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# Detection of MRSA Carriers among Health Care Workers in a Tertiary Care Hospital

**Salma Elfaki Modathir Mohammed [a], Razan Abdulkader Fadul [a], Yosria Mohammed Elsiddig [b], Susan Ali Zroog [c], Salma Osman Noorelhuda Mohammed [d], Sara Abdalla Ali Elhag [e], Nadar Bashir Moalim [f], Babbiker Mohammed Taher Gorish [g*] and Abdelhakam H. Ali [a,h]**

[a] *Faculty of Medical Laboratory Sciences, National University, Sudan.*
[b] *Faculty of Applied Medical Sciences, University of Gezira, Wadmedani, Sudan.*
[c] *Nursing college, Omar AL-Mukhtar university, Libya.*
[d] *Department of Microbiology, Faculty of Medical Laboratory Science, Shendi University, Sudan.*
[e] *Department of Microbiology, Faculty of Medical Laboratory Science, Sudan International University,Sudan.*
[f] *Faculty of Medical Laboratory Sciences, University of Medical science & Technology (UMST), Sudan.*
[g] *Department of Microbiology, Faculty of Medical Laboratory Science, Omdurman Islamic University, Sudan.*
[h] *Faculty of Medical Laboratory Science, University of Al Butana, Sudan.*

***Authors' contributions***

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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**Corresponding author: Email: qorish456@gmail.com;*

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## ABSTRACT

**Objective:** Methicillin-resistant Staphylococcus aureus (MRSA) is one of the main causative agents of nosocomial infections that has posed a major threat to those with compromised immune systems beside health care workers (HCWs) which may act as carriers. This study was aimed to determine the carriage rates of MRSA strains among health care workers.
**Methodology:** Cross-sectional, based study, 60 nasal and hand swabs were collected from HCWs who were enrolled in hospital and had close contact with patients. Isolation and identification of Staphylococcus aureus was done by culture and biochemical tests. Kirby Bauer disk diffusion method was used for the antimicrobial sensitivity test.
**Results:** About 20 (33%) out of the study population were found to be colonized by S. aureus. Only 4 (20%) of isolated Staphylococcus aureus which belong to the nasal sample among HCWs were found to be MRSA while absent at hand.
**Conclusion:** The study concluded that nasal and hand carriage of Staphylococcus aureus, MRSA were relatively low.

*Keywords: Methicillin; staphylococcus aureus; health care workers; antimicrobial resistance.*

## 1. INTRODUCTION

*"Staphylococcus aureus*, especially methicillin-resistant *Staphylococcus aureus* (MRSA), is one of the main nosocomial pathogens associated with morbidity and mortality in both hospital and community settings" [1]. "The most important mode of transmission is through contaminated hands. An alternative mechanism of spread is an airborne dispersal of staphylococci in association with an upper respiratory tract infection" [2]. "Asymptomatic carriers of *Staphylococcus aureus* may act as disseminators of the microorganism to a population susceptible to colonization. Approximately 20% of the population may be considered persistent carriers, 60% transitory carriers, and the remaining 20% do not present colonization by *Staphylococcus aureus*. The highest rates of colonization may be found among healthcare professionals and individuals with immunodeficiency, such as those with HIV/AIDS" [3]. "The level of resistance to non-*β*-lactam antibiotic classes varies between strains that are produced by either health care-associated (HA) MRSA or community-associated (CA) MRSA" [4]. "MRSA colonization is predominantly present in the nose and skin of 30% of people. Other areas of colonization include armpit, groin, perineum, and throat" [5]. "MRSA carriage might be chronic or intermittent, where persons are colonized for a short time period. One form of intermittent carriage is the transient carriage, where MRSA isolated after work is gone before next day's duty, MRSA eradication is usually successful in the majority of HCWs (88%), and successful decolonization (with mupirocin) has been shown in 94% of cases 1 week after treatment, About 5% of MRSA colonized HCWs develop clinical infections, which may progress into serious disease or have negative consequences at work" [6].

