 DOI: 10.18231/2455-6807.2017.0026

Changing Trends of MRSA Isolation in Tertiary Care Hospital

Mangala Suresh Harbade[1,*], Anil A. Gaikwad[2], Jyoti A. Iravane[3], J.B. Bhakare[4], A.S. Damle[5]

[1,2,3,4]Associate Professor, [5]Professor & HOD, Dept. of Microbiology, Govt. Medical College, Aurangabad, Maharashtra

***Corresponding Author:**
Email: drmduthade@gmail.com

Abstract

Methicillin-resistant *Staphylococcus aureus* (MRSA) is an important cause of nosocomial infections worldwide. The aim of study is early detection of MRSA and antibiotic sensitivity pattern. Early detection of MRSA is necessary to implement effective control measures and control their spread in Hospital.

Materials and Method: The bacterial isolates from various clinical specimens of patients admitted in our hospital were cultured as per standard protocol and all isolates of *Staphylococcus aureus* obtained were included in the study. The antimicrobial susceptibility testing was performed by Kirby–Bauer disc diffusion method. The isolates were tested for methicillin resistance by using cefoxitin by disc diffusion method Interpretation of result was done using CLSI 2016 guidelines.

Results: During a period of one year, a total of 464 isolates of *S. aureus* were studied and 186 (40%) were found to be methicillin-resistant. The maximum isolation of MRSA was from pus samples 77 (41%). MRSA isolates showed greater resistance to multiple drugs. 72% of MRSA isolates were resistant to Amoxclav, 61% to Clindamycin, 60% of Penicillin and Co-trimoxazole, 54% to Erythromycin and 41% to Gentamycin. However, all strains were sensitive to Vancomycin.

Conclusion: The regular surveillance of MRSA may be helpful in formulating and monitoring the antibiotic policy. Monitoring the epidemiology and the burden of MRSA infections is crucial to control of MRSA and its spread of infection. This may also help in preserving antibiotics like Vancomycin, only for life-threatening Staphylococcal diseases.

Keywords: Methicillin resistance Staphylococcus aureus (MRSA), Methicillin sensitive Staphylococcus aureus (MSSA).

Introduction

Staphylococcus aureus is recognized as a cause of infections ranging from minor skin infections and chronic bone infections to devasting septicemia and endocarditis.(1) Infections caused by *Staphylococcus aureus* used to respond to betalactam antibiotics. However with emergence of Methicillin resistance Staphylococcus aureus (MRSA); treatment of these infections has become problematic.(2) MRSA is one of the commonest nosocomial pathogens. Methicillin resistance is due to the acquisition of *mecA* gene which encodes a unique penicillin-binding protein, designated PBP 2′ or PBP 2a. This reduces affinity for β-lactams and allows effective cell wall synthesis even in the presence of penicillins including anti-staphylococcal penicillins, as well as cephalosporin's and carbapenems.(3) It has been responsible for causing increasing number of outbreaks of MRSA infections in hospitals reported from many countries.(4) Asymptomatically colonized healthcare workers are the major sources of MRSA in the hospital environment. MRSA causes more invasive infections than other bacterial pathogens. Early detection of MRSA and formulation of effective antibiotic policy in tertiary care hospitals is of paramount importance. The incidence of MRSA varies from 25 per cent in western part(5) of India to 50 per cent in South India.(6)

Since resistance to multiple antibiotics among MRSA isolates is very common, there is a possibility of extensive outbreaks, which may be difficult to control. Indiscriminate use of multiple antibiotics, prolonged hospital stay, intravenous drug abuse, carriage of MRSA in nose are important risk factors for MRSA acquisition.(7) The aim of study is for early detection of MRSA and observe the increase or decrease of MRSA occurrence with that of previous years and antibiotic sensitivity pattern.

It helps us from treatment point of view because it leaves us with very few treatment options such as glycopeptides and linezolid. Detection of MRSA is neccessary to implement effective control measures and control their spread in Hospital.

Materials and Method

The study was conducted in Department of Microbiology Government Medical College, Aurangabad during the period of Jan 2016 to Dec 2016. The various clinical samples included in this study were pus, wound swabs, sputum, urine, blood and endotracheal aspirate. These samples were received in Microbiology laboratory from different wards. The samples were processed as per standard procedures.(8)

Direct smear of each specimen (except blood) was stained with Grams stain and finding noted. The samples were inoculated on Blood agar, MacConkey's agar aerobically overnight at 37ºC .Colony morphology and Gram stained smear of the colonies was observed.(8) Organisms having following colony characters were considered to be suggestive of *Staphylococcus* species: Blood agar colony – shows 1 to 3mm in diameter, circular, white to golden yellow, smooth, low convex, glistening, opaque with or without β haemolysis. Colonies were picked for gram staining. The colonies suggestive of *Staphylococcus* were

subjected to catalase test, slide coagulase and tube coagulase test.[9]

All Staphylococcus *aureus* were tested for routine antibiotic sensitivity testing including Cefoxitin which is one of the methods used for detection of Methicillin resistance was performed by modified Kirby Bauer Disc diffusion method as per CLSI Standards 2016 guidelines.[10]

Results

464 strains of *Staphylococcus aureus* were isolated from patients belonging to various wards. 186(40%) out of 464 were found to be MRSA. Remaining 278(60%) were MSSA. The age of patients from whom MRSA were obtained ranged from 1year to 60 years. Among the 186 isolates of MRSA, 100 were from male patients and 86 from females. Maximum numbers of isolates were from 30 to 40 years age group.

