

## Does Attending Clinical Wards Increase Nasal Carriage of *Staphylococcus Aureus* Among Medical Students?

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### Abstract

**Objectives:** The carriage rates of *S. aureus* among medical students were reported to notably increase after they attended medical wards. We aimed to investigate the nasal colonization rates of *S. aureus* in medical students and assess whether attending clinical wards has an impact on nasal carriage rates of *S. aureus*.

**Methods:** Medical students from Namik Kemal University were divided into two groups, 'preclinical' and 'clinical'. Nasal swabs from both anterior nares were obtained and transferred to the laboratory for culturing. Results: Community-acquired methicilline-susceptible *S. aureus* (MSSA) was detected in 2 out of 75 students (2.66%) in the preclinical group. In the clinical group, 3 out of 75 students (4%) were carriers for community-acquired MSSA. No statistically significant difference in terms of MSSA carriage was observed between the groups ( $p > 0.05$ ,  $p = 0.649$ ). Neither community-acquired methicilline-resistant *S. aureus* nor hospital-acquired *S. aureus* was detected.

**Conclusions:** The results of the study indicated that attending clinical wards did not increase nasal carriage rates in medical school students. Low carriage rates may be explained by strict adherence to the rules of disinfection and antisepsis by the medical students attending clinical wards and the comprehensive hygienic precautions taken by the infection control committee of the hospital.

**Keywords:** Nasal carriage, *Staphylococcus aureus*, medical students, clinical wards

### Introduction

*Staphylococcus aureus* is a gram positive bacterium that can either display a commensal type of living in human hosts or cause significant morbidity and mortality by leading to a variety of infections. Severe *S. aureus* infections involve the skin, soft tissues, cardiovascular system, and central nervous system and can reportedly cause mortality rates ranging from 8–49% [1]. In its commensally form, *S. aureus* may survive by binding to skin and mucosal surfaces. The most commonly reported site of colonization is the anterior nares. The bacterium was also found to be localized in the pharynx, vagina, axilla, perineal region, and gastrointestinal tract [2].

Prevention and treatment of nosocomial infections associated with *S. aureus* are considered to be major public health concerns [3]. A significant source of nosocomial infection was proposed to be the nasal carriage of *S. aureus* among the health care personnel. The carriage rates were found to vary from 20–40% [4,5].

In the literature, the carriage rates of the pathogen among medical students were reported to notably increase after attending medical wards.

It was suggested that after attending medical wards, medical students become both victims of *S. aureus* colonization and significant sources for the

further spread of the pathogen [6]. Conversely, other authors pointed out that there was no association between attending medical wards and increased nasal carriage rates of *S. aureus* among medical students [7,8].

In the present study, we aimed to define nasal carriage rates of *S. aureus* in medical students and investigate whether attending clinical wards impacts nasal carriage rates of the pathogen in this population. The implications of these findings were also discussed using the existing literature

### Material and Methods

The study group was comprised of medical school students from Namik Kemal University who volunteered to be enrolled in the study. Approval of the Local Ethics Committee from the same institute and students' informed consent were obtained. The students were divided into two groups. The first group was called the 'preclinical' and was composed of first, second, and third class students who had not previously attended clinical wards.

**Table 1.** Overall *S. aureus* colonization rates in the preclinical and clinical groups

|                               |   | Students       |             |        |
|-------------------------------|---|----------------|-------------|--------|
|                               |   | Preclinical G. | Clinical G. | Total  |
| <i>S. aureus</i> colonization | Number of <i>S. aureus</i> (+) students | 2              | 3           | 5      |
|                               | %                                       | 2.7 %          | 4.0%        | 3.3 %  |
|                               | Number of <i>S. aureus</i> (-) students | 73             | 72          | 145    |
|                               | %                                       | 97.3 %         | 96 %        | 96.7 % |
|                               | Total number                            | 75             | 75          | 150    |

The second group was composed of fourth, fifth, and sixth class students who regularly attended clinical wards and were therefore called the 'clinical' group. Students with a history of medical conditions requiring hospitalization or antibiotic use within the last sixth months were excluded. All students were examined by the same otorhinolaryngologist. Following nasal endoscopic examinations, students with acute respiratory tract infections (e.g., swelling, hyperemia, or purulent secretions) were also excluded. Seventy-five out of 82 students in the preclinical group and 75 out of 85 students in the clinical group fulfilled the criteria and were included in the study. Nasal swabs from both anterior nares were obtained and transferred to a microbiology laboratory in a transport medium for culturing. Specimens were inoculated on 5% sheep blood agar using the striking method and incubated at 35–37°C for 18–20 hours. Suspected colonies were yellow pigmented and beta-hemolytic; they were identified using conventional and semi-automatic methods. Methicillin resistance was evaluated according to CLSI documents [9]

