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*Full Length Research Paper*

# ***Staphylococcus aureus* Nasal Carriage Among Health Care Workers in Basra**

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**Staphylococci nasal carriage is one of the important sources for nosocomial infection among hospital personnel. This study aims to determine the prevalence of nasal carriers for *Staph. aureus* and coagulase negative Staphylococci (CONS) in health care workers in Basra. Out of 100 samples (50 from health care workers, 50 from control group) 32% revealed *Staphylococcus aureus* while CONS detected in 67%. Health care workers revealed both *Staph. aureus* (44%) and CONS (64%). The prevalence of *Staph. aureus* differed depend on age groups and genders of workers. The results shows *Staph. aureus* nasal carriage was higher in age group >40. Besides that the health care workers of operating theaters seem to carry this bacteria much more (14%) than the others who works in different hospitals words. In conclusion, the prevalence of *Staph. aureus* is much more in the hospital staff of healthcare workers compared to control group. So those staff can be the source of *Staph. aureus* and Methicillin Resistance *Staph. aureus* MRSA as well as transmission of the resistance**

**Keywords:** *Staphylococcus aureus*, Nasal Carriage, Health Care Workers, Basra

## **INTRODUCTION**

Staphylococci colonize skin and nasal mucosa as their normal inhabitants. Among staphylococci, *Staphylococcus aureus* is the most virulent, and it is associated with a wide spectrum of diseases, including skin and soft tissue, systemic infections and exotoxin related diseases (Shittu *et al.*, 2006; Tacconella *et al.*, 1998). About 20% of the population is always colonized with *Staph. aureus*, 60% are intermittent carriers, and 20% never carry the organism (Peacock *et al.*, 2001).

The incidence of community-acquired and hospital-acquired *Staph aureus* infections has been on the rise, with the emergence of drug resistant strains called methicillin-resistant *Staph aureus* (MRSA). Prevalence of MRSA had been previously confined or limited to hospital settings, but as of late, incidences of MRSA infections in the community have also been reported in epidemiological surveys and studies. Bacterial, genetic

and microbiological adaptive changes and properties gave rise to the emergence of antibiotic resistance of the organism. The drug of choice for Staphylococcal infections was penicillin, but indiscriminate use and genetic manipulations on the part of the organism slowly led to penicillin resistance. Health care professions' trainees, especially medical or physician assistant (PA) students, have the potential for significant exposure to infectious organisms.

One of the important sources of staphylococci for nosocomial infection is nasal carriage among hospital personnel. Almost 25% of the health care workers are stable nasal carriers, and 30% to 50% of them also possess the bacteria on their hands. Occasionally, healthcare workers who carry *Staph. aureus* in their nares can cause outbreaks of surgical-site infections (Cespedes *et al.*, 2002).

**Table 1.** Prevalence of bacterial growth in the samples

| Samples            | Positive<br>N(%) | Negative<br>N(%) | Total | P value |
|--------------------|------------------|------------------|-------|---------|
| Health care worker | 39 (78)*         | 11 (22)**        | 50    | < 0.05  |
| Control            | 40 (80)          | 10 (20)          | 50    | <0.05   |
| Total              | 79 (79)          | 21 (21)          | 100   |         |

**Table 2.** Percentage of *Staph aureus* nasal carriage in healthcare workers and control

| Samples                    | <i>Staph. aureus</i> | CONS         | Negative culture | P value |
|----------------------------|----------------------|--------------|------------------|---------|
| Healthcare workers<br>N=50 | 22*<br>(44)          | 32**<br>(64) | 11<br>(22)       | <0.05   |
| Control<br>N=50            | 10<br>(20)           | 35<br>(70)   | 10<br>(20)       | <0.05   |
| Total<br>N=100             | 32<br>(32)           | 67<br>(67)   | 21<br>(21)       |         |
|                            |                      | P<br>≥0.05   |                  |         |

\*:P <0.05 There are statistically significant differences between health workers and control according to occurrence of *Staph aureus*.

\*\* :P ≥0.05 there are no significant differences between isolates of CONS.

### The aim of this study

This study was devised to determine the prevalence of nasal carriers for *Staph. aureus* and coagulase negative *Staphylococci* (CONS) in health care workers in Basra.

### MATERIALS AND METHODS

The study was done over a period of 2 months from March to April 2014 in the Department of Microbiology. A total of 100 nasal swabs were collected. 50 swabs were from healthcare staff working in departments like Surgery, Internal medicine, Intensive Care Unit, Cardio Care Unit, Operating theater and Private sector. While the other 50 swabs were from persons whom worked outside hospitals as a control.

