Nasal carriage of *Staphylococcus aureus* among Basra Medical students

Hanadi Abdulqader Jasim & Wijdan Nazar ALMoosawi

Department of Microbiology, College of medicine, Basra, Iraq.

Hind_iraq2006@yahoo.com

Abstract

Staphylococcus aureus strains are becoming a major cause of nosocomial and community acquired infections specially those strains associated with antibiotic resistance. Nasal colonization of ***S. aureus*** is seen in patients and healthy individuals. This study was done to screen the nasal carriage rate of ***S. aureus*** among medical students (1^{st}, 2^{nd}, 4^{th}, 5^{th} and 6^{th} year). The highest colonization rate (42.23%) of ***S.aureus***revealed in the 4^{th} 5^{th} and 6^{th} year students . However, the nasal carriage of ***S. aureus*** of 1st and 2nd year students was 18.6% ($p<0.001$). In addition, nasal carriage was shown to be higher in male than female students ($p<0.05$). Antibiotic sensitivity pattern of S***.aureus*** against 10 types of antibiotics had been reported.

Key wards*: Staphylococcus aureus*, nasal carriage, Basra medical college

Introduction

Staphylococcus aureusis one of the most common human pathogen causing nosocomial and community-acquired infections (Santosh *et al*, 2007). Nosocomial infections due to ***Staphylococcus aureus*** have become an increasing problem over the last four decades (Stubbs *et al*, 1994).

The infections caused by ***S. aureus*** have clinical range from minor skin infections to severe life threatening infections such as toxic shock syndrome and septicaemia (Lowy, 1998)

The anterior nares have been shown to be the main reservoir of ***S. aureus*** in both adults and children(Collery,2008).

Colonization may be either transient or persistent and may be at single or multiple body sites (Pathak *et al*, 2010).

Carriage of ***S. aureus*** in the nose appears to play a key role in epidemiology and pathogenesis of infection (Kakhandki & Peerapur, 2012). Other sites of colonization are wounds, tracheostomy sites, sputum of intubated patients. (Kakhandki & Peerapur, 2012)

The spread of colonization occurs especially in close contact areas like schools, pre-schools or households probably by the contaminated hands and from surfaces (Citak, 2011; Pathak *et al*, 2010) where it can survive for months.

The prevalence of nasal carriage varies widely ranging from 20 to 65% in both patients and healthy population (Citak, 2011).

Healthy individuals could become carriers of the organism and have a small risk of contracting an invasive infection due to ***S.aureus*** (Santosh *et al*, 2007).

Nasal carriage of ***S. aureus*** acts as endogenous reservoir for clinical infections in the colonized individual but also as a source of

cross-colonization for community spread. ***S.aureus*** nasal colonization can be an indicator of high risk for subsequent infection (Citak, 2011).

The present study was conducted to determine if the exposure to hospital environments affected nasal carriage of ***S. aureus*** among Basrah Medical students.

Materials and Methods:

One hundred of Basra Medical College students (Iraq) were included in this study. First and second year of medical students were included in group 1While fourth, fifth and sixth year students were included in group 2.

Student with any nasal problems (infection and allergy) were not included in this study.

Sampling and bacteriological investigation:

Sterile cotton swabs moisted with sterile normal saline were used in specimen's collection.

Samples were collected by repeatedly swabbing circularly bothanterior nares with sterile cotton-tipped moistened swabs.

Then samples were inoculated and streaked immediately on: Mannitol salt agar (MSA)(Himedia)& Blood agar (Himedia) plates for isolation and identification of the bacteria.

The plates were incubated aerobically at 35°C for up to 72 h. Mannitolfermentingyellow or gold colonies and /or ß- haemolytic or typicalcolonies on blood agar was Gram stained and further screened for diagnosis of bacteria. Further identification of the isolate was done by colonial morphology, catalase, and tube coagulase test. (Murray 2003; Forbes *et al*, 2007)

Antibiotic sensitivity was determined by Kirby Bauer method (Forbes *et al*, 2007) by using Mueller-Hinton agar. Antibiotics tested were (ug): penicillin (10),cloxacilin (5),

vancomycin (30), trimethoprim (5), gentamicin (10), ciprofloxacin (10), amoxicillin (20), cefixime (5), cephotaxime (30) and amikacin (30)

Results were read after24 h of incubationat 37°C.

