ORIGINAL ARTICLE

Prevalence of Methicillin Resistant Staphylococcus Aureus and its Current Antimicrobial Susceptibility Pattern in Clinical Isolates

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ABSTRACT

Methicillin resistant Staphylococcus aureus (MRSA) is a Gram positive bacterium and is frequent cause of infections worldwide. It is resistant to a large group of antibiotics called beta-lactams. The objective of our study was to determine the prevalence of MRSA and to assess its current antibiotic susceptibility pattern. The study was conducted in June, 2014 to November 2014 and 100 cases of staphylococcus positive were selected for this study. The 56% of isolates were from male and 44% were from female patients. Out of 100 isolates of S. aureus 53% were Methicillin resistant. Most of the MSRA specimens were found to be susceptible to vancomycin, whereas most were resistant to ampicillin and cephradin. MSRA isolates were 69% in hospitalized patients and majority was isolated from pus (67%), followed by from sputum samples (21%). The study concluded that to curb the occurrence of MSRA, continuous monitoring of hospital acquired infections and surveillance of antibiotic susceptibility pattern is essential. Proper detection of all MSRA with accurate and quick assays must be adopted as a routine laboratory procedure.

Keywords: Staph. aureus, MSRA, sensitivity pattern, prevalence of MRSA

INTRODUCTION

Staphylcoccus are Gram positive cocci, with diameters of 0.5-1.5 µm. These cocci multiply in more than one plane hence forming grape-like clusters.[1] This pathogen is very versatile, can adopt to several environments, hence causing a range of infections of varying severity affecting the skin, soft tissue, bones, respiratory system, joints and endovascular tissues.[2] Methicillin resistant S. aureus (MRSA) is common term for any strain of S. aureus bacterium that is resistant to beta-lactams ring containing antibiotics[3]. MRSA was initially detected in hospital in 1960. However in recent years it has emerged on large scale worlwide[4]. Among hospitalized patients, it was detected in intensive care units (ICU), nurseries, burn, post- operative, and skin wards. Patients undergoing hemodialysis or peritoneal dialysis are also at risk. The contributing factors may include misuse of antibiotics, lack of hand washing, substandard nursing care and the presence of carriers among hospital staff. [5,6]

The prevalence of health care acquired (HA-MRSA) is found to be 41.9% in Pakistan [6.] Its prevalence is also high in rest of the world which is reported 25-50% in the USA, 5-10% in Canada, 50% in China and 37.5% in India.[7] About 51.6% of S. aureus isolates among patients admitted to burns and orthopedic units in India were reported to be MRSA.[8] These infections include pneumonia, surgical site infections, soft-tissue infections, bacteremia, endocarditis and urinary tract infections. Most HA-MRSA strains are multi-drug resistant (MDR), and are difficult to treat.[9]

The objective of this study was to determine the prevalence of MRSA in clinical isolates collected from a busy tertiary care hospital of Lahore, Pakistan and to assess its current susceptibility pattern.

MATERIALS AND METHODS

The cross sectional, observational study was carried out in Pathology Department, King Edward Medical University, Lahore during the period from Jun 2014 to Nov. 2014. A total of 100 patients

infected with S. aureus of either sex, of all age groups were included in this study. Specimens from immuno-compromised patients were excluded. The bacterial strains were collected from different clinical specimens including pus, blood, sputum and body fluids from indoor and outdoor patients. Samples were first cultured on agar plates (blood, MacConkey and chocolate agar). The plates were incubated at 37ºC for 24-48 hours aerobically. After inoculation of samples on their respective culture media and incubation for 24-48 hours, S. aureus colonies were observed. The Coagulase test was used to differentiate S. aureus from other species of staphylococci.

