

NASAL CARRIAGE OF STAPHYLOCOCCUS AUREUS AMONG HEALTHY POPULATION IN DIYALA

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Abstract

The rate of *S. aureus* nasal carriage varies widely among different populations. This study was conducted to explore the rate of nasal carriage of *Staphylococcus aureus* among healthy population in Diyala province.

A total of 1186 participants were included in this study, which was conducted from 1st January to 30th Jun 2004. They were randomly chosen from those attending the public health laboratory in Baquba for premarriage investigations. 593 were males with mean age 25.6 ± 3.7 years and 593 females with mean age 21.8 ± 5.6 years.

Nasal swabs were collected from the anterior nares using sterile bacteriological swabs. Swabs were cultured immediately on blood agar plates and incubated at 37°C for 24 hours. Identification of *S. aureus* isolates was based on standard bacteriological and biochemical criteria.

The results showed that *S.aureus* nasal carriage was detected in 255 (21.5%) of the participants. Males had slightly higher carriage rate as compared to females (24.7% vs 18.2%). Like wise, participants from rural areas had higher carriage rate than those from urban areas (23% vs 19.7%). Prayer participants had lower carriage rate compared to non-prayers (13.7 % vs 41.1.6%). It can be concluded that considerable proportions of normal healthy population in Diyala carry *S.aureus* in their anterior nares. So, elimination of *S.aureus* from these sites reduces the incidence of nosocomial infection.

Introduction

Staphylococcus aureus is one of the most common causes of both endemic and epidemic hospital or community acquired infections, which results in substantial morbidity and mortality^[1,2]. Between 20%-70% of adult individuals carry *S.aureus* in the nose; some of them are permanently colonized, and others are only transiently colonized^[3,4]. Colonized patients are the chief source of *S.aureus* in hospitals; approximately 10%-40% of people tested as outpatients or on admission has nasal carriage of *S. aureus*^[5]. *S.aureus* could also be acquired during delivery, since about 10% of healthy women have *S.aureus* in the vagina⁶, or from parental skin during infancy^[7]. Persistent carriage is more common in children than in adults, and the carrier type changes in many people between the ages of 10 and 20 years^[8].

Carriage of *S.aureus* in the nose, the principle reservoirs, appears to play a key part in the pathogenesis of infection. It has been associated with an increased risk of infection

in patients after surgery and among patients undergoing renal dialysis^[9]. Furthermore, nasal carriage of *S. aureus* was a risk for the development of nosocomial bacteremia in an intensive care units^[10].

Materials and methods

This study was conducted in the public health laboratory (PHL) for the period from 1st January to 30th Jun 2004. A total of 1186 participants were included. They were chosen randomly from those attending the PHL for premarriage investigations. 593 were males with mean age 25.8 ± 3.7 years, and 593 females with mean age 21.8 ± 5.6 years.

Nasal specimens were collected from the anterior nares using sterile bacteriological swabs. Swabs were streaked immediately on blood agar plates and incubated for 24 hours at 37°C . Suspected colonies on the bases of colonial morphology and gram- stained film were subcultured on mannitol salt agar (with 7.5% Sodium chloride). Other biochemical criteria to confirm identification of *S .aureus*

was based on: Coagulase production, which was performed by slide method according to (Baron et al., 1990)^[11]. Catalase enzyme activity test, which was carried out by slide method according to (Baron et al., 1990)^[11].

Results

The results showed that *S.aureus* was detected in 255 (21.5%) of participants, 147 (24.73%) were male carriers with mean age 25.68 ± 3.79 years, and 108 (18.27%) were female carriers with mean age 21.88 ± 5.6 years. Nevertheless, there was no statistical difference in the carrier rate between male and female ($P > 0.05$), Table (1).

Table (1)
Distribution of carrier rates of *S.aureus* according to the sex and mean age.

Sex	No. tested	No. carriers	Carrier rate
male	593	147	24.7
Female	593	108	18.3
Total	1186	255	21.5

The distribution of carriers according to the age groups showed that the older participants (> 36 years) harboring the highest carrier rates, Table (2).

Table (2)
Age distribution of *S.aureus* carriers.

Age groups	No. carrier	Carrier rate
15-20 (n =323)	62	19.2
21-25 (n =512)	93	18.1
26-30 (n =231)	74	32.0
31-35 (n =72)	7	9.7
36-40 (n =31)	13	41.9
41 + (n =17)	6	35.2

Regarding the residence, the results showed that those reside in the rural areas have higher rate of nasal carriage (23.0% vs 19.7%). However, this result was statistically insignificant ($P > 0.05$), Table (3).

Table (3)
Distribution of carrier rates of *S.aureus* according to the residence.