#### Statistical Analyses

Data analyses were conducted using SPSS (Version 18.0., Chicago). Results were analyzed using the  $\chi^2$  test

#### Results

Carriage of community-acquired methicilline-susceptible *S. aureus* (MSSA) was detected in 2 out of 75 students (2.66%) in the preclinical group. In the clinical group, 3 out of 75 students (4%) were found to be carriers for community-acquired MSSA (Table 1). A comparison of the two groups revealed no statistically significant difference in terms of *S. aureus* carriage ( $p>0.05$ ,  $p=0.649$ ). Community-acquired MSSA was not detected in both groups. Hospital-acquired *S. aureus* (either susceptible or resistant to methicilline) was not detected.

#### Discussion

The colonization of *S. aureus* in health care personnel is a potentially life threatening challenge, especially for patients who are diabetic or receiving hemodialysis.

Patients staying in intensive care units and patients with cardiac or other co-morbid disorders, including immune deficiency and cystic fibrosis, were also reported to be at risk for *S. aureus* associated nosocomial infections [10].

Incidences of nosocomially acquired *S. aureus* infections were found to be increased in certain conditions. A history of surgical operations, hospitalization in an intensive care unit, prolonged antibiotic therapy or hospitalization, or intimate contact with carriers or previously infected patients or health care personnel are all important risk factors for increasing the likelihood of having a nosocomial *S. aureus* infection [11].

Among these factors, nasal carriage of SA in health care personnel was particularly found to have a significant impact on the dissemination of the disease [12]. Medical students, especially interns attending clinical wards, were proposed to contribute to the spread of *S. aureus* from health care settings to the community [13]. Aside from being suspected vectors for the transmission of the pathogen, medical students were also considered victims. During clinical training, the risk of conversion from a non-carrier state to carrier state was found to be increased for medical students. In a follow up study, it was concluded that attending clinical rotations in a hospital setting could increase the prevalence of asymptomatic nasal carriage of *S. aureus* among medical students [6].

A previous study investigated the prevalence rate and risk factors of nasal carriage of *S. aureus* in medical students in Turkey. It was reported that the pathogen was isolated in 50 out of 179 students (27.9%). They concluded that increasing clinical exposure led to an increase in *S. aureus* carriage rates. They also pointed out that although statistically insignificant, the number of resistant cases increased in proportion to clinical exposure [14].

In another study, 38.6% of the medical students investigated were not aware of a hand hygiene protocol, and more than 30% of the students ignored that protocol. Their results revealed that of the medical students they investigated, 39.3% were colonized by SA and 2.1% were colonized by methicilline-resistant *S. aureus*. They pointed out the importance of including medical students in hospital infection control programs and suggested that hand hygiene training should be given to students prior to attending clinical wards [15].

Despite convincing evidence that being in close contact with patients, other health care personnel, and the hospital environment may increase the likelihood of the colonization of SA in medical students, some authors still insist that attending clinical wards does not increase *S. aureus* carriage rates. Nasal carriage of *S. aureus* in medical students

was reported to be very low in a study by Trépanier et al [16]. Furthermore, Slifka et al. analyzed whether exposure to patients created a risk of *S. aureus* carriage for American medical students in their study. They concluded that patient exposure was not an occupational hazard for students attending clinical wards [17]. Another study proposed that the carriage of *S. aureus* was not affected by one to two years of clinical exposure in the hospital [18].

In a recent study, low nasal colonization rates of *S. aureus* were reported among clinically exposed medical students at the University of Vienna. They attributed this finding to their well-established hygienic precautions and comparably low circulation of resistant bacteria [8].

The results of our study also demonstrated that nasal carriage rates of *S. aureus* in both preclinical and clinical medical students at our university were low. In addition, no statistically significant difference was observed between preclinical and clinical groups. Attending clinical wards seemed to have no significant impact on nasal carriage rates of medical students. Furthermore, the isolated pathogens in both groups were community acquired and not hospital acquired. This finding also indicated that nosocomial transmission of hospital-acquired *S. aureus* was not a matter of concern for medical students attending clinical wards. Our findings were consistent with the findings of previous studies that proposed that there was no association between attending clinical wards and increased nasal carriage rates of SA in medical students [8,16-18].

## Conclusion

The findings of our study indicated that attending clinical wards did not increase the prevalence of nasal carriage of SA in medical school students. The authors of this study are of the opinion that low carriage rates can be explained by both the strict hygiene protocols applied in the hospital and the comprehensive counseling of medical staff, including medical students. These measures may protect novice clinical students and prevent the creation of new sources for the nosocomial transmission of SA.

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consent was obtained from the individuals who were included into the study.

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