Samples were received from different wards of the Hospital. Maximum number of MRSA were isolated from Surgery ward 100(54%), NICU 30(16%), Medicine 21(11%), MICU 20(11%), OBGY 10(5%) and Ortho 5(3%) as shown in Table 1.

The maximum isolation of MRSA was from pus 77 (41%) followed by wound swabs 35(18%), blood 34(18%), tracheal aspirate 25 (13%) and sputum 15 (8%) as shown in Table 2.

Antibiogram of the 186 MRSA isolates were studied. This is shown in table 3.

The MRSA strains showed high degree of resistance toward Amoxyclav, Clindamycin, Penicillin, Gentamycin, Erthromycin, and Cotrimoxazole. About 72% of MRSA isolates were resistant to Amoxclav, 61% to Clindamycin, 54% to Erythromycin, 60% of Penicillin and 60% of Co-trimoxazole and 41% to Gentamycin.

Table 1: Isolation of Methicillin resistant *Staphylococcus aureus* (MRSA) from clinical specialties

Sr. No	Name of ward	MRSA N=186	MRSA%
1	Surgery	100	54
2	Ortho	5	3
3	MICU	20	11
4	NICU	30	16
5	OBGY	10	5
6	Medicine	21	11

Table 2: Staphylococcus isolated from various clinical samples

Table 3: Antibiotics resistance pattern of MRSA to other Antibiotics

Sr. No	Name of the Antibiotic	Resistance pattern
1	Amoxyclav	72%
2	Clindamycin	61%
3	Penicillin	60%
4	Cotrimoxazole	60%
5	Erthromycin	54%
6	Gentamycin	41%

Discussion

Among the Gram-positive pathogens, *Staphylococcus. Aureus* continues to cause skin and soft tissue infections (SSTI) in the community as well as invasive infections in the hospitalized patients. MRSA is a major nosocomial pathogen causing significant morbidity and mortality.

In our study 464 strains of *Staphylococcus aureus* were isolated from patients belonging to various wards. Isolation of MRSA was 186 (40%) from 464 Staphylococcus aureus. Similar results 40.38% are shown by Mittal *et al*. (India).[11] The prevalence of MRSA was 30 to 80% in various other studies.[12,13,14,15]

High prevalence of MRSA from pus samples that is (41%) recorded in this study. Similar high prevalence of MRSA in pus samples were also reported by Tiwari et al[16] and Deepak et al that is 43.10%.[17]

Most of the pus samples were from surgical ward, high occurrence of MRSA in these wards is mainly due to higher use of antibiotics, due to overcrowding of patients, increased workload, and understaffing of wards.

MRSA are often multidrug -resistant. In this study also, MRSA strains were found to be more resistant than MSSA strains to almost all the antibiotics. However all were sensitive to vancomycin and linezolid. Currently, the majority of *Staphylococcus. aureus* strains are beta-lactamase producers, hence resistant to penicillin and ampicillin. A study from Maharashtra has reported that more than 90% isolates from South Maharashtra have been found resistant to Penicillin, Ampicillin, Erythromycin, Gentamycin.[18]

Increased trend in MRSA were noted in the studies conducted in Government .Medical college Aurangabad as 21% in 1991,[19] 29% in 2008,[20] 56% in 2009[20] and 28.3% in 2012.[21] However increased MRSA 56% in year 2009 were studied from that it has come down to 40%. Because of proper precaution, vigilance and corrective action taken it came down. It also indicate even now 40% MRSA is higher and need to corrected and proper action to be taken.

Conclusion

Total of 464 Staphylococcus aureus strains were included in the study from different wards coming to our laboratory during the period of one year. Cefoxitin disc diffusion detected 186 MRSA strains thus making

the prevalence of MRSA 40%. Maximum MRSA was found in pus samples (41%). MRSA isolates showed high degree of resistance to other drugs. Monitoring the epidemiology and the burden of MRSA infections is crucial to control of MRSA and its spread of infection.