Residence	No. carrier	Carrier rate
Urban (n= 548)	108	19.7
Rural (n= 638)	147	23.0
Total (n=1186)	255	21.5

The results also revealed that prayer participants have significantly lower rate of carrier compared to non-prayers (41.1% vs 13.7%, $p < 0.05$), Table (4).

Table (4)
Carrier rates of *S.aureus* among prayers and non-prayers participants.

Category	No. carrier
Prayers (n=848)	116
Non-prayers (n=338)	139
Total (n=1186)	255

Discussion:

Nasal carriage of *S.aureus* is an important risk factor for infection by this organism in both community and hospital settings. The present study found that 21.5% of normal healthy individuals in Diyala province were carrier for *S.aureus* in the anterior nares. These results are consistent with previous studies, which found that 20% to 70% of adult individuals carry *S.aureus* in the nose ^[3,4,12]. Another studies had distinguished three patterns of *S.aureus* nasal carriage; first, approximately 20% of healthy people almost always carry a strain; second, a proximately 60% of the population harbors *S.aureus* intermittently and the strain change with varying frequency and third, only 20% almost never carry *S.aureus* ^[8,13]. Furthermore, a strong correlation has been found between strains colonizing the anterior nares, strains isolated from foci of infection, and strains isolated from blood suggesting an endogenous origin of *S.aureus* ^[4,8,14]. In accordance with these results, *S.aureus* infections have been particularly evident in patients after surgery, in

peritoneal and hemodialysis and in other immunocompromised patients.^[5,9,15,16]

The mucin layer in the anterior nares appears to be the critical surface determinant for the colonization of *S.aureus* in the nose in a process involving interaction between staphylococcal protein and mucin carbohydrate^[17,18]. There is also evidence of genetically determined affinity between the nasal mucosa cells and *S.aureus*.^[19,20]

The study also found that there is insignificant difference in the nasal carriage rate between male and female participants (24.7% vs 18.3%). However, the older age groups (36 years and more) showed higher carriage rate as compared to other age groups. These results may imply that the carriage rate is age dependent rather than sex dependent. Although, previous studies reported a higher carriage rate among children than adults^[8,21]. However, further studies are needed to clarify the effect of age and sex on the nasal carriage of *S. aureus*.

On the other hand, the slightly higher carriage rate among rural compared to urban population (23% vs 19.7%) may be related to personal hygiene, availability of municipal water. Similarly the significantly higher carriage rate among non-prayers compared to prayers (41.1% vs 13.7%). These results undoubtedly related to the good personal hygiene, as Muslims should clean his anterior nares with clean water three times before each prayer.

It can be concluded that considerable proportion of normal healthy population carry *S.aureus* in their anterior nares in Diyala. Treatment targets elimination of *S.aureus* reduces the rate of staphylococcal nosocomial infections.

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الخلاصة

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يختلف معدل حمل المكورات العنقودية الذهبية في المنخرين باختلاف المجتمعات. أجريت هذه الدراسة في مختبر الصحة العامة - بعقوبة من الأول من كانون الثاني إلى الثلاثين من حزيران 2004، لاكتشاف معدل الأشخاص الأصحاء الحاملين لجرثومة المكورات العنقودية الذهبية في الأنف في محافظة ديالى.

تم اختيار 1186 للمشاركين في الدراسة بشكل عشوائي من بين المتقدمين لفحوصات ما قبل الزواج . عزل وتشخيص المكورات العنقودية الذهبية تم بالاعتماد على الخصائص الزرعية والفحوص الكيموحياتية القياسية.

أظهرت النتائج أن المكورات العنقودية الذهبية عزلت من انف 255 (21,5%) من المشاركين في الدراسة . نسبة الذكور الحاملين للمكورات العنقودية الذهبية كانت أعلى من الإناث (24,7% مقابل 18,3%) ومثل ذلك كانت نسبة الحاملين للجرثومة من المناطق الريفية مقارنة بالأشخاص من المناطق الحضرية (23% مقابل 19,7%). نسبة الحاملين لجرثومة المكورات العنقودية الذهبية الذين يودون الصلاة كانت أقل منها لدى الأشخاص غير المصلين (13,1% مقابل 41,1%).

من خلال هذه الدراسة يمكن الاستنتاج بأن نسبة الحاملين لجرثومة المكورات العنقودية الذهبية في الأنف بين الأشخاص الأصحاء في محافظة ديالى هي نسبة معتبرة. وان معالجة هواء الحاملين للتخلص من المكورات العنقودية الذهبية يقلل من احتمالية الاخماج بسبب هذه الجرثومة في المجتمع.