



**THE INCEDENCE OF METHICILLIN RESISTANT
STAPHYLOCOCCUS AUREUS IN ALHUSSAIN TEACHING HOSPITAL
OF AL-SAMAWA CITY, IRAQ AND ITS ANTIBIOTICS
SUSEPTIBILITY**

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ABSTRACT

Staphylococcus aureus is one of the leading causes of nosocomial infections and is known for its ability to develop resistance to antibiotics. The drug susceptibility pattern of Methicillin Sensitive *S. aureus* (MSSA) and Methicillin Resistant *S. aureus* (MRSA) may vary. This study was carried out to determine and compare the drug susceptibility patterns in MSSA and MRSA in Al-hussain teaching hospital in Al samawa city, Iraq. We have selected 6 different antibiotic drugs; each belongs to different class of antibiotics based on their mechanism of action to assay the bacterial resistance. The aim of this study is to determine which of the most widely described

antibiotics drugs by the physicians are working against the bacteria and which of these antibiotics are not effective any more due to high rates of bacterial resistance due to indiscriminate use of antibiotics, lack of awareness among patients of low health educational background. As a result, antimicrobial resistance has emerged as one of the most serious health threats prompting widespread efforts to develop new antibacterial.

KEYWORDS: Methicillin-Resistant *Staphylococcus aureus*, methicillin-Sensitive *Staphylococcus aureus*, Antibiotics resistance, CHROMagar.

INTRODUCTION

Staphylococcus aureus bacteremia is a serious infection that leads to significant morbidity and mortality in adults and children.^[1,2] Up to 50% of healthy adults are naturally colonized with *S. aureus*.^[3,4] There are two major types of infection sources: community acquired and

hospital infections. This bacterium causes therapeutic problems due to infections with strains which are resistant to many antibiotics and particularly resistant to methicillin: methicillin-resistant *Staphylococcus aureus*.^[5] MRSA strains were discovered in 1961.^[6] Methicillin-resistant *Staphylococcus aureus* (MRSA) is the most commonly identified antimicrobial-resistant pathogen in hospitals in many parts of the world. In Europe, the proportion of methicillin resistance in strains of *Staphylococcus aureus* (*S. aureus*) isolates in infected patients varied in 2011 from less than 0.5% to more than 50%, with a pooled mean rate of around 17%.^[7] This bacterium is very adaptable and able to cross all host defense system barriers due to its wide spectrum of virulence factors.^[8] Colonization with *Staphylococcus aureus* has a well-recognized association with development of infection, including surgical site and blood stream infections.^[9,10] It is known that individuals can be colonized with *S. aureus* in sites other than the nose, including the throat, axilla, groin and rectum and it is thought that these non-nasal sites might be important in the pathogenesis of infection.^[11] The anterior nares are the main reservoir of MRSA, although other body sites are frequently colonized, such as the hands, skin, axillae, and intestinal tract. Colonized individuals are generally asymptomatic and three types of MRSA carrier status can be distinguished: non-carriers, persistent carriers, who are chronically colonized with the same strain, and intermittent carriers, who are colonized with varying strains for short time.^[12,13] This pathogen also poses a risk of device-related infections, e.g., related to the use of intravascular catheters, propylene nets ventriculoperitoneal shunts, pacemakers, and orthopedic implants.^[14,15,16,17,18,19,20] The most important mode of MRSA transmission is through contamination of the hands.^[21] An alternative mechanism of transmission is airborne dispersal of staphylococci in association with an upper respiratory tract infection.^[22] *S. aureus* can be both a commensal and a dangerous pathogen causing severe infections—skin abscesses, endocarditis, pneumonia, osteomyelitis—even leading to toxic shock syndrome. *S. aureus* infection is a major cause of skin, soft tissue, respiratory, bone, joint, and endovascular disorders. *Staphylococcus aureus* is gradually acquiring resistance to previously effective antimicrobial agents. Therefore, since the 1960s, infections caused by this bacterium have become particularly difficult to treat.^[23] Methicillin resistant *Staphylococcus aureus* (MRSA) has emerged as one of the commonest causes of hospital acquired infections worldwide. The infection caused by MRSA increases the length of hospital stay and it is also responsible for raising health care expenses and morbidity. Resistance to all antibiotics which are available for use against *Staphylococcus aureus* has been reported. In a study done by K. Rajadurai pandi, 63.2% MRSA were found to be resistant to gentamycin, cotrimoxazole,

cephalexin, erythromycin and cephalexin.^[24] Ciprofloxacin usage has already been known to be associated with selection of MRSA.^[25]

MATERIAL AND METHOD

This study was conducted between December 2013 and June 2014 in Microbiology laboratory, Al Muthanna medical college, Al Muthanna, Iraq. By using 118 clinical specimens collected from patient, emergency room and operation rooms of Al Hussain teaching hospital.

The clinical samples were processed by using CHROMagar MRSA, a culture media that is recommended to professional studies for in vitro diagnostics of human and samples of other origin, it's used for detection and identification of Methicillin Resistant *Staphylococcus aureus*.

The specimens were inoculated on CHROMagar and incubated at 37° C for 24-48 hours. MRSA were identified by violet color colonies.

Antibiotic susceptibility testing was done by using Cloxacillin (1 mcg), Erythromycin (15 mcg), tetracycline (30 mcg), Clindamycin (10 mcg), Gentamycin (10 mcg), Amoxicillin/Clavulanic acid (20/10 mcg).

