

Pilot Study to Detect the Presence of MRSA among Healthcare Workers Who Practice Ablution

Zaini RG¹, Ismail KA^{1,2},
Rezk HM^{1,3}, and Dahlawi H¹

- 1 Clinical Laboratory Department, Faculty of Applied Medical Sciences, Taif University, Taif, Saudi Arabia
- 2 Department of Parasitology, Faculty of Medicine, Ain-Shams University, Cairo, Egypt
- 3 Department of Pathology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

Corresponding author: Zaini RG

✉ rana_zy@hotmail.com

Head of Clinical Laboratory Department,
College of Applied Medical Sciences, Taif
University, Taif, Saudi Arabia.

Tel: 0966 555530937

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Abstract

Background: Methicillin-resistant *Staphylococcus aureus* (MRSA) have emerged in the 1960s and is now commonly seen in hospitals, clinics and the community. In Saudi Arabia, MRSA prevalence was different from region to another, and the overall estimation was 35.6%. However, the infection with this pathogen can be prevented using many topical antiseptics or antibiotics. Moreover, colonization by this organism might be reduced by good washing using clean water. Thus, the aim of this study was to detect the presence of MRSA among healthcare workers who practice abluion.

Methods: Nasal swabs were collected from 22 healthcare workers (64% female and 36% male) at Albaha city, Saudi Arabia. Participants were working at three different departments in the hospital including; clinical laboratory, emergency room and infection control unit with 55%, 36% and 9%, respectively. Identification of MRSA was performed by real time polymerase chain reaction (PCR) (BD GenoOhm MRSA™ Assay).

Findings: The results of this study showed that MRSA was not isolated from any participants who use to practice abluion. On the other hand, MRSA was isolated from 3 (27%) samples, which were collected from healthcare workers who do not perform abluion. However, the difference between the two groups was not statistically significant.

Conclusions: MRSA nasal colonization can be reduced by nasal washing in abluion, which can be an easy and effective method to reduce or prevent colonization by this organism and thereby decrease the infection with serious staphylococcal diseases.

Keywords: MRSA; *Staphylococcus aureus*; Staphylococcal bacteremia; Methicillin-resistant

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Introduction

Staphylococcus aureus is commensal gram-positive microorganisms, colonizing in the respiratory tract, nose and the skin of humans with an estimated prevalence of 30% [1,2]. These pathogens are usually cause asymptomatic skin and mucosal carriage. Yet, they are paradoxically recognized as amongst the most frequent causative agents of hospital associated infection (HAI) as well as device associated infection (DAI) [3-5].

Methicillin-resistant *Staphylococcus aureus* (MRSA), which is an

antibiotic resistant strains, have been identified as a significant threat in both the hospital and community environment [6]. In the USA, it has been estimated that MRSA causes between 11,000 and 18,000 deaths, and 80,000 invasive infections every year [7]. In Saudi Arabia, AL Yousef and his colleagues reported that the MRSA prevalence was different from region to another, ranged from 5.97% to 94% in Dahrn and Riyadh cities, respectively. Additionally, the overall prevalence estimation was 35.6% [8].

MRSA infections are generally linked with higher death rate and increased financial costs because of the limited options of

the treatment [9,10]. Methicillin-resistant coagulase-negative staphylococci (MRCoNS), is commonly observed within the surgical site infection (SSI) and DAI, where biofilm formation on implants and on tissue further reduces therapy success [11].

Identifying the source, reservoirs and vectors for the spread of antibiotic resistant bacteria presents challenges. Many factors play a significant role in this regard; the hospital environment, patient's endogenous microflora, and healthcare workers (HCWs) [12-15]. Several research studies have indicated that the patient endogenous microflora may be critical, since clinical studies have found that *S. aureus* skin colonization increases the risk of a subsequent infection by three times and up to 80% of cases of staphylococcal bacteremia are caused by strains identical to those in the patient's nasal cavity [16,17]. In addition, *S. aureus* colonization is significantly associated with a 2-9-fold higher risk of infection [18]. Based on these possible threats, many healthcare institutes introduce routine screening of patients for colonization with *S. aureus* or MRSA upon hospital admission [19,20]. Such active surveillance programs play a role in reducing outbreaks of nosocomial MRSA infections [21].

Personal hygiene is crucial for various openings especially the nose which considers the main source of harmful bacteria. Muslims perform twenty six cleansing actions, which is known as ablution, for five times a day and some times more. According to the instructions of the Prophet Muhammad (PBUH), nasal wash should be done by sniffing the nose three consecutive times which, helps to keep the nostril clean and free of inflammation and germs.

The present study was aim to identify the prevalence and density of nasal colonization of antibiotic resistant staphylococci among healthcare workers who daily repeated nasal washing through practice ablution and who do not.

