10	14.66	76.99	61.54
Clindamycin	2	25.92	79.65	58.97
Chloramphenicol	30	9.95	60.18	51.28
Ampicillin	20	64.92	93.81	92.31

Discussion

MRSA has emerged as a serious public health problem in the India and other regions of the world. Because of the ability of staphylococci to acquire antimicrobial resistance over time, MRSA will continue to be a problem in the future. In this study MRSA prevalence rate 28.46% is quite similar to the 29.1% at a Tertiary Care Hospital in Mangalore, South India in 2008^[6], Mehta AP, Rodrigue C; et al; India (32.8%)^[7], 31.1% multicenter study in Tamil Nadu in 2006^[8]. In clinical settings it is important to differentiate between HA-MRSA and CAMRSA infections to help determine the most effective treatment and to reduce the rate of infections in hospitals and the community. Out of 152 MRSA isolates, 113 were hospital acquired and 39 were community acquired as determined by CDC definition. Percentage of hospital and community acquired isolates was 72.37% and 27.63% which is comparable to other study (Manal M Baddour, et al; Annals of Clinical Microbiology and Antimicrobials 2006).^[9] MRSA isolates were most commonly isolated from skin soft tissue infection (72.37%) this data corresponds to the earlier study.^[6,9] The important and clinically relevant finding of this study is the higher degree of resistance shown by MRSA to the conventional antibiotics. Resistance rate for multiple antibiotics is higher for MRSA isolates than methicillin sensitive isolates in this study. Also among MRSA isolates HA-MRSA were having more resistance rate to various antibiotics than CA-MRSA. The same scenario has been observed in earlier study in Pune.^[10] The impact of MRSA depends on the patient population and their susceptibility to infection. Susceptibility to infection is greatest in critical care areas such as ICUs, but is much less in non-critical units such as long-stay community units. An early diagnosis of MRSA can help the clinician prescribe the most effective antibiotic to treat each type of infection. The ability to do this can decrease the morbidity and mortality rates as well as hospital stays & treatment costs.

Conclusion

In conclusion, MRSA pose a great difficulty in selecting

anti-microbial agents for the management of the infections that they cause. There are quite difference in the antibiotic resistance patterns of MRSA isolates in respect to the place and time throughout the globe. In this study, vancomycin was only antibiotic which showed 100% sensitivity to MRSA strains. Also linezolid and higher generation quinolones showed good sensitivity to these strains. These drugs could be reserved for treating MRSA infections and because overuse of these drugs can lead to emergence of resistance. Since the complete eradication of MRSA might not be possible, control of transmission seems to be the only hope.

References

1. Johnson A. Methicillin-resistant Staphylococcus aureus (MRSA) infection. Net Doctor. Available from <http://www.netdoctor.co.uk/diseases/facts/mrsa.htm>
2. Boyce JM. Should we vigorously try to contain and control methicillin-resistant Staphylococcus aureus? *Infect Control Hosp Epidemiol.* 1991; 12: p 46-54.
3. Baird D. Staphylococcus: cluster-forming Gram-positive cocci. In: Collee JG, Marmion BP, Fraser AG, Simmons A, editors. *Mackie and McCartney practical medical microbiology.* 14th ed. New Delhi: Elsevier; 2006. p. 245-261.
4. Clinical and Laboratory Standards Institute 2011. Performance standards for antimicrobial susceptibility testing; 20th informational supplement. CLSI document M100- S21. Clinical and Laboratory Standards Institute, Wayne, Pa. 2012.
5. Nicolle LE. Infection control programmes to contain antimicrobial resistance. WHO, Department of Communicable Diseases Surveillance and Response, 2001. http://www.who.int/csr/resources/publications/drugresist/infection_control.pdf
6. Pai V, Rao VI, Rao SP. Prevalence and Antimicrobial Susceptibility Pattern of Methicillin-resistant Staphylococcus Aureus [MRSA] Isolates at a Tertiary Care Hospital in Mangalore, South India. *J Lab Physicians.* 2010;2(2):82-4.
7. Mehta AP, Rodrigue C, Sheth K, Jani S, Hakimiyan A, Fazalbhoy. Control of methicillin resistant Staphylococcus aureus in a tertiary care center: *J Med Microbiol.* 1998; 16:31-4.
8. Rajadurai pandi K, Mani KR, Panneerselvam K, Mani M, Bhaskar M, Manikandan P. Prevalence and Antimicrobial Susceptibility Pattern of Methicillin Resistant Staphylococcus Aureus. A Multi centre Study. *Indian J Med Microbiol.* 2006;24(1):34-8.
9. Manal M Baddour, Manal M Abuelkheir, Amal J Fatani. Trends in antibiotic susceptibility patterns and epidemiology of MRSA isolates from several hospitals in Riyadh, Saudi Arabia. *Ann Clin Microbiol Antimicrobiol.* 2006;5:30.
10. Misra RN, Chander Y, Debata NK, Ohri VC. Antibiotic resistance patterns of isolates from wound and soft tissue infections. *Med J Armed Forces India.* 2000,56:205-208

Cite this article as: Patel PG, Khandelwal N, Raval PN, Patel BV, Soni ST, Vegad MM. Prevalence and antimicrobial susceptibility pattern of methicillin resistant staphylococcus aureus in tertiary care teaching hospital, Western India. *Int J Med Sci Public Health* 2014;3:58-60.
Source of Support: Nil
Conflict of interest: None declared