Incidence of Methicillin Resistant Staphylococcus aureus in Blood Culture Isolates—a retrospective study

R HAFEEZ M ASLAM S AMAN
Department of Pathology, Allama Iqbal Medical College, Lahore
Correspondenceto: Dr. Rubeena Hafeez, Assistant Professor Microbiology

To detect the presence of methicillin resistant staphylococcus aureus in blood culture isolates. Retrospective study. Pathology department, Allama Iqbal Medical College, Lahore. January to December 2000. 1200 blood culture samples sent to Pathology Department were reviewed for the presence of methicillin resistance. Out of 1200 cases, 111(19.9%) cases of methicillin resistance staphylococcus aureus bacteraemia were identified. The high incidence of methicillin resistance staphylococcus aureus bacteraemia indicates the need for early and appropriate infection control measures to reduce the transmission, as vancomycin is often the only drug for treatment.
Key words: MRSA; Staphylococcus aureus, bacteraemia

Although strains of staphylococcus aureus resistant to penicillin have caused infections for many years, isolates resistant to methicillin have become predominant primarily in the last 20 years. Methicillin resistant staphylococcus aureus (MRSA) were first described in England in 1961, shortly after methicillin became available for clinical use[1] but have subsequently spread throughout the world. MRSA is of special concern because of its resistance not only to methicillin, oxacillin and nafcillin but also to all other beta- lactams, including cephalosporins, imipenem, meropenem and aztreonam[2]. The prevalence of MRSA in hospitals varies considerably from one region to another and among hospitals in the same city. Richet et al[3] reported an incidence of 1.25% in 27 hospitals in France whereas Berardi et al[4] reported 31.8% from other hospitals in the same area. Data from the National Nosocomial Infection Surveillance System reveals MRSA to account for up to 40% of nosocomial staphylococcus aureus infections in large hospitals and 25–30% of such infections in smaller hospitals. The vast majority of MRSA infections are acquired in the hospitals. The most common infections include surgical site infections- 28%[4]; bacteraemia – 24%[5] and lower respiratory tract infections- 15%[6]. Episodes with MRSA bacteraemia had a significantly higher mortality rate of 58.7% as compared to methicillin sensitive Staphylococcus aureus infections[7].

Thus MRSA infections are of special concern in a community. Serious outbreaks are common especially when one strain is transmitted to other patients. Due to its resistance to antibiotics, treatment becomes difficult and vancomycin is often the only drug of choice in severe MRSA infections[8].

Early and appropriate infection control measures are key elements to reduce MRSA transmission and to control the hospital reservoir. The present study was carried out retrospectively to detect the incidence of MRSA in blood culture isolates sent from various wards of Jinnah Hospital, Lahore, during the year 2000 from January to December.

Material and methods

1200 blood culture samples sent to Pathology Department for analysis during the period of January to December 2000 were reviewed. During the period studied the standard protocol for collection of blood samples was followed.

Aseptically, peripheral venous blood samples were collected from the patients presenting clinically with septicaemia. The skin over the selected area was first cleaned with 2% iodine and then rubbed with 70% alcohol. Ten milliliter of blood was withdrawn in a sterile disposable syringe and immediately added to the aerobic blood culture bottles, chocolate agar and maclankey agar containing tryptic soya broth. The bottles were gently shaken to mix the blood with the broth. The date, time of sample collection and name of the patient were noted on the bottles.

The blood culture bottles were incubated at 37°C for 24 hours; then they were subcultured aerobically on blood agar for 24 to 48 hours at 37°C. In the absence of growth the bottles were further incubated for 7 days and subcultured on alternate days in the same way.

All Staphylococcus aureus isolates obtained were confirmed by Gram staining, coagulase tube test and Dnase test. Methicillin resistance was detected by putting up oxacillin discs on Meullar Hinton agar and incubation at 35°C (1μg) for 24 hours according to NCCLS recommendations [9]. Zone size of ≤10 mm was considered resistant (Table 1).

