

Original article

A Research of nasal methicillin resistant/sensitive *Staphylococcus aureus* and pharyngeal beta-haemolytic *Streptococcus* carriage in midwifery students in Kahramanmaras, Eastern Mediterranean Region of Turkey

Ekrem Kirecci¹, Ali Ozer², Murat Aral³, Meral Miraloglu¹

Abstract

Background: In the hospitals where hygienic conditions are not provided, nasal methicillin resistant/sensitive *Staphylococcus aureus* (MRSA/MSSA) colonization is seen in the hospital personnel and patients. Both the individuals' themselves being MRSA/MSSA carriers and also other people around them are under risk and this bacterium leads to nasal colonization and then can propagate through contaminated hands and hospital materials.

Objective: In this study, it was aimed to research MRSA/MSSA and beta-haemolytic streptococcus (BHS) carriage in the nose and throat flora of students of, School of Health.

Methods: In the study, total of 160 midwifery students taking midwifery education was included in the research but 135 (84.4 %) out of 160 students were able to be reached. The nose and throat swab samples taken from students were examined through microbiological methods.

Results: 14.1 % of students were nasal MSSA carrier. While there wasn't the nasal MRSA carrier among students attending the study in the 1st and 2nd class, 3.3 % (1 person) of the 3rd class students and 10.0 % (3 people) of the 4th class students were the nasal MRSA carrier. In addition, BHS carriage was determined in 1.5 % of students and there wasn't any difference between classes.

Conclusions: These results indicate that midwifery students might have been contaminated with MSSA/MRSA during clinical practice. That MSSA/MRSA being an important pathogen is seen in midwifery students taking education in the birth units threatens the mother-child health. [*Ethiop. J. Health Dev.* 2010;24(1):57-60]

Introduction

Staphylococcus aureus colonies are found in approximately 30% of the general population. In approximately one tenth of these (3 percent of the general population) there are methicillin resistant/sensitive *S.aureus* (MRSA/MSSA), and these people are known as people having MRSA colonization in their bodies (1). Especially in the hospitals where hygienic conditions are not provided, nasal MRSA colonization is seen in the hospital's personnel and patients (2). Both the individuals' themselves being MRSA carriers and also other people around them are under risk and this bacterium leads to nasal colonization. Further more it can propagate through contaminated hands and hospital materials (3,4).

Streptococci are bacterial disease factors which are not evaluated among nosocomial factors but commonly take place in the nature and are most often met especially in childhood with the throat infections (5). Pharyngeal carriage in asymptomatic people bears big importance in epidemiology of the A and B Group beta-haemolytic streptococcus (BHS) infections. Especially the Group B streptococci become colonized in pharynx and vagina flora and so can lead to many maternal and neonatal infections such as intra-amniotic infection, early membrane rupture, premature birth risk, postpartum

endometriosis, bacteremia after cesarean, bacteriuria during and after pregnancy (25-30 %) (6, 7).

It is significantly important that the bacteria stated above shouldn't be found in the body flora of individuals being served in health services like the mother and child care before, during and after the birth.

Many researches concerning MRSA carriage in the hospital personnel are conducted globally but studies towards midwifery students are not adequate. In our country, the midwifery students take the applied education in the hospital units concerning the birth, mother and baby health for 4 years by starting from the first class and also visit homes for baby health. When these students don't comply with hygienic rules in the hospital medium adequately, they can become colonized with various pathogen microorganisms and can propagate these bacteria to other health personnel and patients. So in the protection of the mother and child's health, the prevention of *S. aureus* and BHS carriage in health personnel and students taking health education bears big importance.

In this study it was aimed to research MRSA/MSSA and BHS carriage in the nose and throat flora of midwifery

¹School of Health, Kahramanmaras Sutcuimam University, 46050, Kahramanmaras, Turkey

²Faculty of Medicine, Department of Public Health, Kahramanmaras Sutcuimam University, Kahramanmaras, Turkey

³Faculty of Medicine, Department of Microbiology, Kahramanmaras Sutcuimam University, Kahramanmaras, Turkey

students of School of Health, Kahramanmaras Sutcuimam University.

Methods

Design and specimen collection

This is a descriptive study. A total of 160 midwifery students taking education in the 2008–2009 term in Kahramanmaras Sutcuimam University, School of Health, Department of Midwifery was taken into the scope of the research and any sampling was not made. 135 (84,4 %) out of 160 students were reached. These students were taking the applied birth knowledge lesson in the birthing rooms of the Women's Birth Hospital and Medicine Faculty. The nose flora of students was examined with respect to *MRSA/MSSA* and the throat flora with respect to BHS colonization. With this aim, the throat and nose swab was taken from the students not having clinical symptoms (pharyngitis, cryptic tonsillitis, sinusitis, otitis media, and other upper respiratory illnesses), and swabs of throats were sampled in early morning time and cultures were made. The throat swab samples were taken from tonsillar and pharynx mucosa with dry, sterile swab and the nose swab samples were taken from the anterior nares of nose with the swab soaked with sterile serum physiologic. While taking samples, it was paid attention that there weren't findings such as fever, hyperemia, exudates, micro abscess bringing the infection thought into the mind in physical treatment and that there wasn't the use of the medicine like antibiotics.

