

Nosocomial infection caused by Methicillin- Resistant *Staphylococcus aureus* from different positions of Al-Fehaa Hospital-Basrah

Kuthar H.Mehdi, Mehammed A.I.Almazini, Muna A.I.Almazini.
Department of Biology- College of Science- University of Basrah- Iraq.

Abstract

Ninety bacteria isolates were obtained from different areas in Al-Fehaa Hospital, this represents the operative theaters, wards and hallways of the hospital, the present studies showed that the prevalence of 27 Methicillin-resistant *Staphylococcus aureus* (MRSA) in nosocomial infections and their antibiotic resistant pattern to (Clavulanic acid, Amoxicillin, Clarithromycin, Vancomycin, Cefotaxin, Gentamycin) in concentrations (15, 20, 10, 30, 10, 30, 30) $\mu\text{g/ml}$ at respectively.

The isolates of MRSA were identified by biochemical tests and all isolates of MRSA were resistant to Vancomycin (30 $\mu\text{g/ml}$), Amoxicillin (30 $\mu\text{g/ml}$), Gentamycin (10 $\mu\text{g/ml}$) and Clarithromycin (10 $\mu\text{g/ml}$).

Introduction:

Staphylococcus aureus is one of the most important human pathogens in term of nosocomial and community- acquired infections. Methicillin- resistant *S. aureus* (MRSA) has spread world wide. The mortality for patients with MRSA infections is twice as high as for patients with methicillin susceptible *S. aureus* (MSSA) infections. (Hare and Malaya, 2010).

Staphylococcus aureus is a Gram-positive, non-motile, catalase positive, coagulase positive, facultative anaerobe, involved in causing a number of diseases including, boils, pustules, impetigo, osteomyelitis, mastitis, septicemia, meningitis, pneumonia and toxic shock syndrome (Chigbu, 2009, Uwaezuoke, 2010). Nosocomial infections of which *S. aureus* is a typical example, are known to account for morbidity and mortality of millions of patients annually world wide (Mansouri and Khaleghi, 2010).

S. aureus is considered the most resistant of all non-spore forming pathogens, with well developed capacities to withstand high salt (7.5-10 %), extremes in pH and high temperatures (up to 60 minutes). It also remains viable after months of air-drying and resists the effects of many disinfectants and antibiotics (Amadi *et al.*, 2010).

The genus *Staphylococcus* includes pathogenic organisms in which *Staphylococcus aureus* is most important. It has overcome most of the therapeutic

agents that have been developed in the recent years and hence the antimicrobial chemotherapy for this species has always been empirical. The most notable example of this phenomenon was the emergence of Methicillin Resistant *Staphylococcus aureus* (MRSA)(Wyllie and Katsutoshi,2008). Many of these MRSA are becoming resistant and are susceptible only to glycopeptides antibiotics such as Vancomycin and low level resistance even to Vancomycin is emerging at present. The global spread of MRSA constitutes one of the most serious contemporary challenges to the treatment of hospital-acquired infection (Mehta *et al.*,2008;Assadullah *et al.*,2010)

Methicillin play role to inhibition the final stage in create of peptidoglycan through it binding with proteins called Penicillin Binding Proteins (PBPS), but MRSA has gene of *mec-A* that inhibition activity of methicillin by produce protein (PBP2).(Kanerva *et al.*, 2007)

The aim of the present study was to isolate MRSA from different location in the Al-Fehaa Hospital in the Basrah city and detect multidrug to other types of antibiotics.

Material and Methods

1- Selection of hospital:

The hospital selected for this study was Al-Fehaa Hospital. The samples were taken from operative theaters, wards, hallways, indoor environment

2- Period of Study:

The period of sample collection were between the September and December, 2010.

