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Original Research Article

Antimicrobial Susceptibility Pattern of Staphylococcus Aureus Isolated From Various Clinical Samples in a Tertiary Care Hospital

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Abstract: S. aureus is by far the most important human pathogen among the staphylococci. S. aureus is one of the most common causes of healthcare and community associated infections. It has a remarkable capacity of acquiring different mechanism of resistance to various antibiotics. The main aim of this study is to establish the antimicrobial susceptibility pattern of S. aureus and to identify the degree of resistance to commonly used antibiotics so that empirical therapy can be modified accordingly. Total 150 isolates of S. aureus from various clinical specimens are included in the study. S. aureus isolates are identified by colony morphology and gram stain and confirmed by catalase and coagulase test. Antimicrobial susceptibility testing was done on Muller Hinton agar by Kirby-Bauer method using 17 different antibiotics. The study shows that S. aureus shows higher degree of resistance to penicillins and cephalosporins and more sensitive to aminoglycosides, fluoroquinolones,and macrolides. Co-trimoxazole and tetracycline are also a better options when there is resistance to other group of antibiotics. Vancomycin and teicoplanin shows 100% sensitivity.As drug resistance is so common among S. aureus, the appropriate antibiotic should be chosen based on antibiotic sensitivity testing.
Keywords: S. aureus, resistance, antimicrobial susceptibility pattern

INTRODUCTION

S. aureus may cause a variety of infectious processes ranging from relatively benign skin infections to life-threatening systemic illnesses [1]. S. aureus is one of the most common cause of hospital and community associated infections [2].Originally in 1941, penicillin was the drug of choice for the treatment of serious S. aureus infections. In 1944 one hospital acquired strain was identified as resistant to penicillin in due to production of enzyme β-lactamase. By 1950, over 80% of S. aureus isolates are resistant to penicillin because of the action of hydrolytic β-lactamase enzymes [3]. Semisynthetic, penicillinase resistant penicillins (oxacillin, methicillin, nafcillin) then became the drug of choice. In 1980s, resistance to penicillinase resistant penicillins emerged due to production of altered penicillin binding protein. To counter this threat, the pharmaceutical industry marketed six novel class of beta lactam antibiotics (penicillins, cephalosporins, cephamycin, carbapenems, monobatams and penicillinase inhibitors) along with glycopeptides, aminoglycosides, quinolones and various other agents. Vancomycin and teicoplanin are used to treat infections caused by methicillin resistant strains. Later on in 1990s the susceptibility to vancomycin has also been changed [4]. Their ability to develop resistance to penicillin and other antibiotics enhance their importance as a human pathogen especially in the hospital environment [5]. Resistant strains are being increasingly associated with hospital infections thereby rendering all β-lactams ineffective for the treatment. So, it is very important to identify the susceptibility pattern of these isolates to avoid indiscriminate use of antibiotics.

MATERIAL AND METHODS

Various clinical samples like blood, pus, urine, sputum, pleural fluid, throat swab, endotracheal secretions received in department were tested. Samples are inoculated on blood agar and nutrient agar, incubated at 37°C for 18-24 hrs. S. aureus produces golden yellow pigment on nutrient agar and gives β-hemolysis on blood agar. Colonies were identified by gram stain, catalase and coagulase tests. They are gram positive cocci that occur in clusters and are catalase and coagulase positive [5]. Antimicrobial susceptibility testing was done using 17 antibiotics on Muller Hinton agar by Kirby-Bauer disc diffusion method [6]. Results were interpreted according to CLSI guidelines [7].

RESULTS AND DISCUSSION

Total 150 isolates of S. aureus from various clinical samples were included in the study. Majority S. aureus isolates are from pus samples from surgical wards. Resistances of S. aureus to commonly used antibiotics are listed in below mentioned table-1.

Table: 1 resistance of S. aureus to various antibiotics

Sr. no.	Name of antibiotic(its concentration)	Resistance (%)
1	Penicillin(10 units)	73.8
2	Ampicillin(10µg)	66.8
3	Oxacillin(1µg)	56.0
4	Augmentin(20µg)	57.7
5	Cefadroxil(30µg)	57.0
6	Cefuroxime(30µg)	49.4
7	Cefaclor(30µg)	64.5
8	Cefotaxime(30µg)	55.2
9	Cefoperazone(75µg)	33.0
10	Gentamycin(10µg)	34.0
11	Ciprofloxacin(5µg)	54.0
12	Erythromycin(15µg)	57.6
13	Azithromycin(15µg)	45.5
14	Co-trimoxazole(30µg)	58.9
15	Tetracycline(30µg)	32.6

All isolates are 100% sensitive to vancomycin and teicoplanin.

Out of total 17 antibiotics tested, penicillin showed highest overall resistance (73%) followed by ampicillin (66.8%), Cefaclor (64.5), co-trimoxazole (58.9%), Augmentin (57.7%), erythromycin (57.6%), Cefadroxil (57.0%), oxacillin (56%), cefotaxime (55.2%), ciprofloxacin (54%), cefuroxime (49.4%), azithromycin (45.5%), gentamycin (34%), Cefoperazone (33%), tetracycline (32.6%), vancomycin (0%), and teicoplanin (0%). S. aureus shows more resistance to penicillins and cephalosporins while aminoglycosides, macrolides, fluoroquinolones and tetracycline are more sensitive. Glycopeptides are highly effective against S. aureus.

CONCLUSION

Antimicrobial therapy is vital to the management of patients suffering from staphylococcal infections. S. aureus is still the most common cause of nosocomial and community acquired infection and multi-drug resistance is common. Resistance to penicillins and cephalosporins is high as compared to aminoglycosides, macrolides and fluoroquinolones. Because of the unpredictable nature of any clinical isolates, broad spectrum antibiotics should be used for empirical treatment but definitive treatment must be according to susceptibility testing results. Combination therapy may be more beneficial. Vancomycin and teicoplanin are highly effective against S. aureus but its use should be restricted to only MRSA strains. Indiscriminate use of these antibiotics may result in emergence of resistance to them also. Continuous surveillance should be done using antimicrobial susceptibility testing as susceptibility profile changes very often.

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