### Methods

Sterile cotton wool swabs moistened with sterile normal saline were used to collect the specimen from the anterior nares. The swabs were transported to the laboratory immediately and processed. Swabs were cultured on Blood agar and Mannitol Salt agar and then incubated at 37C for 24hrs. *Staph. aureus* and other bacterial growth were identified using standard methods based on colony morphology, Gram stain, catalase test, mannitol fermentation and coagulase test (Murray *et al.*, 2003; Forbes *et al.*, 2007).

### Statistical analysis

Statistical Package for Social Science (SPSS) version17 was used to analyze the data. Chi-square ( $X^2$ ) test and student t-test were used to assess the significance of differences between groups. P. value < 0.05 was considered as statistically significant and P- value ≥ 0.05 considered as no significant.

### RESULTS

A total of 100 nasal swabs that were collected of which 50 were from the health care workers staff and 50 were from the control. Of the 50 swabs (healthcare staff), 39 (78%) revealed positive bacterial growth (Table 1) while 22% showed no bacterial growth. Also of 50 control samples 80% revealed positive growth.

In this study *Staph aureus* showed 32% from all bacterial growth. From that 22(44%) isolated from healthcare workers while 10(20%) strains had been isolated from control group. CONS revealed also from both health care workers and from control (64%, 70 %) respectively. (Table 2)

According to gender we found that *Staph. aureus* nasal carriage among male higher than that from female (54.55, 45.54%) respectively without any statistical differences  $P \geq 0.05$ . Also CONS revealed in percentage from male higher than from female (Table 3).

Nasal carriage of *Staph. aureus* from health care

**Table 3.** Nasal carriage of *Staph aureus* in health care worker according to gender

| Gander        | Bacterial growth | <i>Staph .aureus</i> | CONS         | Negative culture | P value |
|---------------|------------------|----------------------|--------------|------------------|---------|
| <b>Male</b>   | 20<br>(51.28%)   | 12<br>54.55%         | 17<br>53.13% | 5<br>45.45%      | ≥0.05   |
| <b>Female</b> | 19<br>48.72%     | 10<br>45.45%         | 15<br>46.87% | 6<br>54.55%      | ≥0.05   |
| <b>Total</b>  | 39<br>(100)      | 22<br>(100)          | 32<br>(100)  | 11<br>(100)      |         |

**Table 4.** Nasal carriage of *Staph .aureus* in healthcare workers according to age groups

| Age group     | Total     | Bacterial growth n (%) | <i>Staph aureus</i> n (%) | CONS n(%) | Negative culture n(%) | P value |
|---------------|-----------|------------------------|---------------------------|-----------|-----------------------|---------|
| <b>Female</b> | <b>25</b> |                        |                           |           |                       |         |
| <30           | 12        | 8(66.66)               | 3 (25)                    | 7 (58.33) | 3 (25)                | ≥0.05   |
| 30 – 40       | 4         | 3 (75)                 | 2 (50)                    | 3 (75)    | 1 (25)                | ≥0.05   |
| >40           | 9         | 9 (100)                | 7 (77.77)                 | 7 (77.77) | 0 (0)                 | ≥0.05   |
| <b>Male</b>   | <b>25</b> |                        |                           |           |                       |         |
| <30           | 10        | 8 (80)                 | 5 (50)                    | 6 (60)    | 2 (20)                | ≥0.05   |
| 30 -40        | 12        | 8 (66.66)              | 2 (16.66)                 | 6 (50)    | 4 (33.3)              | ≥0.05   |
| >40           | 3         | 3 (100)                | 1 (75)                    | 3 (100)   | 0 (0)                 | ≥0.05   |

**Table 5.** Nasal carriage of *Staph. aureus* in health care workers male according to smoking

| Workers            | Number | <i>Staph.aueus</i> | CONS      | Negative culture | P value |
|--------------------|--------|--------------------|-----------|------------------|---------|
| <b>Smokers</b>     | 11     | 5 (45.45)          | 7(63.63)  | 2                | ≥0.05   |
| <b>Non smokers</b> | 14     | 3 (21.42)          | 8 (57.14) | 4                | ≥0.05   |
| <b>Total</b>       | 25     | 8                  | 15        | 6                |         |

**Table 6.** Nasal carriage of *Staph .aureus* among healthcare workers according to wards

| Wards                    | Total | Nasal carriage N(%) |
|--------------------------|-------|---------------------|
| <b>Operating room</b>    | 15    | 7(14)               |
| <b>ICU</b>               | 7     | 2 (4)               |
| <b>CCU</b>               | 14    | 3 (6)               |
| <b>General Surgery</b>   | 1     | 1(2)                |
| <b>Internal Medicine</b> | 8     | 6 (12)              |
| <b>Private Sector</b>    | 4     | 3(6)                |
| <b>Total</b>             | 50    | 22                  |

workers recorded higher frequency in female workers with age group >40 while the lowest frequency appeared with those female workers in age group (30-40). Besides that male healthcare workers in age group 30-40 revealed higher percent (16.66). These results appeared with no any statistical significant differences between age groups for both sexes (Table 4).