Inoculum suspension was prepared by taking selected colonies from overnight growth on nutrient agar plate and transferring them to sterile saline. Suspension of final concentration of 105-106 colony forming units/ml was adjusted. The suspension was then inoculated on Mueller Hinton agar plates. Disc diffusion test of Methicillin (ug), Vancomycin (ug), Ampicillin (ug), Amoxil and Cephradin(ug) was carried out by using Kirby-Bauer method. The plates then placed for inoculation at 35 ºC in ambient air for exact 24 hrs. Zone diameters were measured at 24 and 48 hours following Clinical Laboratory and Standard Institute criteria. Data hence produced was analyzed on statistical software (SPSS) V.20.0.

RESULTS

Clinical specimens were taken from 100 patients. Out of them 56 patients were males and 44 were females. Age range was 1 to 70 years.

Fig. 1: Distribution of clinical specimens cultured for S. aureus

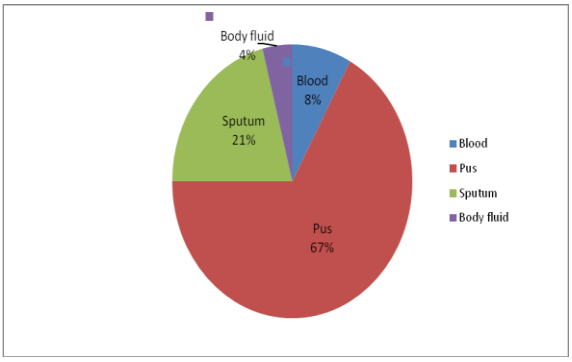

Figure 1 depicts the distribution of clinical isolates. Two-third of isolates was pus specimens followed by sputum (21%). Body fluids constituted only a minor fraction of total isolates that is (4%). MSRA isolates were 69% from hospitalized patients and majority was isolated from pus (67%). Sensitivity pattern of cultured S. aureus strains is shown in Table 1. Fifty-three percent of S. aureus were resistant to methicillin. Resitance to cephradin was lowest (21%). Ampicillin and Amoxil showed similar resistance. S. aureus strains showed highest sensitivity to Vancomycin (70%) and lowest sensitivity to Ampicillin (20%)

Table 1: Culture Sensitivity pattern of strains of S. aureus isolated from clinical isolates

Name of Antibiotic	Resistant (%)	Intermediate Sensitive (%)	Sensitive (%)
Methycillin	53	13	34
Vancomycin	30	37	33
Ampicillin	48	32	20
Amoxil	49	15	36
Cephradin	21	48	31

DISCUSSION

S. aureus continues is a major gram positive bacterium to cause skin and soft tissue infections (SSTI) among community and hospitalized patients. Recently a Europe-wide survey, reported that most common bacteria in SSTIs were *S. aureus* (71% cases) among these 22.5% were MRSA. [10] In our study, prevalence of MRSA is estimated at 53% which is a bit higher as compared to the developed countries, although in some countries the reported prevalence is even more than 60%. In a study conducted in Nepal the prevalence has been reported about 69%[11] and the most common specimen was pus similar to our study where specimen from pus has shown 67% positivity for MRSA.[11] In an Indian study the prevalence of MRSA is reported about 55%[9], this shows the prevalence of MRSA in the South East Asia is higher than the developed countries like USA and Europe. Similarly high prevalence was also observed (35% in ward and 43% in ICU) in patients from Delhi.[12]

The sensitivity pattern of our study has shown significant trend of multi drug resistance to S. aureus strains, which is similar to study conducted in Nepal and India. Vancomycin is not as effective as β-lactams ring containing antibiotics for treatment of methilin-sensitive S. aureus.[13] Therefore, Cephalosporins are better drugs for the treatment of MSSA infections among patients who cannot tolerate penicillins.

