ORIGINAL ARTICLE

JIACM 2008; 9(1): 33-5

Incidence of Methicillin Resistant *Stahylococcus aureus* (MRSA) in Pus Samples at a Tertiary Care Hospital, AIIMS, New Delhi

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Abstract

Between December, 2001 and March, 2002, patients with MRSA were treated at All India Institute of Medical Sciences, New Delhi, a tertiary care hospital with 1,200 beds. Methicillin resistant Staphylococcus aureus (MRSA) is an important cause of nosocomial infections worldwide. The prevalence of MRSA in surgical wound infections at AIIMS in 2001-02 was determined. The analysis of 2,080 pus samples was done. A high incidence of S. aureus was observed. The MRSA prevalence rate was 44% of all S. aureus isolates. All isolates were sensitive to vancomycin, rifampicin and teichoplanin. MRSA occurred sporadically in a wide distribution of surgical wards. The high incidence of MRSA in this hospital warrants the use of antibiotics and application of control measures to prevent the spread of such resistant strains.

Key words: Methicillin, MRSA, Staphylococcus aureus, Vancomycin, Teichoplanin, Surgical wards.

Introduction

MRSA emerged as a nosocomial pathogen in the early 1960s. Most occurrences were isolated in sporadic outbreaks but in the 1970s, an increasing number of large hospital outbreaks were reported in many countries including the USA, Europe, Japan, and Australia[1]. MRSA was first reported in a teaching hospital in Malaysia in 1972. *S. aureus* is the organism, predominates in surgical wound infections with prevalence rate ranging from 4.6% – 54.4% of all *S. aureus* isolates[2-5]. The choice of treatment for post-surgical wound infections requires an understanding of the usual flora, available antimicrobial agents, and susceptibility patterns. Routine surveillance for hospital acquired wound infections is thus recommended by both, the Centres for Disease Control and Prevention, and the Surgical Infection Society[2]. Thus the incidence of MRSA in both developed and developing countries prompted to carry out a retrospective study to determine the prevalence of MRSA in surgical wound infections at AIIMS hospital in north India, in order to utilise the information obtained from this study to apply appropriate control measures.

Material and methods

Specimens

The retrospective analysis included 2,080 pus samples obtained from patients with surgical wound infections admitted to All India Institute of Medical Sciences hospital during a three-month period from December 15, 2001 to March 15, 2002.

Collection and transport of specimens

Samples were obtained using cotton tipped swabs from all skin wounds, and direct aspiration of pus from deep-seated wounds. Swabs were transported to the laboratory in Thioglycolate broth (TGB) (Hi-media Limited, India). The samples were delivered to the microbiology laboratory within 30 minutes of collection.

Culture

If pus discharge/aspirate/any other infected fluid, is used for culture, then one loopful is used for inoculating blood agar (BA) and MacConkey agar (MA) plates, and one loopful in TGB medium and for direct smear. If catheter tip is sent, roll the tip all over with sterile forceps on BA and then MA. The tubes are then put into TGB. The samples cultured on blood agar (BA) and MacConkey agar (MA) plates are incubated aerobically at 37° C for 48 hrs. The isolates were identified using standard laboratory procedures[6].

Anti-microbial susceptibility

All staphylococcal strains were tested for susceptibility to amikacin, teichoplanin, ciprofloxacin, vancomycin

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amoxycillin, cefuroxime, and rifampicin by standard disc diffusion method recommended by the National Committee for Clinical Laboratory Standards (NCCLS)[7].

Detection of MRSA

As recommended by NCCLS, the isolates of staphylococci were tested for oxacillin susceptibility by agar screen method using 6 µg/ml oxacillin[8]. The four strains i.e., *S. aureus* (ATCC-25923), *S. epidermidis*, WHO-23, and WHO-2 were used as a control. Agar plates were incubated at 35° C and read after 24 hrs. of incubation. All bacterial growth on oxacillin screen agar was considered to be MRSA.

Table I: Distribution of resistant *S. aureus* isolates in relation to surgical speciality.

S. No.	Surgical speciality	No. of isolates (%)
1	Neurosurgery	30 (26%)
2	Orthopaedics	26 (24%)
3	Paediatric surgery	20 (17.8%)
4	Cardio-thoracic surgery	15 (14%)
5	General surgery	8 (7.1%)
6	Skin OPD	7 (6.25%)
7	Oncology	3 (2.6%)
8	Physical medicine and rehabilitation	2 (1.78%)
9	General ICU	1 (0.89%)

Table II: Antibiotic-sensitivity of MRSA isolates.