The smoking activity also presented in our data as shown in Table 5. Smokers harbored by *Staph aureus* isolates higher than non smokers without any statistical differences ( $p \geq 0.05$ ), while CONS slightly differed

between those groups.

Healthcare workers from different wards also presented variable percentage of nasal carriage. Significantly, workers of operating theater recorded higher percentage of *Staph. aureus* nasal carriage than other workers, followed by healthcare workers of Internal Medicine wards (14%,12%) respectively ( $p < 0.05$ ). Persons who had been worked in CCU, ICU, Private sector and other also showed nasal carriage in different percentages (6%,4%,6%,2%) respectively (Table 6).

## DISCUSSION

*Staphylococcus aureus* is a common community and nosocomial pathogen of growing concern due to multidrug-resistant strains of MRSA. The important reservoirs of MRSA in hospitals are infected or colonized patients, and transient hand carriage on the hands of health care workers is the predominant mode for patient-to-patient transmission (Thompson, 1982; Sowirka *et al.*, 2000).

In this study bacterial growth seems to be carried in healthcare workers and in those in community control group (Table 1). But from that bacterial growth the nasal carriage of *Staph. aureus* (COPS) in healthcare workers had been shown higher frequency (44%) than that of control group (20%) (Table 2). However the control group carried CONS in percentage higher than that of healthcare workers (70%,64%) respectively.

In present study, whole prevalence of nasal carriers of *Staph. aureus* was 32%. In the previous study in Turkey, the prevalence of nasal *S. aureus* and MRSA were reported to be 17 to 85% and 13%, respectively (Dayan *et al.*, 1997; Karabiber, 1991). Generally, nasal carriage among hospital healthcare workers and patient (60-70%) are much higher than those in community carriers (30-50%) (Lowy, 1998). It seems that the frequency of *S. aureus* nasal carriage in our study is similar to that result reported by Dayan *et al.* (1997) and (Karabiber, 1991).

The colonization of *Staph. aureus* in nares of healthcare workers may be spread from patients to the workers staff, patient to patients, or healthcare workers to patients, hence the primary rout of transmission of *Staph. aureus* in hospitals seems to be from the medical staff to patients (Murray *et al.*, 2003).

Our data reported bacterial growth in both genders and in all age groups although the prevalence of *Staph. aureus* and CONS seems to appear somewhat in male higher than that in female (Table 3). Besides that nasal carriage of *Staph. aureus* appeared in age group >40 females higher than other age groups as shown in table-4 previously. These results comparable to that reported by Morgan *et al.*, 1997 who showed that studies showed that the prevalence of nasal carriers of MRSA and *S. aureus* is highest over 75 years of age. But these results differ with higher prevalence in males than in females (Morgan *et al.*, 1997).

In this study there is an increase in nasal carriage rate of *Staph.aureus* from healthcare workers of operating theaters followed by those of internal medicine wards than the others who works in different hospitals words as shown in Table 6. Actually those staff may be appeared as a potential source as colonizers and disseminators of *Staph. aureus* in the hospital settings. The risk of that

transmission has been raised when the strains of *Staph aureus* belongs to that of MRSA. This study just highlights the nasal carriage of *Staph. aureus* and the occurrence of MRSA among these isolates not neglected. Yun *et al.*, (2003) mentioned that the staff who were positive for the growth of *Staph. aureus* and MRSA were advised to apply Mupirocin ointment that inhibit protein synthesis, to the anterior nares 3 times daily for 5 days .

In conclusion, the prevalence of *Staph. aureus* is higher in the hospital staff of healthcare workers compared to control group. So those staff can be the source of *Staph. aureus* and Methicillin Resistance *Staph. aureus* MRSA as well as transmission of the resistance. Also the prevalence of nasal carriage of *Staph. aureus* revealed in both genders and in all age groups with higher frequency in those healthcare workers of Operating theater and of Internal medicine wards.

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