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## کارگاه های آموزشی مرکز اطلاعات علمی



مقاله نویسی علوم انسانی



اصول تنظیم قراردادها



آموزش مهارت های کاربردی در تدوین و چاپ مقاله

## Prevalence of Nasal Carriage of *Staphylococcus aureus* in Madani Heart Hospital, Tabriz

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### Abstract

**Background:** *Staphylococcus aureus* has been known as one of the most common nosocomial pathogens which include as much as %30 to %50 of general population. Regarding to the presence of carrier staff can be considered as one of the infection source; remarking of carrier for prevention purposes is important.

**Methods:** In a cross-sectional study we determined the prevalence of *staphylococcus aureus* carriage among 113 medical staff of Madani Heart Hospital, Tabriz (Iran) 28/08/2009 to 28/09/2009 on ( Physicians, nurses, technicians, secretaries, the administrative personnel and services), including surgical wards , laboratory, ICU and CCU .

**Results:** In this study, 113 participants comprised of 60 males (53%) and 53 females (47%), and their mean age of participants in this study was 34.8 years (20-55). Sampling was carried out from nasal of employees. Samples were place on blood agar and mannitol salt agar; suspected colonies have been cultured and identified by catalase, coagulase and DNAase. Generally, of 113 people who entered the study, 30 person (26.5%) had positive cultures and 82 (72.6%) had a negative culture. The incidence of *staphylococcus aureus* carriage was more in men than women 57% vs. 43% ( $p<0.05$ ).

**Conclusion:** In this study *staphylococcus aureus* carriage incidence in Tabriz heart centre (Madani hospital) was 50 % to 80% lower than our estimation, unexpectedly.

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**Keywords:** *Staphylococcus aureus* –Carriage –Medical Staff

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## Introduction

*Staphylococcus aureus* is the second cause of nosocomial infections after the *Escherichia coli*. These bacteria create a wide range of diseases, including superficial and deep infection, and systemic poisoning shock, disseminated intravascular coagulation (DIC), and finally death. *Staphylococcus aureus*' characteristic golden color, which this pigment acts as a virulence factor with an antioxidant action that helps the microbe evade death by reactive oxygen species used by the host immune system. According to The National Nosocomial Infections Surveillance System (NNIS) and Centers for Disease Control (CDC), *Staphylococcus aureus* resistant has increased in hospitals United States of America from 2/4% in 1975 to 29% in 1991.<sup>1</sup> Because its primary habitat is moist squamous epithelium of the anterior nares, most invasive *S aureus* infections are assumed to arise from nasal carriage.<sup>2</sup> Methicillin is the first penicillin-resistant semi-synthetic derivatives which was released in 1959.<sup>3-4</sup> Shortly strains of *Staphylococcus* Matthew Penicillin was reported in 1961 that this strain can be called MRSA (Methicillin Resistant *staphylococcus aureus*) Commonly *Staphylococcus aureus* strains transported across from a patient to patient by the hands or gloves the staff.<sup>5</sup> The staff can also contact with infected or through colonized infected wound. Nasal mupirocin ointment inside the nose for the eradication and treatment of patients and carriages is used. Mucosa in the anterior part of nose and throat is the main settlement of the carrier's organisms.<sup>6</sup> Strains of *Staphylococcus aureus* in the nose before the surgery, the individual exists are the most common cause of surgical wound infection. Eliminate carrier state by local and systemic antibiotics before surgery can reduce *staphylococcus* infection rate after surgery. Several Reviews shows that frontal holes of the nose are of the most isolated areas of this organism. The prevalence of colonization with *S. aureus* and with MRSA was 31.6% and 0.84%, respectively, in the non-institutionalized U.S. population 151. Medical personnel were colonized with more antibiotic-resistant isolates than nonmedical personnel and the strain profiles indicated that they tended to be more

clonal in origin, suggesting that exposure to hospital isolates alters the colonization profile.<sup>7</sup> Prevalence of nasal carriers of *staphylococcus aureus* strains in hospital staff from 16.8% to 90% has been estimated.<sup>6</sup> Although many studies in the prevalence of *staphylococcus aureus* strains in our country has been done but there is little research in this field associated with nasal carriers.

## Methods

A cross-sectional study for determination of the prevalence of *Staphylococcus aureus* carriage among medical staff of Madani Heart Hospital, Tabriz was conducted from 28/08/2009 to 28/09/2009 on 113 of (Physicians, nurses, technicians, secretaries, the administrative personnel and services) in surgical wards, laboratory, ICU and CCU departments.