References

1. Chambers ST (2005).Diagnosis and management of Staphylococcus infections of pacemakers and cardiac defibrillators. Intern Med J 35 Suppl 2:S63-71.
2. Klutmans J, Belkum AV, Verburg H. Nasal carriage of S.aureus: Epidemiology, Underlying mechanisms and associated risk. Clin Microbiol Rev. 1997;vol 505-520.
3. Tsubakishita S, Kuwahara-Arai K, Sasaki T, et al. Origin and molecular evolution of the determinant of methicillin resistance in Staphylococci. Antimicrob Agents Chemother. 2010;54:4352–59. [PMC free article] [PubMed]
4. Cox RA, Conquest C, Mallaghan C, Marples RR. A major outbreak of methicillin resistant *Staphylococcus aureus* caused by a new phage type (EMRSA-16) J Hosp Infect. 1995;29:87–106. [PubMed]
5. Patel AK, Patel KK, Patel KR, Shah S, Dileep P. Time trends in the epidemiology of microbial infections at a tertiary care center in west India over last 5 years. J Assoc Physicians India. 2010;58(Suppl):37–40. [PubMed]
6. Gopalakrishnan R, Sureshkumar D. Changing trends in antimicrobial susceptibility and hospital acquired infections over an 8 year period in a tertiary care hospital in relation to introduction of an infection control programme. J Assoc Physicians India. 2010;58(Suppl):25–31. [PubMed])
7. Anupurba, S., Sen, M.R., Nath, G., Sharma, B.M., Gulati, A.K., Mohapatra, T.M. 2003. Prevalence of methicillin resistant Staphylococcus aureus in a tertiary care referral hospital in Eastern Uttar Pradesh. Indian J. Med. Microbiol., 21:49–51.
8. Baird D. Staphylococcus Micrococcus: cluster forming Gram positive cocci In: Collee JG, Fraser AG, Marmion BP, Simmons A, editors. Mackie and McCartney Practical Medical Microbiology 14 edition .Edinburg; Churchill Livingstone;2008:245-262.
9. Winn W, Allen S, Janda W, Koneman E, Procop G, Schreckenberger P, et al., editors. In: Koneman's Colour Atlas and TextBook of Diagnostic Microbiology. 6th ed. Lippincott, Williams and Wilkins; 2006. pp. 643–648.
10. Clinical and laboratory Standards Institute 2016, Performance Standards for Antimicrobial susceptibility testing. Twenty-second information supplement. Wayne PA, USA: Clinical and laboratory standard institute; 2016.
11. Mittal V, Kishor S, Siddique ME. Prevalence of inducible clindamycin resistance among clinical isolates of *Staphylococcus aureus* detect by phenotypic method: A preliminary report. J Infect Dis Immun 2013;5:10-2.
12. Srinivasan D Sheela, Shashikala, R Mathew, J. Bazroy, R Kanungo. Risk factors and associated problems in the management of infections with methcillin resistant Staphylococcus aureus. IJMM 2006;24(3):182-5**.**
13. Sachdev D, Amladi S, Nataraj G, Baveja S, Kharkar V, Maharajan S et al. An outbreak of methicillin resistant Staphylococcus aureus (MRSA) infection in dermatology indoor patients. Indian J Dermatol Venereol Leprol 2003;69:377-80**.**
14. McDonald M. The epidemiology of methicillin resistant Staphylococcus aureus: Surgical relevance 20 years on. Aust NZ J Surg 1997;67:682-5**.**
15. Wable VR, Turbadkar SD, Chavan SA, Sengupta SS, Chaudhary AS, Bharadwaj RS. Prevalence of Methicillin Resistance Staphylococcus aureus (MRSA) in Hospitalized patients. Milestone April 2006;5(2):16-18.
16. Tiwari HK, Das AK, Sapkota D, Sivrajan K, Pahw Methicillin resistant *Staphylococcus aureus*: Prevalence and antibiogram in a tertiary care hospital in Western Nepal. J Infect Dev Ctries 2009;3:681-4.
17. Deepak S, Samant SA, Urhekar AD. Study of coagulase positive and coagulase negative Staphylococus in clinical samples. Indian J Med.Sci.1999;53:425-8.pubmed.
18. Kandle SK, Ghatole MP, Takpere AY, Hittinhalli VB, Yemul VL. Bacteriophage typing and antibiotic sensitivity pattern of *Staphylococcus aureus* from clinical specimen in and around Solapur (South Maharashtra) J Commun Dis. 2003;35:17–23. [PubMed]
19. S.D Bhat, A.B Deshmukh, A.S. Damle. Bacteriophage Typing and Antibiotic Sensitivity Pattern of Staphylococcus from Clinical Samples. IJMM1991,Vol 9 Issue 4:173-178.
20. Sangeeta Joshi, Pallab Ray, Vikas Manchanda, Jyoti Bajaj, D.S. Chitnis, Vikas Gautam, Parijath Goswami, Varsha Gupta, B.N. Harish, Anju Kagal, Arti Kapil, Ratna Rao, Camilla Rodrigues, Raman Sardana, Kh Sulochana Devi, Anita Sharma, and Veeragaghavan Balaji, Indian Network for Surveillance of Antimicrobial Resistance (INSAR) group, India. Methicillin resistant *Staphylococcus aureus* (MRSA) in India: Prevalence & susceptibility pattern. Indian J Med Res. 2013 Feb;137(2):363–369.
21. Gajbhiye P.S, Damle A.S. Study of MRSA Isolates from Patients of Tertiary Care Hospital. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS): Volume 14, Issue 3 Ver. II (Mar. 2015), PP 59-62.

How to cite this article: Harbade M.S., Gaikwad A.A., Iravane A.J., Bhakare J.B., Damle A.S. Changing Trends of MRSA Isolation in Tertiary Care Hospital. International Journal of Medical Microbiology and Tropical Diseases 2017;3(3):113-115.