RESULTS AND DISCUSSION

A total of 118 samples were incubated from different hospitalized patient, emergency room and different operation rooms. Methicillin resistance was observed in 35(29.7%) of the isolated samples of *S.aureus* isolates. Table 1 shows the distribution of the 118 MRSA and MSSA clinical specimen where saliva samples accounts 29.66% of the total samples, while samples from patient suffering from 2nd and 3rd degree burns accounts only 2.54% from the total samples due to the difficulties in obtaining these sample from the burns section in the hospital but shows 100% MRSA.

Table 2 shows the age variation of patients from which the samples were taken from, females represent 54.4% of total patients number and males represent 45.6%. The major age group patients were in their twenties. The antibiotics resistance test results are indicated in table 3, which summarize the percent of resistant of *S.aureus* for each of the antibiotic used in this study, the bacterium produce 100% resistance to 1µg Cloxacillin, and 80% to Gentamycin.

Table (1): number of isolates of MRSA and MSSA from clinical specimen

Clinical specimen	Number, (%) of MRSA isolates. (n=118)	Number, (%) of MSSA isolates. (n=118)
Saliva "throat".	4 (3.39%)	31 (26.27%)
Ears "otitis media"	10 (8.47%)	9 (7.62%)
Burns	3 (2.54%)	0
Emergency room "walls, floors& windows"	5 (4.23%)	3 (2.54%)
Emergency room "beds, devices &tools"	13 (11.01%)	10 (8.47%)
Operation rooms "walls, floors& windows"	0	5 (4.23%)
Operation rooms "beds &tools"	0	25 (21.18%)

Table (2): number of participant according to age group.

Age group	Number of participants (n=57)	% of participants (n=57)
0-10 years	5	(8.77%)
11-20 years	5	(8.77%)
21-30 years	15	(26.31%)
31-40 years	7	(12.28%)
41-50 years	10	(17.54%)
51-60 years	5	(8.77%)
61-70 years	5	(8.77%)
71-80 years	5	(8.77%)

Table (3): Comparison of antibiotic resistance of MRSA and MSSA.

Antibiotic	MRSA number (%) (n=35)	MSSA number (%) (n=35)
Clindamycin	30(85.7%)	5(14.28%)
Cloxacillin	35(100%)	0(0.0%)
Erythromycin	34(97.1%)	1(2.85%)
Gentamycin	28(80%)	7(20%)
Tetracycline	32(91.4%)	3(8.57%)
Amoxicillin/Glavulanic acid	34(97.1%)	1(2.85%)

Skin and skin-structure infections are often caused by Staphylococci or streptococci, *Staphylococcus aureus* skin infections were classified as primary or secondary.^[26] Primary infections were those occurring on apparently normal skin, and mainly comprised impetigo, ecthyma, folliculitis, furuncles, sycosis barbae, cellulitis, abscesses, paronychia and whitlows. Secondary infections were those arising in damaged skin (traumatized skin, or a pre-existing skin disease).^[27] as it presented in the samples that we isolates from the skin of burns patient, which shows that the damaged skin contains MRSA bacterium. Skin and soft tissue infections (SSTIs) are ubiquitous and the most common of infections. The vast majority of SSTIs are caused by Staphylococci.^[28] β -lactamase production by staphylococci is the recognized

mechanism of resistance to β -lactam antibiotics, such as penicillin G, methicillin and ampicillin. In human medicine, it has been estimated that most of nosocomial infections are biofilm associated,^[29] moreover, biofilm formation has been shown to be positively correlated with resistance to antimicrobial agents.^[30] Some reports indicate a rate of 40% - 96% of MRSA from several recent studies in Iran.^[31] It is documented that with the frequent antimicrobial treatment prescribed for dermatitis patients, methicillin-sensitive *S. aureus* colonies present on skin lesions, are often replaced by MRSA,^[32] in our study the 100% resistance in burns skin lesions samples indicates the prevalence of Methicillin resistant staphylococcus aureus in serious dangerous patterns in case of skin infections. The mechanical ventilator provides the most common organ support in an intensive care unit, emergency rooms and operation rooms, the prevalence of patients requiring a mechanical ventilator in certain survey was found to be 56%.^[33] We isolated samples from mechanical ventilators that found in emergency rooms and operation rooms about 7.6% of the total samples we investigated in this study. In most Western hospital surgical intensive care units, gram positive organisms, especially methicillin-resistant *Staphylococcus aureus* (MRSA), are the prominent pathogens.^[34,35,36] Recent study carried out in Hilla, Iraq showed that some of medicinal plant extracts of basil leaf, henna and olive oil have antimicrobial activity against staphylococcus aureus which might be promising in finding a proper treatment for this widespread bacterial infections.^[37] Focusing on the resistance of which *S.aureus* produce against clindamycin, cloxacillin, erythromycin, gentamycin, tetracycline and amoxicillin/ Glavulanic acid because these antibiotics are the most frequently prescribed by phiscians for the treatment of infections of alsamawah population. So this study was to spot the light on the resistance of S.aureus against these antibiotics and to point the need for developing a new antibiotic to overcome this major problem.

CONCLUSION

The wide spread of bacterial resistance is becoming a significant problem. Providing a convenient effective treatment is also a raising challenge. All MRSA isolates in our hospital had different susceptibilities to the different most dispensed antibiotics, so proper selection of the antibiotics based on antibiotic susceptibility test result is needed for effective treatment and prevention of emergence of resistance in MRSA and MSSA.

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Authors' Contribution

Noor Th. Al-saadi designed the study, arranged sample collections and wrote the manuscript. Taisir Abdulelah carried out the examinations and laboratory experimentation of samples.

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