3- Specimen Collection:

The samples collection from the inanimate surface were isolated by swabbing using sterile cotton swabs previously moistened in 1ml of Brain heart infusion broth and transported to the microbiological laboratory and incubated within 2-3 hours at 37°C (Benson,2002)

4- Isolation of Organisms:

A loopful of each swab was inoculated on Mannitol salt agar and MacConkey and all plates were incubated aerobically over night at 37°C (Benson, 2002).

5- Identification:

All isolated bacteria were examined by Gram stain and Microscopic Characteristics . The colour and size of the colonies were recorder for identification purpose (Cheesbrough, 2002).

All isolates were identified by conventional methods (Gram staining, catalase test, coagulase test and sugar utilization test which represented with glucose, lactose, sucrose), after that were confirmed as *S.aureus* by their ability to coagulase test

6- Antibiotic sensitivity testing:

All isolates were tested by Barry method (Barry *et al.*, 1970) for susceptibility to the following antibiotic disc table (1) and the plates were aerobically incubated at 37c° for 24h. The diameters of inhibition zone was recorded and it was less than 3 mm was considered as resistant (Cheesbruogh, 2002). The quality control strains of *S. aureus* ATCC and *E. coli* ATCC were used to examine the antibiotic disc potency.

Table 1:Antibiotics used in antibiotic susceptibility test.

Antibiotic	Symbol	µg/ml	Name of company
Novabiocin	NV	30	Bioanalyse- Turkey
Cefotaxime	CTX	30	Bioanalyse- Turkey
Gentamycin	GN	10	Bioanalyse- Turkey
Vancomycin	VA	30	Bioanalyse-Turkey
Amoxicillin	AMC	20	Bioanalyse-Turkey
Clarithromycin	CLR	15	Bioanalyse-Turkey
Penicillin	PE	10	Bioanalyse-Turkey
Methicillin	ME	5	Bioanalyse-Turkey

Result and Discussions:

Ninety isolates of *S. aureus* were isolated, the distribution of this isolates and it resistances to methicillin are shown in table (2).

Table (2): Distribution MRSA and sensitive isolates

location	No. of <i>S.aureus</i>	MRSA		<i>S.aureus</i> sensitive to methicillin	
		No. of isolates	%	No. of isolates	%
Operative Theaters	39	7	17.9	32	82
wards	24	13	54.1	11	45.8
hallways	27	7	25.9	20	74

We notice from table(2), the numbers of MRSA in the wards more than MRSA in the operative theaters and hallways, the occurrence of MRSA in the operative theaters less than other position may be due to continuous used of disinfectants and occurrence of little staff (Abraham *et al.*,2009 ;Boyle, 2010).

Coagulase Test:

Results of coagulase test reveals that 27 isolates were Coagulase Positive Staphylococci (COPS) and all (COPS) isolates were MRSA (100%)

Resistance of MRSA to common antibiotics:

The isolates were identified as MRSA were screened for their sensitivity to many antibiotics table (3).

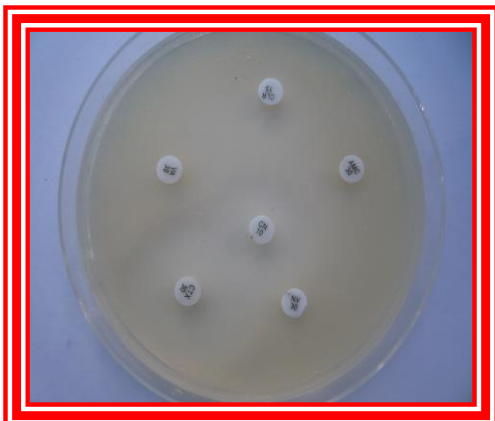
Table (3): Resistance of MRSA to common antibiotics

