

Evaluation of Methicillin and Vancomycin Resistant *Staphylococcus Aureus* among The Patients with Chest Infections

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Abstract

The aim of this study was to evaluate methicillin and vancomycin resistant *Staphylococcus aureus* among the patients with chest infections, in Al-Shaab hospital during the period from May to June 2011. In this study 147 sputum samples were collected from patients, from all ages, suffering from chest infection, who were previously investigated by physician. All the samples were subjected to bacteriological examination in order to isolate *Staphylococcus aureus*. Then the samples were subjected to antimicrobial sensitivity tests by disc diffusion method, using Methicillin and Vancomycin discs. Various strains of *Staphylococcus aureus* were isolated as causative agents, 25(17%). On subjecting to antimicrobial sensitivity these strains gave different results about 3(12%) were found resistant to Methicillin and all the strains were susceptible to vancomycin. The study showed that the prevalence of the MRSA was greater in ages between 15 to 30 years and more in males than in females.

Keywords: *S. aureus* – Pneumonia – MRSA - VRSA

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Introduction

Staphylococcus aureus normally causes pneumonia only after preceding influenzae viral infection, [1] and in association with right-sided staphylococcal endocarditis, which is a serious complication of intravenous drug abuse. [2] Complication of staphylococcal pneumonia includes staphylococcal pericarditis, meningitis, osteomyelitis and multiple metastatic abscesses in soft tissues. [3] Furthermore, these serious infections have emerged more frequently among non-hospitalized patients and are associated with strains that produce the Panton-valentine leukocidin toxin. Also worrisome is that these serious infections are frequently mediated by methicillin-resistant *S. aureus*. [4]

S. aureus is normal flora, spreads of patient's endogenous strain to

normally sterile site by traumatic introduction, and may be transmitted by fomites, air, or unwashed hands of health care workers, especially in the nosocomial setting. may be transmitted from infected skin lesion of health care worker to patient. [4] MRSA, representing 12.7% of all patients colonized with *S. aureus*. [5] Many of MRSA strain are not type-able with standard and additional or experimental phages. [6] The control and prevention of MRSA involves early and reliable detection in the laboratory through surveillance, patients isolation when admitted to hospital. [6] Health care workers should strictly adhere to infection control policies by wearing gloves and wash hands before and after patients contact. [7] and the sensible use of antibiotics such measures have been very successful. [6]

Serious MRSA infections such as those involving the blood stream, respiratory tract and bones or joints more difficult to treat than infections caused by methicillin-susceptible isolates. Methicillin resistance is mediated through the *mecA* gene, which encodes a unique penicillin-binding protein. Community-acquired strains have been describe that can cause soft tissue infections, these strains often produce the panton-valentine leukocidin. They can be distinguished from endemic hospital strains, from which it is believed that have arisen. [6]

S. aureus are variably sensitive to many antimicrobial drugs, Resistant to penicillin depends on production of the enzyme penicillinase, a β -lactamase that open β -lactam ring. [6] Penicillin-resistant strain of *S. aureus* are treated with flucloxacillin, methicillin and the cephalosporins independent of β -

lactamase production. MRSA arise due to the *mec A* gene, which encodes nafcillin resistance resides on the chromosome, and the gene encodes a low-affinity penicillin binding protein (PBP2 or PBP2a). [7] MRSA strains resistant to all β -lactam agent, and often other agents such as aminoglycoside, and fluoroquinolones. glycopeptides (vancomycin or teichoplanin) are the agents of choice in the treatment of systemic infection with MRSA. [6] In the United States, *S. aureus* is considered to be susceptible to vancomycin if the minimum inhibitory concentration (MIC) is equal or less than 2mg/ml, of intermediate susceptibility if the MIC between 4-8mg/ml, and resistant if the MIC is equal or more than 16mg/ml. Strains of *S. aureus* with intermediate susceptibility to vancomycin have been isolated in Japan, the united

