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Antibiotic Resistance Pattern in Nasal Carriage of Methicillin-Resistant *S. aureus* (MRSA) Aand Methicillin-Sensitive *S. aureus* (MSSA) in Isolated Samples from People who Non-exposed to Hospital Environment

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Abstract

Methicillin-resistant Staphylococcus aureus (MRSA) is one of the major pathogens associated with community-acquired serious nosocomial infection because these strains generally show multiple drug resistance. The aim of this study was to describe epidemiology of nasal colonization of S. aureus and compare antibiotic resistance patterns in nasal colonization with methicillin-sensitive S. aureus (MSSA) and MRSA. The results showed 80.7% of those people were carried Staphylococcus Coagulase positive (CPS) and 19.3% of them were carried Staphylococcus Coagulase negative (CoNS). Moreover, among of those people 15.38% were resistance to oxacillin while 84.62% were sensitive to oxacillin. Too conclude, high prevalence of MRSA carriage was identified in people who non-exposed to hospital environment, so we need more efforts for early prevention and control infection among community for reducing occurrence of this infection.

Keywords:* *Methicillin-resistant Staphylococcus aureus; Staphylococcus Coagulase negative (CoNS); Oxacillin

Introduction

Methicillin-resistant *S. aureus* (MRSA) is a multidrug-resistant bacterium strain of *S. aureus* which is able to cause infections in humans. Infection with this bacterium is hardy to treat it due to its ability to resist penicillin [1]. This resistance is occurred due to produce β-lactamase which is an enzyme that able to resist all semi-synthetic penicillins compounds like methicillin, oxacillin and nafcillin. This bacterium has also alternative way to resist these semi-synthetic penicillins compounds through expressing unusual penicillin binding protein in the cell wall of this bacterium [1]. MRSA is firstly described in 1944,

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penicillinase-producing strains of *S. aureus* became universally present in hospitals in the 1950s and dominant in the community in the early 1970s ("National Nosocomial Infections Surveillance (NNIS) System Report, data summary from January 1992 through June 2003, issued August 2003," 2003) [2]. Methicillin was introduced in 1959 as the first β-lactamase-resistant penicillin, but outbreaks of MRSA infections now become everywhere in worldwide [2,3]. The outbreaks of MRSA were reported in the Saudi Arabia and this report shows the prevalence of MRSA becomes highly rate in hospitals in Saudi Arabia [4].

MRSA is a major cause of hospital infections worldwide and has high rates of morbidity and mortality. MRSA found in outside hospital environment and it causes infections in community populations [5]. The standard treatment for infections caused by MRSA is Vancomycin [6]. Since nasal carriage of MRSA plays a vital role in the epidemiology and pathogenesis of *S. aureus* diseases among people who non-exposed to hospital environment [7,8]. Worldwide, an estimated 2 billion people carry some form of *S. aureus*; of these, up to 53 million (2.7% of carriers) are MRSA carriers. In the United States, 95 million carry *S. aureus* in their noses; of these, 2.5 million (2.6% of carriers) carry MRSA [9]. This study was conducted to investigate nasal carriage of MRSA among people who non-exposed to hospital environment inAl Qassim city, Saudi Arabia. This study describes epidemiology of nasal colonization of *S. aureus* and compares antibiotic resistance patterns in nasal colonization with methicillin-sensitive *S. aureus* (MSSA) and MRSA.

Materials and Methods

Subjects

People who not exposed to hospital environment which includes students and workers who are not work in health care settings.

Nasal Swabs

A Swab from the anterior nares were carefully inserted into each nostril so that the tip is entirely at the nasal ostium level (about 2.5 Cm. from the edge of the nare) and gently rolled 5 times.

Culture and Identification

Swabs were immediately cultured on tryptone soya broth for enrichment. After incubated the agars at 34ºC for 24 hrs, inoculated in blood agar, macConkey agar, nutrient agar and mental salt agar. Pick the staph colonies and examined by Gram stain and tested for catalase and production of coagulase. Subcultures were made from the broth to Mueller-Hinton agar to check antibiotics sensitivity.

Sensitivity to other antibiotics

Nutrient agar plate was inoculated with a swab dipped in a suspension of each strain equivalent to Mac Farland 0.5. Sensitivity discs of oxacillin (5 µg), erythromycin (15 µg), gentamicin (10 µg) and vancomycin (30 µg), ciprofloxacin (5 µg), Cefotoxime (30 µg) and ampicillin (10 µg), sulfamethoxazole (25 µg) and cloxicillin (5 µg) were used. The disc contents and zones of inhibition were as recommended by the Clinical Laboratory Standards Institute (CLSI).

Results

Fifty two people from Al-Qassim province were screened through this study and result showed the number of bacteria was isolated from these people. 80.7% of those people were carried Staphylococcus Coagulase positive (CPS) and 19.3% of them were carried Staphylococcus Coagulase negative (CoNS) (TABLE 1).

TABLE 1. **Total number of isolated samples in this study.**

Bacterial isolates		
	Number	**Percent**
Staphylococcus Coagulase positive (CPS)	42	80.70%
Staphylococcus Coagulase negative (CoNS)	10	19.30%
Total	52	

Moreover, rate of MRSA among people in this study was 15.38% while 84.62% of people were sensitive to oxacillin (MSSA) (TABLE 2).

TABLE 2. **5.38% of isolated samples are resistance to oxacillin while 84.62% were sensitive to oxacillin.**

Total number of samples	**Organism**	
	MRSA (%)	**MSSA(%)**
(N= 52)	15.38%	84.62%

Antibiotic resistance pattern of MRSA and MSSA was carried out for investigate rate of resistance pattern among people who participated in this study. All samples were sensitive to vancomycin (TABLE 3).

TABLE 3. **Antibiotic resistance pattern of MRSA and MSSA.**

Antibiotics	**Percent of isolates resistance to antibiotics**			
	MRSA	***MRSA***	***MSSA***	***MSSA***
	(n=08)	**(%)**	**(n=32)**	**(%)**
Penicillin	7	87.50%	19	59%
Oxacillin	8	100%	0	0%
Erythromycin	5	62.50%	18	56%
Cephalothin	6	75%	15	46.80%
Ciprofloxacin	4	50%	14	43.70%
Tetracycline	4	50%	16	50%
Gentamycin	3	37.50%	9	28%
Co-Trimoxazole	6	75%	19	59%
Vancomycin	0	0%	0	0%

The percentage of Multi-drug resistance was high among MRSA and MSSA (TABLE 4).

TABLE 4. **Multi-drug resistance in MRSA and MSSA.**

Bacterial isolates	**No. of isolates and percentage of Multi-drug resistance**		
	Total no.	**(MDR)**	**Percentage**
Methicillin resistance staphylococcus aureus (MRSA)	8	6	75%
Methicillin sensitive staphylococcus aureusstaphylococcus (MSSA)	34	15	44%
Total	42	21	50%

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