Methods

Cross section study was held on 22 healthcare workers (64% female and 36% male) at Albaha city, Saudi Arabia. Enrollment was voluntary and the participants were working at three different departments at the hospital including; clinical laboratory, emergency room and infection control with 55%, 36% and 9% respectively. All participants signed a written consent and completed a questionnaire of demographic and professional information. They also provided a nasal swab. Bacterial identification was correlated to participants' personal information including; personal medical history. This study divided the participate into two groups: the first group was included 11 participants, who were usually washed their nose by inhalation of water for three times during each ablution. The second group was included 11 participants, who rarely wash their nose and did not perform ablution. Nasal swabs were collected at random time from inside of the nostrils. The swab was inserted into one nostril to a depth of 1 cm, rotated three times on the nasal lining. The obtained swabs were saved in sterile tubes. Identification of MRSA was performed by real time polymerase chain reaction (PCR) (BD GenoOhm MRSA™ Assay) according to the manufacturer instructions.

Statistical analysis

The data were collected and analyzed statistically using SPSS version 16.

Ethical consideration

Ethical approval for this study was obtained from the Ethics Review Committee of the College of Applied Medical Sciences at Al-Taif University. All information obtained at each course of the study was kept confidential.

Results

The rates of presence and colonization of MRSA among healthcare workers who perform ablution and who do not perform ablution are shown in table 1. MRSA was not isolated from any participants who use to practice ablution. On the other hand, MRSA was isolated from 3 (27%) samples, which were collected from healthcare workers who do not perform ablution. However, the study did not show any statistically significant difference between the two groups ($p>0.05$) (Table 1).

Discussion

The nose is the main reservoir for *S. aureus*, which can be distributed into the respiratory tract and to the surface of the skin and even to the surrounding air during exhalation [22]. However, colonization of *S. aureus* can be seen in several human body sites, the anterior nares are the most common carriage site for this organism [23]. Moreover, *S. aureus* grows in the nose and spread to the skin and in the atmosphere. If these bacteria are decreased or eliminated in the nose, the quantities on the skin surface and in the atmosphere will be decrease as well [24]. In this study, MRSA was isolated from healthcare workers who perform ablution as well as who do not. Results from this study have shown insignificant difference ($p>0.05$). This might indicates that ablution had no effect on reducing MRSA. On the other, many several studies have been contradicted this result. A study was conducted by Ghonaim and El-Edel, showed higher rate of *S. aureus* were isolated from non-worshippers compared to worshippers before ablution. Also the study showed no significant difference [25]. Interestingly it has been reported that the density of *S. aureus* was significantly lower in worshippers than in non-worshippers. These results might suggest the important role of ritual ablutions in decreasing colonization of the nose by this organism [26]. Ghonaim and El-Edel studies have also shown that, among worshippers, there was statistically significant reduction of *S. aureus* isolation when samples were collected directly following ablution when compared to that collected before performing ablution. Following two hours, an increase in the rate of isolation was demonstrated. Such crucial results indicate that proper nasal washing in ablution has a significant effect on *S. aureus* nasal colonization. Moreover, Al-Khayat, has performed a study, and concluded that practicing ablution, combined with mupirocin intranasal application, was an effective measure against *S. aureus* carriage and decreased the incidence of continuous ambulatory peritoneal dialysis-associated *S. aureus* peritonitis [27]. A number of different studies in several countries

Table 1: Chi-Square Test for Association: number of positive and negative MRSA results between health employees who perform ablution and who do not perform ablution.

Study samples	No	MRSA results		X ²	P value
		Positive No (%)	Negative No (%)		
Perform ablution	11	0 (0%)	11 (100%)	3.4	P>0.05 Non sig
Do not perform ablution	11	3 (27%)	8 (73%)		

were conducted by Ghonaim et al. [28], El-Ghamdi et al. [29], and by Biswajit et al. [30] have shown that *S. aureus* is not only resistant to antibiotics, but also has several other mechanisms of resistance including: staphylokinase [31], membrane lipid modification [32], Cationic antimicrobial peptides, including defensins and cathelicidins, present in the nasal mucosa. Furthermore, all *S. aureus* strains are also lysozyme-resistant since they possess the peptidoglycan specific O-acetyltransferase [32]. Thus, the proper act of ablution or/and nasal wash seems to be an appropriate solution for reducing the colonization by this pathogen. Performing ablution properly is not only to clean the vital parts of the body from dust and dirt but also softens and refreshes the skin and positively affecting the inner coating of the nostrils. In Alexandria University, a study performed and concluded that the cleansing act can be one of the best methods to remove germs trapped in the nostrils [33].

This study has some limitations. Firstly, the study has targeted health workers only and did not include any patients whom are also prone to being infected with MRSA. Given that MRSA is a cross cutting problem affecting both health-care settings as well as the community, it is essential to include evidence from these settings too. Secondly, the small size of the study (22 samples) in

which 11 of them were performing ablution and the remaining 11 were not. Thirdly, the study might have been biased in favor of a certain gender as the majority of the samples were obtained from female health workers. Fourthly, no samples were obtained from males who do not perform ablution due to the unavailability of male staff who do not perform ablution. Fifthly, this experiment was costly as PCR is considered a highly expensive procedure, thus has caused a limitation in the size of the study. Sixthly, this experiment is highly sensitive as DNA can be easily affected by any environmental debris such as dust, heat, or gloves powder. Strengths include effective data collection throughout the study.

In conclusion, this study was conducted to identify if there was any difference in MRSA rate between healthcare workers who perform ablution and those who did not. Results have shown that there was insignificant difference between the two categories.

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