## 2. MATERIALS AND METHODS

A cross-sectional hospital base study was carried out among health care workers, which were a total of 60 practitioners, with a male-female ratio 25-35. The researchers chose random

**Table1. Distribution of health care workers according to gender and specialty NO = 60**

| Category | Frequency (%) | Male (%) | Female (%) |
|---|---|---|---|
| Nurses | 10(16.6%) | 4(6.6%) | 6(10%) |
| doctors | 27(44.8%) | 11(18.2%) | 16(26.6%) |
| Dentists | 7(11.6%) | 3(5%) | 4(6.6%) |
| Nutritionists | 6(10%) | 1(1.6%) | 5(8.3%) |
| Pharmacist | 4(6.6%) | 2(3.3%) | 2(3.3% |
| Lab technicians | 1(1.6%) | 1(1.6%) | - |
| X- ray technicians | 5(8.3%) | 3(5%) | 2(3.3%) |
| **Total** | **60 (100%)** | **25(41.7%)** | **35(58.3%)** |

samples from the staff of nurses and doctors from different units, pharmacists, dentists, nutritionists, laboratory technicians, and x-ray technicians at Alragi Private Hospital. Study participants provided nasal and hand swabs for collection. The study excluded HCWs who do not have a direct relationship with patients and whom they refused to participate. Sample quickly transported to microbiology lab for culture, isolation and identification procedures.

Isolation and identification of *Staphylococcus aureus* started by a sample had been cultured on Mannitol Salt Agar. After overnight incubation, Mannitol fermentation, colonial morphology were observed, then, gram stain, catalase test and coagulase test were done for identification. Methicillin resistance was tested using the Kirby Bauer disk diffusion method.

## 3. RESULTS AND DISCUSSION

Out of the 60 nasal swabs examined from health care workers, *Staphylococcus species* were detected in 45(75%) and 15(25%) were not *Staphylococcus species* of the total samples. Of these 45 positive samples, 20 (44%) were positive to the coagulase test and 25 (55%) were negative to the coagulase test. Among the 20 coagulase positive *Staphylococcus aureus* 4 (20%) were found to be MRSA, 16 (80%) were found to be MSSA (Table2). The overall percentage of MRSA among the health care workers was (6%).

**Table 2. Antimicrobial susceptibility test of the *Staphylococcus aureus***

| Antibiotic | Sensitive (MSSA) | Intermediate | Resistance (MRSA) |
|---|---|---|---|
| Oxacillin (1 µg) | 16 (80%) | 0 | 4(20%) |

*MSSA: Methicillin Sensitive Staphylococcus Aureus*
*MRSA: Methicillin Resistant Staphylococcus Aureus*

**Table 3. MRSA carriage rate**

| Nasal | Hand | Category |
|---|---|---|
| 3 (5%) | 0% | Emergency room |
| 1 (1.6%) | 0% | Nurse |

