

Evaluation of Patients with Asymptomatic Nares Colonization with Methicillin-Resistant Staphylococcus Aureus at Hospital Admission

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Abstract: Asymptomatic colonisation with methicillin-resistant Staphylococcus aureus (MRSA) is a risk factor for MRSA that is a significant nosocomial pathogen of nosocomial infection. We evaluated the effect of asymptomatic nares MRSA colonization on the improvement of MRSA infection.

Methods: Volunteer persons who admitted to the otorhinolaryngology department of Ahi Evran university hospital were included in this study. Nares samples were obtained for culture at admission.

Results: Of the 658 patients who had cultures of nares samples performed at admission, 13.2% were colonized with S. Aureus. Methicillin resistance was detected in 11.4% of patients with S. Aureus colonization at admission.

Conclusion: MRSA colonization of nares improves the risk for MRSA infection. Detecting MRSA colonization before hospitalisation of patients could help to reduce the risk for subsequent MRSA infection.

1. INTRODUCTION

Staphylococcus aureus and its resistant form of methicillin-resistant S. aureus (MRSA) are the most prevalent nosocomial pathogens that increase morbidity and mortality in long hospitalisation and cause increasing in hospital stay and costs (1,2). Staphylococci may be present as normal flora members in skin and mucous membranes, but may cause serious infections (3,4,5). About 20% of the population are continuously nasal S. aureus carriers, while about 20% never colonize and the remaining 60% become carriers intermittently. Factors such as chronic diseases and hospitalization increase the nasal S. aureus carriage rate. S. aureus is endemic in many hospitals in our country and in lots of other countries (6). Nosocomial infections due to S. aureus are becoming an increasingly important problem due to the increased resistance of methicillin and glycopeptide to this strain. Important feature of S. aureus is property of biofilm formation besides many disease-causing mechanisms. Biofilm formation begins with the attachment of

bacteria to the surface via the extracellular matrix slime layer and is an important feature in terms of infection development. The ability of multiplying of bacteria within the biofilm structure leads to resistance to both antimicrobials and host defense. They lead to serious health problems, especially in catheterized patients. Methicillin resistance can alter the biofilm phenotype and cause serious clinical problems (7,8,9). Carriers should be treated to control the MRSA epidemic and prevent recurrent infections, especially in health care facilities. For this purpose, administration of nasal mupirocin (psodomononic acid) three times a day for five days provides eradication (10,11). However, due to inappropriate use of mupirocin, mupirocin resistance has started to develop in S. aureus strains in recent years (12).

2. MATERIAL AND METHODS

A total of 658 nasal swab samples from volunteer patients who were admitted to the department of otolaryngology of Ahi Evran University Training and Research Hospital between June 2015 and December 2015 were

included in this study. Informed consent were obtained from all subjects before admission to the study. This study was approved by the Ethics Committee of Clinical Investigations of Turgut Özal University in accordance with Helsinki Declaration and numbered 99950669 / 32-9.01.2015.

Nasal swab specimens were delivered to the laboratory within the appropriate conditions. Swab specimens were cultured on medium with mannitol, the selective medium for *S. Aureus* isolates. *S. aureus* was identified by coagulase test in yellow colonies. Methicillin resistance was tested according to the European Committee on Antimicrobial Susceptibility Testing (EUCAST) recommendations using cefoxitin (30 µg) disc. *MecA* gene presence was confirmed by polymerase chain reaction (PCR) method in isolates that were positive for methicillin resistance (13).

3. STATISTICAL ANALYSIS

Age groups were compared with the Mann-Whitney U test because of the age variable did not show a normal distribution. Mean errors and standard errors for continuous variables were calculated and frequencies (in percent) for categorical variables were calculated. Univariate analyzes were performed using Chi-square test, Fisher exact probability test, or student t test. Multivariate analysis was performed using logistic regression to assess the relationship between affecting factors and *S. aureus* and MRSA nasal carriage. Statistical significance level was accepted as $p < 0,05$. Data analysis was done with SPSS 17.0 statistical package program (SPSS, Version 17, Chicago IL, USA). The presence of *S. aureus* and datas of methicillin resistance has been expressed in descriptive statistics.

4. RESULTS

S. aureus were detected in 87 of the 658 nasal swab samples (13.2%). Methicillin resistance was detected in 10 isolates (11.4%) of 87 breeding isolates.

Characteristic	MRSA (n=10)	MSSA (n=77)	OR and 95% CIs	P value
Age	40.7 (24–60)	47.1 (18–71)	n/a	0.04
Gender: female	60.0%	53.2%	1.2(0.87,1.6)	0.49
Allergy	30.0%	25.6%	1.3 (0.82,2.1)	0.67

Additional Disease	20.0%	26.1%	1.1 (0.89,1.3)	0.22
Hospitalisation	30.0%	32.04%	0.98 (0.64,1.6)	0.98

Characteristics and demographics of patients with SA detection

5. DISCUSSION AND CONCLUSION

It is known that *S. aureus* carriers have a very important role in the epidemiology of staphylococcal infections. *S. aureus* carriage is usually in the form of nasal carriage. Staphylococci located in the nose are colonized by people through the hands of people and if there is a predisposition, it can lead to life-threatening infections. The colonization of *S. Aureus* in the nose is problematic because it can lead to outbreaks, show multiple resistance, and the cost of treatment is high. Patients, doctors, nurses and other health care workers who stay in the hospital environment for a long time are more likely to be *S. aureus* carriers than the general population (3,5,8). This can be a source of serious hospital infections, especially for hospitalized patients who are exposed to invasive procedures, and sometimes can lead to severe epidemic episodes (3,14). In healthy adults, *S. aureus* carriage may range from 10% to 35% , while this rate may be up to 43.6% from 19% for health care workers. When our study was evaluated as a reflection of the population, *S. aureus* detection rate was found to be 13,2%, unlike other studies. In addition, it was found that 14.4% continuous carriage, 16.3% intermittent carriage, 52.9% rarely carriage and 16.3% never carry *S. aureus* in the community as a whole (15). MRSA was first discovered in 1961 and then spread widely to the world (16). In the United States, the rate of methicillin resistance in *S. aureus* strains has nearly reached 60% in 2003 with an average resistance rate of 50% between 1998 and 2002 (12). In Europe, the rate of methicillin resistance in *S. aureus* strains isolated from infected patients increased from 21% in 2002 to 23% in 2005 and then decreased to 19% in 2008 (17). MRSA carriage can be determined as 2.4% - 22.5% in health care workers different from normal society (10,11,18,19,20). Among our study, MRSA detection rate was found to be 11.4%, unlike other studies. These ratios may vary considerably from the study population (20,21,22). As we have seen in our study, there was no significant difference in the distribution of nasal *S.aureus* carriage according to different

occupational groups like some studies (22,23). On the other hand, in another study, when nose and hand *S. aureus* carriage were examined in medical and non-medical health care workers, there was no difference in nasal carriage between the two groups, whereas antibiotic resistance was detected in *S. aureus* strains isolated from medical health care workers (24). In our study, no significant difference was found between the hospitalization, history of allergy and *S. aureus* carriage. It has been found that there is an association between virulence and slime production in the majority of epidemiologic studies. In most of the studies slime production being detected at a higher level in MRSA. It is also reported that the genetic control mechanisms in the gene regions forming the biofilm are different in strains that are resistant to methicillin (25,26,27). *S. aureus* continues to be an important cause of both community-acquired and hospital-acquired infections. In particular, health care workers have an important role in the transmission of the agent. It is worrisome that antibiotic resistant *S. aureus* strains are increasing day by day.

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