Isolation and identification of bacteria

The throat and nose swab samples were arrived to the laboratory and planted to 5% sheep blood agar and 7.5% salt and mannitol (Chapman) culture and then incubated in the sterilizer of 37°C. In these cultures, if there wasn't doubtful reproduction, colonies in the Gram positive coccus were identified microscopically according to their appearances in the beta-hemolysis, colony morphology and Gram stained preparate, and BHS, mannitol effect, coagulase, catalase and DNAase, positive colonies were identified as *S.aureus*. BHS strains were typed with the latex agglutination (Dryspot Streptococcal Grouping Kit, Oxoid) test (8,9,10).

Methicillin susceptibility testing of staphylococcus strains

The methicillin susceptibility test was made with Kirby-Bauer disk diffusion method according to CLSI criteria.

A bacterium suspension in 0.5 McFarland turbidity standard was prepared from each *S.aureus* strain. The plantation was made to Mueller-Hinton agar from these suspensions and the oxacillin disk (1µg) was placed to the culture plates and the plates were incubated for 24 hours at 35°C in the aerop medium. Of colonies reproducing, those having 13 mm zone diameter were accepted as sensitive, those having 11-12 mm as medium sensitive and strains forming the inhibition zone under 11 mm as methicillin resistant. In the study, *S.aureus* ATCC 25923 strain was used for the control (11, 12).

Statistical analysis

Fisher's exact test was used in statistical analyses and $p < 0.05$ level was accepted as meaningful. The statistical analysis was performed using SPSS (SPSS 12.01 for windows SPSS Inc. 2003).

Ethical approval

The study was approved by the Ethics Committee at the Medical School of the University of Kahramanmaras Sutcuimam, and all subjects provided their oral informed consent before participating in the study.

Results

30.4% of 135 midwifery students attending the research were in the 1st class, 25.2% in the 2nd, 22.2% in the 3rd and 22.2% in the fourth. The total of 135 students evaluated in the scope of the study was attending actively to the applied lessons in the hospital medium. While there wasn't the nasal MRSA carrier among students attending the study in the 1st and 2nd class, 3.3 % (1 person) of the 3rd class students and 10.0 % (3 people) of the 4th class students were the nasal MRSA carrier. In the 4th class students the MRSA carriage was meaningfully higher than other classes ($p < 0.05$) (Table 1). 14.1 % of midwifery students were nasal MSSA carrier and this ratio was 4.9 % in the 1st class students, 8.8 % in the 2nd class and 23.3 % in the 3rd and 4th classes. In the 3rd and 4th classes the nasal MSSA carriage was found out meaningfully higher than the 1st and 2nd classes ($p < 0.05$) (Table 2). As seen in Table 3, while pharyngeal BHS carriage was negative in the 1st and 3rd classes, it was positive in 2.9 % of the 2nd classes and in 3.3 % of the 4th classes. The distribution of pharyngeal BHS carriage of midwifery students according to their classes was not meaningfully different ($p < 0.05$) (Table 3).

Table 1: Nasal MRSA carriage according to classes students study in Kahramanmaras, Turkey (2008–2009).

| Class | Positive | | Negative | | Total | |
|------------------------|----------|------------|------------|-------------|------------|--------------|
| | N | % | N | % | N | % |
| 1 st class | 0 | 0.0 | 41 | 100.0 | 41 | 100.0 |
| 2 nd class | 0 | 0.0 | 34 | 100.0 | 34 | 100.0 |
| 3 rd class | 1 | 3.3 | 29 | 96.7 | 30 | 100.0 |
| *4 th class | 3 | 10.0 | 27 | 90.0 | 30 | 100.0 |
| Total (n) | 4 | 3.0 | 131 | 97.0 | 135 | 100.0 |

* The difference is sourced from this group. $\chi^2 = 5.37$, $p = 0.03$

Table 2: Nasal MSSA carriage according to classes students study in Kahramanmaras, Turkey (2008–2009).

| Class | Positive | | Negative | | Total | |
|------------------------|----------|------|----------|------|-------|-------|
| | N | % | N | % | N | % |
| 1 st class | 2 | 4.9 | 39 | 95.1 | 41 | 100.0 |
| 2 nd class | 3 | 8.8 | 31 | 91.2 | 34 | 100.0 |
| *3 rd class | 7 | 23.3 | 23 | 76.7 | 30 | 100.0 |
| *4 th class | 7 | 23.3 | 23 | 76.7 | 30 | 100.0 |
| Total (n) | 19 | 14.1 | 116 | 85.9 | 135 | 100.0 |

* Different from other two groups. $\chi^2=7.83$, $p=0.004$

Table 3: Pharyngeal BHS carriage according to classes students study in Kahramanmaras, Turkey (2008–2009).