Statistical Analysis:

Statistical Package for Social Science (SPSS) version17 was used to analyze the data. Chi-square (X^2) test and was used to assess the significance of differences between groups. P value less than 0.05 was considered as statistically significant and P value less than 0.01considered as highly significant.

Results

Outof 100 samples that examined, 43(86%) of Group 1 students and 45(90%) of Group 2 students showed positive bacterial growth (Table-1). Nasal carriage of ***S.aureus***was shown in all student as in Table-2.

It has been found that ***S.aureus*** recovered from theGroup 2 students in 42.23, which was statistically higher (P<0.001)than that from Group 1 students(18.6%).

On other hand**,** ***S.epidermidis*** appeared significantly higher in Group 1 students than those in the second group(P<0.001).

Nasal carriage rate of ***S.aureus*** among Group 1 students has been differ significantly between males and females.

Out of 35 females of Group 1 students 30 (85.7%) carried ***S.aureus***, while out of 15 males ,13(86.6%) was revealed ***S.aureus*** (Table-3).

Similarly, out of 30 females ofGroup 2 students, 25(83%) carried ***S.aureus***. While all male in this group (100%) showed ***S.aureus***nasal carriage. Both results were significantly differed

(P<0.005, P<0.001 respectively) (Table-4).

The pattern of antibiotic sensitivity of 10 isolates of ***S.aureus*** showed variable effect against 10 types of antibiotic discs by measuring the diameter of inhibition zone on Muller-Hinton agar (Table-5).

All ***S.aureus*** isolatesshowed high sensitivity (100%) towards gentamicin, vancomycin, amikacin and ciprofloxacin. On the other hand, S aureus isolates observed very low sensitivity percentage to cloxacillin, cifixime and cephotaxime (20%, 20%, 40%) respectively

Table 1. Frequency of positive cultures among groups

Study groups	*Positive culture	Negative culture	Total
Group 1	43 (86%)	7 (14%)	50
Group 2	45 (90%)	5 (10%)	50
Total	88	12	100

df=1 ***P≥0.05***

***No statistical difference between various parameters P≥0.05.**

Table -2 Frequency of *S. aureus* among studied groups

Study groups	***S.aureus***	***S.epidermidis***	Mixed	*Total
Group 1	8 (18.6%)	35 (81.4%)	0 (0.0)	43 (48.86%)
Group 2	19 (42.23%)	17 (37.78%)	9 (20%)	45 (51%)
Total	27 (30.68%)	52 (59.09%)	9 (10.23%)	88 (100%)

df=1 ***P≤0.001***

***Highstatistical difference between various groups and various bacterial types(P≤0.001).**

Table -3 Nasal carriage of*S.aureus* among Group 1 according to sex differences

Sex	Positive	Negative	*Total
Female	30 (85.71%)	5 (14.29%)	35 (70%)
Male	13 (86.67%)	2 (13.34%)	15 (30%)
Total	43 (86%)	7 (14%)	50 (100%)

df=1 ***P≤0.001***

***High statistical difference between male and female (P≤0.001).**

Table -4 Nasal carriage of*S.aureus* among Group 2 according to sex differences

Gender	Positive	Negative	*Total
Female	25 (83.34%)	5 (16.67%)	30 (60%)
Male	20 (100%)	0 (0.00%)	20 (40%)
Total	45	5	50

df=1 ***P≤0.005***

***Nasal carriage of *S.aureus* in group 2 found to be statistically differ between male and female(P≤0.005).**

Table-5 Antibiotic susceptibility of *S.aureus* isolates

Antibiotic types	Conc.	Inhibition zone range	Sensitive isolate No. (%)	Resistant isolate No. (%)
Penicillin	10 µg	17-24mm	8 (80%)	2 (20%)
Amoxicillin	20µg	16-22mm	8 (80%)	2 (20%)
Cloxacillin	5µg	10-13mm	2 (20%)	8 (80%)
Trimethoprime	5µg	12-18mm	6 (60%)	4 (40%)
Gentamicin	30µg	12-19mm	10 (100%)	0
Vancomycin	30µg	10-18mm	10 (100%)	0
Cephotaxime	30µg	12-13mm	4 (40%)	6 (60%)
Amikacin	30µg	19-24mm	10 (100%)	0
Ciprofloxacin	10µg	22-30mm	10 (100%)	0
Cifixime	5µg	10-12mm	2 (20%)	8 (80%)

Discussion:

Medical students can become colonized with various pathogens and can propagated these bacteria to other contacts (including healthy individuals or patients (Chambers 2001; Mulligan *et al*, 1993).