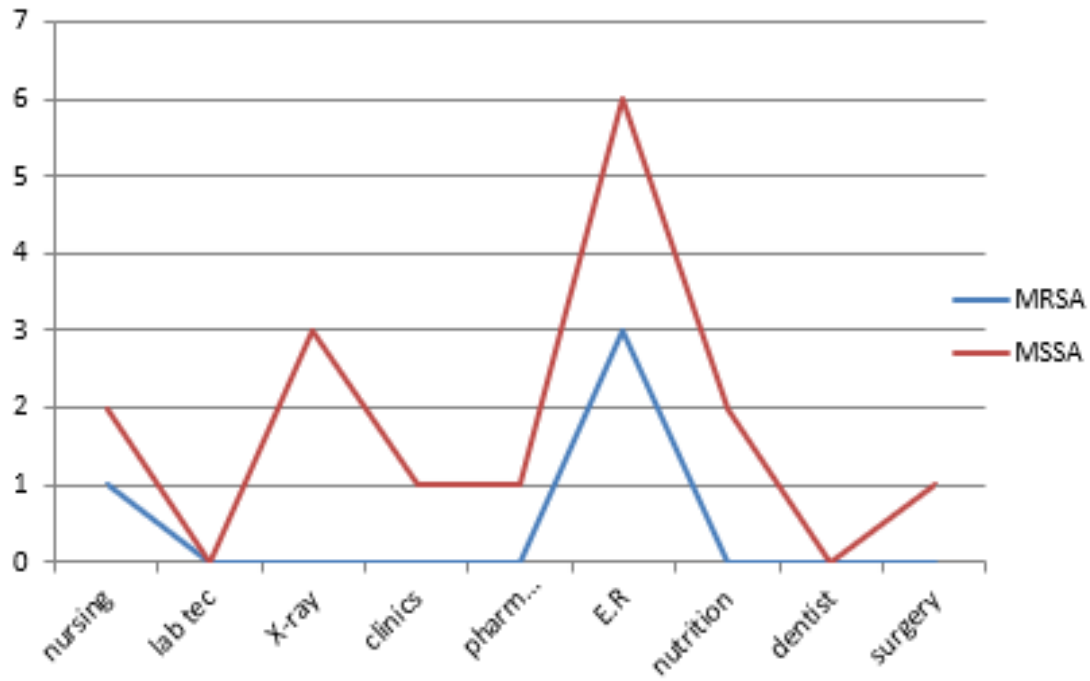


**Fig. 1. MRSA carriers among participqants**

All *Staphylococcus aureus* isolates were sensitive to the Vancomycin antibiotic by the Kirby Bauer disk diffusion method.

Twenty (33.3%) *Staphylococcus aureus* strains were isolated in all, of which 4 (6.6%) were MRSA. The proportion of HCWs with the nasal carriage of MRSA was higher (6.6%) than that on the hand (0%).

This study assessed the theory of MRSA colonization among health care workers, thus increasing the possibility of its spread to hospitalized patients. In this study, 60 participants were enrolled, the result showed that 20 (44%) *Staphylococcus aureus* were isolated, out of them 4(20%) were methicillin resistant *Staphylococcus aureus*. These results were dissimilar to a study conducted in Southwestern Uganda. Out of the 97 participants, 13 (46.4%) were phenotypically MRSA [7]. And slightly similar to the study conducted in Saudi Arabia, MRSA colonization rate was 9.04% [8]. Also, it is similar to study in the emergency department of Imam Reza hospital, Tabriz, Iran Out of 8 isolated *Staphylococcus aureus*, 2 cases (25%) were methicillin- resistant [9].

Forty-three percent of the population from nurses encountered with *Staphylococcus aureus* present with their nasal sample, this finding is more worrying because the nursing personnel are more close to admitted patients than the other HCWs.

Of 60 nasal samples with *Staphylococcus aureus*, 14.9% presented Oxacillin resistance (MRSA [10].

Swab sample from on fingertip and hand showed no growth of *Staphylococcus aureus* this result is dissimilar to that was done the in referral and teaching hospital in Zambia and Kisangani where the carriage rate of *Staphylococcus aureus* was 17.1% & 16.6 [11,12] respectively. The differences in carriage rate of *Staphylococcus aureus* can be attributed to variations in sampling techniques, microbiological procedures, and local infection control standards.

In addition, for this study, no MRSA carriage rate among healthcare workers was hand swabs, the same result obtained in a study from Kenya among HCWs hand swabs [13]. While different results obtained from Northern Ethiopia with the MRSA carriage rate were 48.3% [14].

In this study, the MRSA carrier rate on nasal swabs is high among emergency workers, which may be due to daily contact with incoming patients.

## 4. CONCLUSION AND RECOMMENDATIONS

This study concluded that nasal carriage of *Staphylococcus aureus* and MRSA is relatively low, 20 (44%), 4 (20%) Respectively. However, *Staphylococcus aureus* and MRSA were not detected on both fingertips and hand swab. All HCWs should be periodically educated about the maintenance of personal hygiene infection control procedures and the effects of the use, or rather, the misuse of antibiotics.

## ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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