S. No.	Antibiotics	Sensitivity (%)
1.	Vancomycin	100%
2.	Rifampicin	62%
3.	Teicoplanin	56%
4.	Amikacin	31%
5.	Ciprofloxicin	16%
6.	Cefuroxime	11%
7.	Amoxycillin	6.25%

Results

Of the 2,080 specimens received, 800 (38%) were culture positive. *S. aureus* was the most common cause of surgical wound infections accounting for 260 (32%) of the total isolates; coagulase-negative staphylococcus was isolated in 60 (75%) samples. Methicillin resistance was documented in 112 (44%) of the *S. aureus* isolates. Of the 60 coagulase-negative staphylococci, 25 (42%) were methicillin resistant. The distribution of 112 MRSA isolates in relation to the surgical speciality from which they were taken, is as follows: neurosurgery (26%), orthopaedics (24%), paediatric-surgery (17.8%), cardio-thoracicsurgery (14%), general surgery (7.1%), skin OPD (6.25%), oncology (2.6%), physical medicine and rehabilitation (1.78%), general ICU (0.89%). All the 112 MRSA were sensitive to vancomycin, rifampicin and teichoplanin. The sensitivities of methicillin resistant staphylococci to various antibiotics were as follows: vancomycin (100%), rifampicin (62%), teichoplanin (56%), amikacin (31%), ciprofloxacin (16%), cefuroxime (11%), amoxycillin (6.25%). Out of 112 MRSA, the 66 were detected to be positive β-lactamase, and 46 were negative β-lactamase.

Discussion and conclusion

The previous inclination of MRSA is in high intensity in the surgical and intensive care services, where antibiotic usage is the greatest. According to this study, there is high occurrence of MRSA in surgical wound infection, especially in the neurosurgical and orthopaedics patients, due to overcrowding, workload, and understaffing of wards. The MRSA could be prevented by identifying and screening MRSA carriers inside high-risk wards as it is an important clinical problem at AIIMS. It should not be ignored as it can seriously disrupt the efficient delivery of healthcare services in the hospital. Preventing colonisation and infection remains the most effective way to control the spread of MRSA and simple measures such as patient isolation, cohorting doctors and nurses working with patients. Strict enforcement of hand washing and early discharge of infected patients will go a long way towards reducing the spread of this pathogen in this hospital[3,5]. All the isolates of MRSA were sensitive to vancomycin and teichoplanin, in contrast to recent reports of *S. aureus* isolates with reduced susceptibility to vancomycin by the Centres for Disease Control and Prevention (CDC, USA), and of three *S. aureus* isolates fully resistant to vancomycin by Japanese workers[9,10]. Thus, the results of the present study show a high endemicity of MRSA at AIIMS hospital, New Delhi. This poses a serious problem for drug therapy because the treatment options have been restricted to potentially toxic antimicrobials like vancomycin, leading to increased mortality and morbidity.

Therefore, preventing surgical infection with MRSA requires application of surgical first principles and immediate reinforcement of the appropriate use of antibiotics plus commitment of local resources.

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Background: Methicillin resistant Staphylococcus aureus (MRSA) has emerged as an important nosocomial pathogen. Asymptomatic colonization among healthcare workers is the major source of MRSA in hospital environment. There is paucity of information on carriage of MRSA by healthcare workers in developing nations. Aim of this study was to determine nasal carriage rate of MRSA in healthcare workers and the antibiotic sensitivity of the isolates. Methods: 300 nasal swabs were collected from doctors and health care workers. All the isolates were identified by standard methods and antibiotic sensitiv Staphylococcus aureus is an opportunistic pathogen often carried asymptomatically on the human body. Methicillin-resistant S. aureus (MRSA) strains have acquired a gene that makes them resistant to nearly all beta-lactam antibiotics. Resistance to other antibiotics is also common, especially in hospital-associated MRSA. These organisms are serious nosocomial pathogens, and finding an effective treatment can be challenging. Community-associated MRSA strains, which originated outside hospitals, are also prevalent in some areas. While these organisms have generally been easier to treat, some have Although Staphylococcus aureus is a commensal of humans [1], it is also a frequent cause of human infections which may become serious if caused by antimicrobial resistant strains [2]. Antibiotic resistant S. aureus, especially MRSA, are equally adopted to hospitals and outer environments evolving as major pathogens of public health concern [3, 4]. Shortly after the introduction of methicillin in clinical world to treat infections caused by penicillinase producing S. aureus in 1960, MRSA emerged and spread worldwide [5, 6]. The high rate of methicillin resistance among Staphylococcus aureus has