A recent study has shown the 100% sensitivity of Daptomycin against multi drug resistant S. aureus strains and this drug may be “the drug” for the treatment of infection with these strains.[14] Lack of infection control measures in the hospitals, and prescription of antibiotics without sensitivity reports may be the contributing factors for the high prevalence of MRSA in our region

CONCLUSION & RECOMMENDATIONS

Incidences of MRSA are on the rise and bacteria are becoming more resistant to antibiotics as it is evident from our study. For comprehensive evaluation of the prevalence of MRSA continuous monitoring of hospital acquired infection and surveillance of antibiotic resistance is very important. Proper use of antibiotics (proper dose and duration of taking antibiotics) is very important to curb the spread of MRSA. Rapid and accurate detection methods for MRSA must be adopted in the laboratory.

REFERENCES

1. Harris LG, Foster SJ, Richards RG. An introduction to Staphylococcus aureus, and techniques for identifying and quantifying S. aureus adhesions in relation to adhesion to biomaterials: review. Eur Cell Mater 2002; 4: 39–60.
2. Ray P, Gautam V, Singh R. Meticillin-resistant *Staphylococcus aureus* (MRSA) in developing and developed countries: implications and solutions. Regional Health Forum. 2011; 15:74–82.
3. Kejela T, Bacha K. Prevalence and antibiotic susceptibility pattern of methicillin-resistant *Staphylococcus aureus* (MRSA) among primary school children and prisoners in Jimma Town, Southwest Ethiopia. *Ann Clin Microbiol Antimicrob* 2013; **12**: 11.
4. Stefania S, Chungb DR, Lindsay JA et al. Meticillin-resistant Staphylococcus aureus (MRSA): global epidemiology and harmonisation of typing methods. International journal of antimicrobial agents. 2012;39, 273-82
5. Oberoi L, Kaur R, Aggarwal A.: Prevalence and antimicrobial susceptibility pattern of Methicillin Resistant Staphylococcus aureus (MRSA) in rural tertiary care hospital in north India. International Journal of Applied biology and pharmaceutical technology. 2012; 3(1):200-5.
6. Hussain M, Basit A, Khan A, Rahim K, Javed A. Antimicrobial Sensitivity Pattern of Methicillin Resistant Staphylococcus aureus Isolated from Hospitals of Kohat District , Pakistan. J Inf Mol Biol. 2013;1(1):13–16.
7. Hassan A, Mohammad, Humera et al. Prevalence of antibiotic susceptibility pattern and demographic factors related to Methicillin resistant staphylococcus aureus in Lahore, Pakistan. International Journal of Microbiology and Immunology. 2014;2(3):45-48
8. Pervaiz S, Barakzi Q, Farooqi BJ. Antimicrobial susceptibility pattern of clinical isolates of Methicillin resistant Staphylococcus aureus. JPMA. 2007; 57:2-4.
9. RibeiroI J, John M. BoyceII, Zancanaro PQ: Prevalence of methicillin-resistant Staphylococcus aureus (MRSA) among patients visiting the emergency room at a tertiary hospital in Brazil. Braz J Infect Dis 2005; 9:52-5.
10. Sader HS, Farrell DJ, Jones RN. Antimicrobial susceptibility of Gram-positive cocci isolated from skin and skin-structure infections in Euro Medical Centres. Int J Antimicrob Agents. 2010; 36:28–32
11. Tiwari HK and Das AK. Methicillin resistant staphylococcus aureus : prevalence and antibiogram in a tertiary care hospital in western Nepal. J Infect Dev ctries 2009; 3(9):681-4
12. Tiwari S, Sahu M, Rautaraya B et al. Prevalence of methicillin resistant Staphylococcus aureus and its antibiotic susceptibility pattern in a tertiary care hospital. J Indian Med Assoc 2011; 109 (11):800-1.
13. Joshi S and Ray P. Methicillin resistant Staphylococcus aureus (MRSA) in India: Prevalence & susceptibility pattern Indian J Med Res 2013; 137(2): 363–9.
14. Sorlozano A, Gutierrez J, Lieban J, Piedrola G: Activity of daptomycin against multiresistant clinical isolates of staphylococcus aureus and streptococcus agalactiae Micro Drug Resist 2009;15:125-7.