| Class | Positive | | Negative | | Total | |
|-----------------------|----------|-----|----------|-------|-------|-------|
| | N | % | N | % | N | % |
| 1 st class | 0 | 0.0 | 41 | 100.0 | 41 | 100.0 |
| 2 nd class | 1 | 2.9 | 33 | 97.1 | 34 | 100.0 |
| 3 rd class | 0 | 0.0 | 30 | 100.0 | 30 | 100.0 |
| 4 th class | 1 | 3.3 | 29 | 96.7 | 30 | 100.0 |
| Total (n) | 2 | 1.5 | 133 | 98.5 | 135 | 100.0 |

Discussion

Methicillin-resistant *Staphylococcus aureus* (MRSA) is an important nosocomial pathogen. It can lead to epidemics and its antibacterial treatment options are limited (13). Infection was determined in 45% of patients lying in intensive care units of hospitals in European countries and it was detected that 21% of these were the MRSA acquired in the hospital (14). It is significantly important to examine MRSA infections epidemiologically since *S.aureus* gains multiple resistance against antibiotics and transforms into an endemic hospital factor, its eradication realizes hard and due to the fiscal load brought along by epidemic diseases. Numerous MRSA strains leading to epidemics were defined but it was determined that these strains did not always show propagation (15,16). To treat and prevent the nasal MRSA carriage plays key role in epidemics of MRSA infections and in pathogenesis of the disease. Reva et al (2009) (17) investigate pathogen carriage in nursing students and determined that hand/nasal MSSA carriage increased (18.2%) depending on clinical applications. MSSA carriage was similarly 14.1% in our study as well and this ratio was increasing in the upper classes. In the same study, while Reva et al (2009) (17) were not able to find MRSA in the hand/nasal flora of the students not taking clinical application, MRSA was determined 6.1% in the students making clinical practice in the hospital. 3.0% of the students attending our study were nasal MRSA carriers and these students were in the 3rd and 4th classes. In the upper classes taking more applied lessons than the 1st and 2nd classes it was determined that the carriage meaningfully increased based on the increase in the work in the hospital medium.

The nasal MRSA carriage was investigated in Nebraska High School athletes between 2006-2008 years and the community acquired MRSA (CMRSA) was isolated in 51 out of 271 students (18). That MRSA carriage is seen in this ratio in healthy individuals not taking place in the

hospital medium shows dimensions of the risk to be met with respect to the public health.

In our country preschool 0-6 age group children go to health centers due to various health problems at least 9 times until 1 years old, and after 1 years old one time in a year (14). In addition, midwives visit homes for the mother-child health in certain periods. In a study made in our country, the nasal *S.aureus* carriage was investigated in 200 children being in the 0-6 age group and *S.aureus* colonization was detected in 18% of children. Also, methicillin resistance was determined in 5.6% of these strains (13). In another study, the nasal *S.aureus* carriage was compared between two groups and the carriage ratio was found to be 32.4% (59.1% for surgeons and 22.7% for other surgical staff) in the surgery clinic personnel taking place in the 1st group and this ratio was found to be 21.6% in biology faculty students taking place in the 2nd group. In the same study, when looked at the results taken from the hospital personnel, it was revealed that both nasal carriage and antibacterial resistance in the isolated bacteria were meaningfully high (19). Both our study's results and also other studies show that nasal *S.aureus* (MSSA/MRSA) is mostly acquired in the hospital medium and then propagates to the patient and near surrounding (19). In our study, when pharyngeal BHS carriage was also investigated in midwifery students, the Group A BHS carriage was available in 1.5% of students and there wasn't meaningful difference according to groups. This situation can be dependent on that BHS is not a pathogen acquired in the hospital medium and it is generally a community acquired factor. Since the A group leads to diseases such as hemolytic streptococci and streptococcal tonsillo-pharyngitis, it is very important especially for the child health. These bacteria can infect individuals in the places where the populations such as school, day nursery and hostel are intensive through aerogenic way (20).

In our study BHS carriage was determined in very low ratio and not concerned with the hospital medium. However BHS existence being an important pathogen both in adults and children shouldn't be ignored.

In conclusion, when MRSA contaminates a hospital, its eradication becomes difficult. In the struggle with MRSA, microbiological scanning must be done to the infected or colonized patients, the carriers must be determined and treated. Personnel must be informed, the hands must be washed before and after the contact with the patient and a suitable antiseptic must be applied. Contaminated material must be disinfected or sterilized and the gloves and aprons must be used during the contact with the patient. Except some special situations like mucus aspiration, there isn't need for wearing mask. MRSA carriage must be determined and the control of responsible midwife or nurse must be in the entries to isolated patient rooms. The rules of being protected from the hospital infections and hygiene rules must be taught practically to the students taking midwifery, nursing or medicine education. That MRSA being one of the hospital infection factors is found especially in midwifery students interning in the birth units, visiting homes for the mother-child health and working especially in the birth units in their occupational lives threatens the mother-child health seriously. So for the mother-child health, the carriage of both MRSA/MSSA and other pathogens in midwifery students and personnel must be periodically investigated and identified and treated.

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