Results

A total of 1200 cultures were sent to the laboratory during the year 2000. Out of these 558(46.5%) were positive for gram positive/negative organisms. Of these 111(19.9%) cases of methicillin resistant staphylococcus aureus bacteraemia were identified from the positive blood cultures submitted to the Microbiology laboratory over a one-year period. Two high risk areas were identified—the

pediatric unit with an incidence of 24.1% and 20% of MRSA respectively.

Table 1. Criteria for methicillin resistance (NCCLS)

	Oxacillin Susceptible	Oxacillin Intermediate	Oxacillin Resistant
Staphylococcus Aureus	≥13mm	11–12mm	≤10mm

Table 2 Positive blood cultures isolated from different units

Unit	No. of Cultures (n = 1200)	Positive cultures (n = 558)	%age
Pediatrics	545	282	51.7
Oncology	150	115	76.7
Medical	229	85	37.1
Orthopedics	115	39	33.9
Surgical	109	25	22.9
Urology	52	12	23.2

Table 3. MRSA isolation from different sites

Unit	No. of +ve Cultures (n = 558)	No. of MRSA (n = 111)	%age
Pediatrics	282	68	24.1
Oncology	115	23	20.0
Medical	85	13	15.3
Orthopedics	39	02	05.1
Surgery	25	04	16.0
Urology	12	01	08.3

Discussion

Throughout history the world has suffered and benefited from the tiny creatures we call microorganisms. Staphylococcus aureus is certainly one of the most formidable foes of man. Carried on the nose or skin, it is easily transmitted, and is the cause of a wide variety of illnesses [10] .In 1950 penicillin was only 15% effective on Staphylococcus aureus. In 1959 a new line of penicillin's: methicillin and oxacillin became a new hope in the battle against Staphylococcus aureus. The enzyme, pencillinase, made by the bacterium, did not inactivate the new antibiotics. However, in 1961 the bacteria once again became resistant to the first line antibiotics and could no longer be eradicated by penicillins. This new strain of Staphylococcus was renamed Methicillin resistant Staphylococcus aureus due to the antibiotic resistance. Traditionally, MRSA infections have been acquired almost exclusively in hospitals or long term care facilities. Risk factors for MRSA colonization or infection in the hospital include prior antibiotic exposure, admission to an intensive care unit, surgery and exposure to an MRSA colonized patient[11]. Due to antibiotic resistance of MRSA the treatment is different than a regular Staphylococcus aureus infection. Vancomycin is the drug of choice. The main trust and challenge that faces the medical community is to find a way to control and prevent the spread of MRSA that is affordable, effective and tolerable.

This study analyses methicillin resistance staphylococcal bacteraemia retrospectively in 1200 patients who were admitted to the various units of Jinnah hospital, Lahore over a one-year period (January to December 2000).

Five hundred and fifty eight (558) patients developed microbiologically proven bacteraemia. Out of these 111(19.9%) showed methicillin resistance. This is similar to the incidence reported by various studies in the West[5,12,13,14] . However, Cueing et al[15] reported an incidence of 6.9 % in blood cultures from a Malaysian Hospital, which is very low as compared to our results. Even lower percentages have been reported by Blumberg and Kligman –1.3% [16] and Richet et al –1.2 %[3]. But more recent studies show a shift towards a higher incidence of MRSA. Data from the National Nosocomial Infection Surveillance System reveals that MRSA accounts for up to 40% of nosocomial Staphylococcus aureus infections in large hospitals[2]. Farrington et al [17], in their study conducted at a teaching hospital in UK, reported that the proportion of MRSA positive blood cultures rose nearly 7-fold by 1996 and 27-fold by 1997 as compared to mid-year 1995. Our incidence is consistent with the studies conducted more recently[12,14].

The results of the study show the highest incidence of MRSA in the pediatric unit. The incidence of 24.1% in the pediatric unit is comparable to the value of 27.5% seen in pre-school children by Gang et al[12].

It is important that collaborative studies on the incidence of MRSA should be performed on a repetitive basis to assess the trend and incidence of antibiotic resistance. The hospital reservoir for MRSA should be identified in our setting and early and appropriate infection control measures instituted to reduce MRSA transmission and to control the hospital reservoir.

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