### Data collection

Different groups of staff such as physicians, nurses, technicians, secretaries, the administrative personnel and services in different sectors were selected. This selection was done randomly through a confidential list of employees in the Office of Management of Hospital and Nursing Services. Nasal swab was taken out only by one person. A sterile cotton swab was applied into the nose with a drop of sterile distilled water to the depth of one centimeter into the anterior part of each nostril and five times is rotated. Then immediately transferred into sample tubes containing liquid Soy Broth Trypticase at temperature 37-25 ° C was sent to the laboratory. Samples in a laboratory environment Manitol Salt Agar on a specific environment and for the differential diagnosis is *Staphylococcus aureus* were cultured From Clooney that yellow halo, and have established a colony morphology similar to *Staphylococcal* were stained gram was performed. Diagnosis between streptococcus, *staphylococcus* and catalase test was used. In the next step to ensure that full colony of, the specific medium MSA was used for separation of *Staphylococcus* Finally, to detect *Staphylococcus aureus* from other *Staphylococcus* ( eg *Staphylococcus epidermidis* and *Staphylococcus saprophyticus*) and coagulase tests Exclusion criteria from the study: People who a month before receiving the first culture



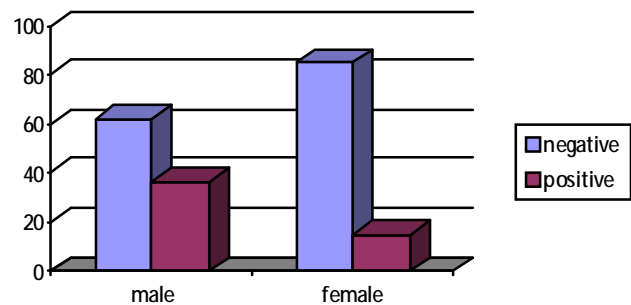
had consumed antibiotics were excluded. People from hospital staff that their length of service was less than two months and remained after the first start of the review have also been removed. Also those with anomalies or infection in their nose were excluded. Statistical analysis Phase analysis data from SPSS software version 16.0 was used according to descriptive statistics about the tests or analysis were used. For comparison between qualitative variables Chi-square statistic and in cases of necessity Fisher Exact Test was used.

### Ethical consideration

This study was approved by ethics committee of Tabriz University of Medical Sciences

### Results

Among the 113 participants that were enrolled, mean age was 34.8 years (20-55). It was noted that among the hospital staff in the age group between 20-30 years, 24% had positive culture results. Among people in the age group of 35-31 years the prevalence of a positive culture is 20.5%. In the group of 36-40 years, 24% and in the age group of 41-45 years, 46.7% had positive culture. Among employees in the 46-50 age group, 28.6% have a positive culture. In the age group of 36-40 years, 24% and in the age group of 41-45 years, 46.7% had positive culture. Among the 113 patients who entered the study, 60 male (53%) and 53 (47%) were females. According to Figure, 37% of men and 15% of women had positive cultures ( $P=0.008$ ).



**Fig -** Distribution of carriage of *S. aureus* in 113 health care workers in this study according to gender.

According to Table the academic qualifications of those with positive culture participating in the study were obtained: Highschool education (25%), diploma (43%), Technician (16.7%), Bachelors degree (16.1%), Masters Degree (75%) and Doctorate (50%). For every 5 years service employees, results of positive culture are as following: 20.8%, 30%, 21.6%, 38.5%, 20% and 66.7%, respectively. The location of service of participants, among 113 patients was: 11 patients (10%) in the laboratory, 26 patients (23.6%) in the operating room, 18 (16.4%) in Angiography, 17 (15.5%) at ICU-2, 10 patients (9.1%) in ICU-1, 9 patients (8.2%) in CCU-1, 9 patients (2.8%) in CCU-2 and 10 people (1 / 9%) general ward. In the laboratory, operating room, angiography, ICU-1, ICU-2, CCU-1, CCU-2 and the general ward frequency of a positive culture were obtained: 45.5%, 44%, 22.2%, 17.6%, 30%, 11.1%, 0% and 20%. Overall among the 113 people who entered the study, 30 patients (26.5%) had positive cultures and 82 (72.6%) had a negative culture.