states, and several other countries, these are often known as vancomycin intermediate *S. aureus*, or VISA. They have generally been isolated from patients with complex infection who have received prolonged vancomycin therapy. Often there has been vancomycin failure. The mechanism of resistance is associated with increased cell wall synthesis and alterations in cell wall and is not due to van A gene found in enterococci. *S. aureus* strains of intermediate are susceptible to vancomycin usually are nafcillin resistant but generally are susceptible to oxazolidinones and to quinopristin/dalfopristin. Since 2002, several isolates of vancomycin-resistant *S. aureus* (VRSA) strains were isolated from patients in the United States. The isolates contained vancomycin resistant gene van A from enterococci and nafcillin resistant gene mec A. Both of the

initial VRSA strains were susceptible to other antibiotics. Vancomycin resistance in *S. aureus* is a major concern worldwide. [7]

Because of the misuse and abuse of antibiotics, the treatment options for MRSA in near future are going to shrink further. This study was carried out to evaluate antibiotics resistant *Staphylococcus aureus* among the patients with chest infections as one of causative agents.

Materials and Methods

Sample collection:

A total of 147 sputum samples were collected from patients with chest infections (different ages and both genders) during the period from May to June 2011 at Al-Shaab teaching hospital.

Methods

All collected samples were tested first for direct Gram stain then by using routine culture media for isolation *S. aureus* (Mannitol salt

agar, Nutrient agar, blood agar), indirect Gram stain and biochemical tests (Catalase test, DNA-ase medium) then susceptibility to 5microgram Methicillin and 30 microgram vancomycin discs were tested by Kirby-buar method using (Muller-Hinton agar). American Type Culture Collection) ATCC 25933 strain was used as control for the diagnostic process of potency of antimicrobial discs.

Results

Twenty five (17%) *S. aureus* were isolated including 14(56%) from males and 11(44%) from females. Three (12%) methicillin resistant *S .aureus* were detected (1:2 female: male) using phenotypic detection by oxacillin 5 micg, there is no resistance to vancomycin 30micg. (vide Table1)

Table 1: The effect of age in MRSA-chest infection (age in years).

Age-group	No of <i>S. aureus</i> infection	No. of MRSA infection	No of males	No of females
14-19	6	1 (17%)	5	1
20-29	7	1 (14%)	3	4
30-39	4	1 (25%)	4	0
40-49	4	0	0	4
=/>50	4	0	2	2
Total	25	3 (17%)	14	11

Discussion

Most *Staphylococcus aureus* bacteria can be treated with vancomycin and methicillin antibiotics, some bacteria have developed a resistance and can no longer be treated. MRSA and VRSA are types of antibiotic resistant *Staphylococcus aureus*. In the present study the percentage rate of MRSA was 12% and no VRSA (0%). However this percentage was less than 67.2% which was reported by Al-Zahra Hospital, Iran, from patients who contracted nosocomial infection [8]. The results of our study were less than the value reported by Khan *et al* in medical college, during the period from August 2005 to July 2007, who found that (143) 33.25% isolation rates for MRSA[9]. The results correlated with those of , Jernigan, J. Pullen *et al* Manian, F. Senkel, Mylotte, J. M [5,10,11], but not Khorvash *et al* and Khan *et al* [8,9]. Pullen *et al* observed that acute rehabilitation units were considered high-risk populations of MRSA colonization infection because the majority of those patients were transferred from an

acute care hospital or nursing home. However other factor might be possible; that community-acquired MRSA was dependent on a geographic factor or specific high-risk population, such as, children in day care, inmates, sport teams, and other similar minorities.

Conclusions:

All *Staphylococcus aureus* which were isolated from chest infection showed resistance to Methicillin while they showed sensitivity to vancomycin. In conclusion, the results obtained suggest that there is an emergence of a new *Staphylococcus aureus* resistant strain.

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