Original article

Staphylococcus aureus Nasal Carriage among Surgical personnel in National Ribat University Teaching Hospital-Khartoum-Sudan

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Abstract

Introduction: *Staphylococcus aureus* (*S. aureus*) is one of the most common causes of both community and hospital acquired bacterial infection. There is strong correlation between *S aureus* nasal carriage and disease progress. Nasal carriage is high among health care workers. Inappropriate usage of antibiotic may lead to emergence of resistant strains which has serious consequences.
Objective: The objective of this study is to reveal the frequency of *S aureus* nasal carriage and its drug resistance among surgical personnel in National Ribat Teaching Hospital Khartoum Sudan.
Methods: This is a hospital-based case study. Nasal smears were taken from medical workers in the surgical department and operational theater at National Ribat Teaching Hospital in Khartoum State, Sudan. Samples were processed, cultured, then susceptibility tests were performed using Bauer-Kirby disc diffusion methods following recommendations of National Committee for Laboratory Standards (NCCLS). Results were analyzed and discussed.
Results: Sixty three samples were taken. Thirty were males. Growth was achieved in only eight (12.6%). Majority showed resistance to penicillin. However, alls strain were sensitive to amoxicillin/calvunalic acid, vancomycin and oxacillin.
Conclusion: this study gives an early alarm on the problems related to *S. aureus* colonization rate and its drug resistance. Nevertheless, the small number of our study group is a bit fall.

Key words: drug resistance, hospital acquired bacterial infection,

Staphylococcus aureus (*S. aureus*) is one of the most common causes of both community and hospital acquired bacterial infection[1]. It constitutes part of normal flora of skin and mucous membrane[1, 2]. It is estimated that about 10% to 35% of healthy populations have either transient or persistent nasal colonization. The percentage is high among health care workers.

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Acute infection in non-colonized patients is usually attributed to indirect contact with a colonized individual[3, 4].Studies showed that health care workers can serve as sources for transmission of staphylococci[4, 5]. There is strong correlation between *S aureus* nasal carriage and disease progress[4]. National Nosocomial Infection Surveillance system in US hospitals reported increasing number of *S aureus* related to nosocomial infection[6]. Same reports also showed that there is increasing frequency of *S aureus* resistance to many drugs worldwide, including strains that are resistant to methicillin, lincosamides, macrolides, aminoglycosides, or combination of these antibiotics[6]. Resistance of *S aureus* to Methicillin (MRSA) has important epidemiological concern because glycopeptides (eg.vancomicin) are the only

alternative drugs for its treatment. The emergence of *S aureus* strains resistance to glycopeptides is alarming because of possible resistance of these strains to all available antibiotics[7-10].

The aim of this study is to reveal the frequency of *S aureus* nasal carriage and its drug resistance among surgical personnel in National Ribat Teaching Hospital Khartoum Sudan. We hope that the findings of this study will contribute to science and prevention of *S aureus* resistance to available antibiotics. To the best of our knowledge there is only one published study about *S aureus* nasal carriage and it's relation with surgical site infection done in Khartoum Teaching Hospital[11]. This study will be first of it is kind in the country.

Methods:

This is a hospital-based case study. Sixty three nasal smears were taken from medical workers in the surgical department and operational theater at National Ribat Teaching Hospital in Khartoum State, Sudan in the period November 2007 to January 2008. Nasal swabs were transferred in Aimes transport media to laboratory within two hours of collection. Swabs were cultured in Manitol Salt Agar and Blood Agar (OXOID), and incubated at 37Cº for 48 hours. Suspected colonies were stained with Gram method and biochemical tests were performed. Gram-positive cocci, catalase, coagulase and DNAase positive were accepted as *S aureus* and then susceptibility tests were performed using Bauer-Kirby disc diffusion methods following recommendations of National Committee for Laboratory Standards (NCCLS).

Ethical clearance:

Nasal swabs usually do not cause any risk to patients. Mild annoyance or discomfort may occur by dry swabs in some patients. To avoid or minimize discomfort swabs were moistened with sterile distilled water. Written informed consent was obtained from each individual participant prior to enrolment in the study. Results were conveyed to the participants and positive cases were given appropriate management free of charges.

Results:

Seventy four different categories of medical workers from surgical and Operational Theater at National Ribat Teaching Hospital were selected and requested to participate in this study. Only 63 gave consent to participate with a response rate of (85.1%). Thirty two (50.8%) of them were males. Growth was found in eight (12.6%) workers and smears were positive for both nares. Smears showed different sensitivity results to tested antibiotics. The tests for antibiotics resistance and sensitivity included Penicillin, Oxacillin, Amoxicillin/calvunalic acid, Cephalotin, and Vancomycin. Two-thirds of cases showed resistance to penicillin. All isolates were sensitive to Amoxicillin/calvunalic acid, Vancomycin and Oxacillin. [Table 1]

Table No 1: Drugs Susceptibility Results

No	Amc	Cl	Va	Ox	P
1	S	S	S	S	R
2	S	S	S	S	R
3	S	S	S	S	R
4	S	R	S	S	R
5	S	S	S	S	R
6	S	S	S	S	S
7	S	S	S	S	S
8	S	S	S	S	S

Amoxicillin/calvunalic acid (Amc), Cephalotin (Cl), Vancomycin (Va), Oxacillin (Ox) and, Penicillin (P)

S= Sensitive, R= resistant.

Discussion:

Nasally colonized healthcare worker can transfer *S aureus* to the patients and this may lead to major epidemics in healthcare settings[12]. Fortunately, progression among carriers to infection is relatively uncommon, occurring only in 2.5% of colonized nurses caring for home patients[13]. Nevertheless, it also occurs in 37% of postoperative patients[12-13]. Studies revealed that elimination of nasal carriage reduced the incidence of *S aureus* infections[13]. This study showed that about 12% of the study population carries *S aureus* in their anterior nares. Our findings are

similar to study reported by other investigator[14]. Studies from Turkey and Ivory-Coast showed higher *S aureus* nasal carriage rate among health personnel than our study[15-16].

Different studies showed that there is an increase in the number of multidrug resistant *S aureus* worldwide, especially to Methicillin (MRSA)[17-19]. The authors of the majority of published studies from North America and Asia demonstrated an increasing rate of MRSA nasal carriage among individuals in both community and hospitals[20-23]. Also studies revealed that patients who have MRSA bacteremia have an increased risk of mortality and hospital cost compared with patients who have Methicilin sensitive *S aureus* (MSSA)[20-22]. Fortunately no MRSA were seen among isolated *S aureus* in this study. The small number of patients with positive microorganisms may partially explain that. Similar to reports from elsewhere, our study showed resistance to cephalosporin and penicillin among isolated strains[10, 23, 24]. The use of first generation cephalosporin as a prophylactic measure has to be re-assessed.

Recent studies in Japan and US showed cases of intermediately resistant *S. aureus* to Vancomycin. Vancomycin is the drug of choice when MRSA is isolated. Vancomycin intermediately resistant is difficult to identify under routine disc diffusion method for susceptibility test used by most of laboratories[25-26]. The emergence of *S. aureus* with intermediate glycopeptide resistance is a serious development. Optimizing usage of Vancomycin, early detection of resistant pathogens, following strict infection-control measures for infected or colonized patients may help to prevent that. Karabay O et al from Turkey in their study showed that simple precautions like hand washing and short education period can decrease staphylococcal nasal carriage among nursing home residents [27].

The small number of our study group is a bit fall. We believe that this study gives an early alarm on the problems related to *S aureus* colonization rate and its drug resistance. Further studies are needed to assess the real situation.

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