In this study, the student of ,4th 5th and 6th year been colonized with bacteria more than 1st and 2nd year students. Beside that from this high percent of growth (90%) ***S.aureus*** has been estimated to colonize the nasal passages of those students significantly higher than***S.epidermidis***, this might be resulted from that the second group had more than five sessions in the hospital which lead to prolong contactwith the patients and medical staff in the hospitals .This finding was in agreement with that study of Reva Balcı *etal*, 2009.

A high nasal carriage rate of ***S.aureus*** difference was determined in male than female in all student(Tables 3 &4).These difference might be occurred regarding the females behavior in cleaning their face.Also the variation could be associated with oestrogn levels (Winkler *et al*, 1990).

The pattern of antibiotic sensitivity of ***S.aureus*** isolates reported levels of resistance against cloxacillin, cifixime. Cephotaxime (table-5). The emergence of antibiotic resistant bacteria constitutes a major problem in antibiotic therapy. This could be attributed to unrestricted use of antibiotics in a particular environment (Onwubiko & Sadiq, 2011). Actually high level antibiotic abuse arising from self-medication which is often associated with inadequate dosage.

Hence, the nasal carriage of ***S.aureus*** should be Prevented to overcome the transmission of resistance strains .

Stubbs *et al* (1994) and Foster (2004) had been demonstrated that the individual with harmless ***S.aureus*** could become carrier.

The interaction and exposure to hospitalenvironments could cause major brisk in transmitting to hospital patients & spreading nosocomial infection.

So, wearing masking, sterilization of hands and object before and after entering of students to the hospitals besides protection measure of the hospitals at all could be helpful in elimination both cross-infection &increasing the carriage rate of ***S.aureus.***

In conclusion the students of 4^{th} 5^{th} and 6^{th} year had been colonized with bacteria more than 1^{st} and 2^{nd} year students. Also ***S.aureus*** has been estimated to colonize the nasal passages of those students significantly higher than ***S. epidermidis***. The pattern of antibiotic sensitivity of ***S***. ***aureus*** isolates reported levels of resistance against Cloxacillin, Cifixime&Cephotaxime.

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الحمل الجرثومي الانفي للمكورات العنقودية الذهبية لدى طلبة كلية طب البصرة

هنادي عبد القادر جاسم وجدان نزار الموسوي

فرع الأحياء ألمجهرية / كلية الطب / جامعة البصرة

Hind_iraq2006@yahoo.com

الخلاصة

تعتبر سلالات المكورات العنقودية الذهبية من الاسباب الرئيسية لعدوى المستشفيات وعدوى المجتمع المكتسبة وخاصة تلك السلالات المقاومة للمضادات الحيوية. ان الحمل الجرثومي لهذه المكورات الذهبية سجل لدى كل من المرضى والاشخاص الاصحاء. اجريت هذه الدراسة لتحديد معدلات الحمل الجرثومي لدى طلبة كلية طب البصرة (المرحلة الاولى والثانية والرابعة والخامسة والسادسة). اعلى معدل للاستعمار الجرثومي (42,23%) وجدت في طلبة المرحلة الرابعة والخامسة والسادسة. كما ظهر الحمل الجرثومي لطلبة المرحلتين الاولى والثانية بنسبة 18,6%(p<0.001) . بالإضافة الى ذلك فان الحمل الجرثومي ظهر أكثر في انوف الطلبة الذكور من الاناث. (p<0.05) اجري اختبار الحساسية الدوائية باستخدام عشرة انواع من المضادات الحيوية لتحديد حساسية انواع المكورات العنقودية المعزولة من انوف الطلبة.