**Table -** Relationship between Education and Staphylococcus aureus culture.

Result	Education						Total
	Diploma	Doctorate	Technician	Bachelors Degree	Masters Degree	School Education	
Negative culture	16 (57%)	2 (50%)	10 (83.3%)	47 (83.9%)	1 (25%)	6 (75%)	82
Positive culture	12 (43%)	2 (50%)	2 (16.7%)	9 (16.1%)	3 (75%)	2 (25%)	30
28	4		12	56	4	8	113



## Discussion

In our study the prevalence of nasal colonization with *Staphylococcus aureus* in hospital personnel (26.5%) is significantly different from the general population. The prevalence in the general population, such as preschool reaches 25% (39) and is similar in adults and children. The prevalence of colonization with *S. aureus* and with MRSA was 31.6% and 0.84%, respectively, in the non-institutionalized U.S. population.<sup>10</sup> A study from Japan shows that 44 percent of people with constant stuffy noses carry the bacteria, staph aureus, in their noses.<sup>13</sup> Although many studies in the prevalence of *Staphylococcus aureus* strains in our country has been done but there is little research in this field associated with nasal carriers.<sup>9</sup>

Question that arises is whether the prevalence among all workers at the center, based on age, sex, educational level, employment experience and staff within the hospital is the same. To answer the question, we determined that its colonization prevalence of *Staphylococcus aureus* dispersion in different parts of the hospital. Personnel in wards such as CCU, in which most patients have non-respiratory conditions, and the sections in which patients do not routinely have long-standing catheters have obviously lower frequency of positive culture than the wards in which patients routinely stay longer (mean 10 days vs. 3 days in CCU). In these sections the prevalence of aggressive intervention, such as urinary and intravascular catheter are more than general wards (30% versus 10%). Laboratory wards prevalence reaches 45% probably due to more direct contact with secretions of patients. The prevalence of colonization of *Staphylococcus aureus* in the nose of 44% of operating room staff is higher than the normal population and compared to other wards, which needs further investigations. The relatively low prevalence of 22% in catheterization laboratory according to the short stay patients and sterile conditions and the use of masks by the personnel was predictable. The gender specific information, except for the reported increase in colonization prevalence of women at some time during the period prior to menstruation, has not been found in similar studies. The 15% prevalence of carriers in the women and 37% in men can result from a better

job conditions and health among women. This difference (15% vs. 37%) is statistically significant ( $p = 0.008$ ). Higher education level is not associated with reduced incidence of carriers. Although at an early age is higher than its colonization prevalence later in life, risk is higher. In this study the prevalence of likely ages 41 to 45 years of age and most of all 46 to 50 were lower (46% vs. 15%). The nose is the main ecological niche where *S. aureus* resides in human beings, but the determinants of the carrier state are incompletely understood. A variety of studies have examined community prevalence of nasal carriage of *S. aureus* in diverse subpopulations, such as adult outpatients, health care workers, college students, and injection drug users.<sup>12-13</sup> Asymptomatic colonization of the anterior nares can be detected in between 15% and 40% of the population, a frequency which massively outweighs the percentage of serious *S. aureus* infections.<sup>14</sup> The incidence of community-acquired and hospital-acquired *S. aureus* infections has been rising with increasing emergence of drug-resistant strains called methicillin-resistant *S. aureus* (MRSA).<sup>15</sup> In a study 812 subjects were enrolled from central Italy to establish the rates of nasal carriage of *S. aureus*, and antibiotic susceptibility patterns, in the community. The prevalence of *S. aureus* nasal carriage was 30.5%.<sup>29</sup> Eradication of *S. aureus* from nasal carriers prevents infection in specific patient categories for example in haemodialysis and general surgery patients. Infections at surgical sites remain an important cause of illness and death and substantially increase health care costs.<sup>1</sup> Prevention is thus important not only for the safety of patients, but also in terms of cost-effectiveness. *S. aureus* infections at surgical sites often occur in patients with nasal colonization by *S. aureus* and frequently involve the same strain as that found in the patient's nose. Several risk factors for CA-MRSA have been identified, including intravenous drug use (IVDU), hospitalization within the past year, increasing age, being of Hispanic origin, incarceration and chronic illness.<sup>16-18</sup> Outbreaks have been reported in inner-city populations, prisons and sports teams. In multiple studies, suppression or eradication of *S. aureus* in a patient's nose has been associated with reduced rates of *S. aureus* infection. Given the



results of the 18 prospective epidemiologic studies mentioned above, it seems that nasal colonization with *S. aureus* is an important risk factor for infection and that suppression or eradication of this organism can help prevent serious *S. aureus* infections. Today, cost effectiveness has become a predominant consideration in decisions about health care programs, including preventive measures. The cost-effectiveness studies suggest that at least for colonized patients undergoing cardiothoracic surgery or hemodialysis, prophylactic treatment with mupirocin can save money. Intranasal mupirocin reduces post-operative *Staphylococcus aureus* infection in patients who were nasal carriers preoperatively. While warning against widespread mupirocin use, which promotes resistance, it is thought that "cost-effectiveness studies suggest that at least for colonized patients undergoing cardiothoracic surgery or hemodialysis, prophylactic treatment with mupirocin can save money."<sup>19</sup>

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