NO. of isolate	Antibiotic ($\mu\text{g/ml}$)									
	NV 30	CTX 30	GN 10	VA 30	AMC 20	CLR 15	PE 10	ME 5		
1	S	S	R	R	R	S	R	R		
2	S	S	R	R	R	R	R	R		
3	R	R	R	R	R	R	R	R		
4	S	R	R	R	R	R	R	R		
5	S	S	R	R	R	R	R	R		
6	S	S	S	R	R	R	S	R		
7	R	R	R	R	R	R	S	R		
8	R	S	R	R	R	R	R	R		
9	R	R	S	R	R	R	R	R		
10	R	R	S	R	R	R	R	R		
11	S	R	S	R	R	S	R	R		
12	R	R	S	R	R	S	R	R		
13	S	R	S	R	R	R	R	R		
14	S	R	R	R	R	R	R	R		
15	S	R	R	R	R	R	S	R		
16	S	R	R	R	R	R	S	R		
17	R	S	R	R	R	R	S	R		
18	R	R	R	R	R	R	R	R		
19	R	R	R	R	R	S	S	R		
20	R	R	R	R	S	R	S	R		
21	S	S	R	R	R	S	S	R		
22	S	S	R	R	R	S	R	R		
23	R	S	R	S	R	S	R	R		
24	R	R	R	S	S	R	R	R		
25	R	R	R	S	S	R	R	R		
26	R	R	R	S	S	R	S	R		
27	S	R	R	R	S	R	S	R		

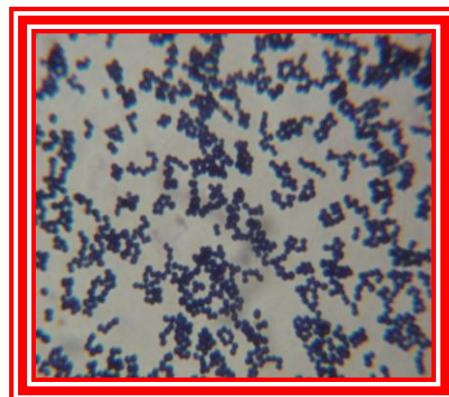
S:Sensitive

R:Resistance

The result in table (3) showed that the MRSA have multiple resistance of antibiotics for Vancomycin, Gentamycin, Clarithromycin and Amoxicillin. The reason of these resistance may be due to use of many types of antibiotics and the patients may be infected with another types of the diseases (Santos *et al.*,2009) . The treatment of MRSA is very difficult which cause using multidrug resulting in multidrug resistant strains (Hare and Malaya ,2010).



صورة (1)
توضح MRSA



صورة (2) توضح مقاومة MRSA

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عزل المكورات العنقودية المقاومة للميثيسيلين (MRSA) من اماكن مختلفة لمستشفى الفيحاء - البصرة

كوثر هواز مهدي، محمد عبد الامام المازني ومنى عبد الامام المازني
قسم علوم الحياة - كلية العلوم - جامعة البصرة - العراق

تناولت الدراسة اخذ 90 عينة على شكل مسحة من عدة اماكن في مستشفى الفيحاء تمثلت في صالة العمليات وردهاات المرضى وممرات المستشفى. تركزت الدراسة على المكورات العنقودية *Staphylococcus* المقاومة للمضاد الحيوي methicillin ولمجموعة من المضادات الحيوية هي (Clarithromycin, Amoxicillin, Calvulanic Acid, Novabiocin, Gentamycin, Vancomycin) وبتركيز (30, 30, 10, 30, 10, 20, 15 مايكروغرام/مل على التوالي، تم الحصول على 27 عزلات مقاومة للميثيسيلين من الوسط الانتقالي بالخالص بالمكورات العنقودية (MRSA) *Methicillin Resistant Staphylococcus aureus* . وياجراء بعض الاختبارات التاكيدية عليها صنفت الى مكورات عنقودية ذهبية مقاومة للميثيسيلين (MRSA) *Methicillin Resistant Staphylococcus aureus* (MRSA) ذات مقاومة للفانكوميسين Vancomycin بتركيز (30 µg /ml) وكذلك قاومت ثلاث مضادات هي Amoxicillin بتركيز 30µg/ml و Gentamycin بتركيز 10µg/ml و Clarithromycin بتركيز 10µg/ml .