

Nasal Carriage Rate of *Staphylococcus aureus* in Hospital Personnel of National Medical College and Teaching Hospital and their Antibiotic Susceptibility Pattern

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ABSTRACT

Nasal carriage of *S. aureus* has been identified as a risk factor for community-acquired and nosocomial infections. Healthy hospital personnel may carry pathogenic hospital strains in their nose and skin and may spread these pathogens to the community leading to more dreadful condition. This study was carried out at National Medical College & Teaching Hospital with the objective to study the nasal carriage of *Staphylococcus aureus* among the staffs at the hospital. A total of 54 nasal swabs were taken from the hospital staff. All the samples were processed following standard microbiological method. Gram positive cocci that were mannitol fermenting, catalase positive and coagulase positive isolates were considered as *S. aureus*. Nasal carriage rate of *S. aureus* among hospital staff was found to be 20.37%. Carriage among male and female staff was 19% and 21.2% respectively ($p > 0.05$). All nasal *S. aureus* isolates were sensitive to Amikacin and Vancomycin. Methicillin resistance rate was found to be 45.5%. High rate of nasal carriage of *S. aureus* indicates need for standard infection control practices to prevent transmission.

Key words: Hospital staff, Nasal Carriage, *S. aureus*

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INTRODUCTION

Staphylococci colonize skin and nasal mucosa as their normal inhabitants. Among staphylococci, *S. 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.^{1,2} Nasal carriage of *S. aureus* has been identified as a risk factor for community-acquired and nosocomial infections.³ Healthy hospital personnel may carry pathogenic hospital strains in their nose and skin and may spread these pathogens to the community leading to more dreadful condition.⁴ Healthcare workers, who have direct contact with persistently colonized patients, or contaminated objects in the immediate environment around them can contaminate their hands and subsequently transmit the organism to other patients. A subset of these will remain as nasal carrier for a prolonged period of time and may spread the organism to patients by direct contact transmission.⁵ The fact that huge portions of healthy population carry *S. aureus* in their nose and body surfaces is responsible for the fast spread of the staphylococcal infections and the situation seems worse in hospitals. So, study of *S. aureus* as nasal carrier is of importance, especially in people concerned with hospitals to explore the clear picture regarding its existence.

S. aureus is carried in the anterior nares of 40% of healthy individuals.⁶ In general; nasal carriage rates among hospital personnel and patient (60-70%) are much higher than those in community carriers (30-50%).⁷ Pant and Rai reported nasal carriage rate of *S. aureus* among the healthcare staffs at Nepal

Medical College, Kathmandu to be 43.8%.⁸ In a similar study carried out at National Medical College and Teaching Hospital, Birgunj, Shakya and co-workers reported nasal carriage rate of 12.5% out of which 57.1% were resistant to methicillin.⁹ In another study carried out at a teaching hospital in Kathmandu, nasal carriage rate of *S. aureus* was reported to be 27.13% among healthcare workers.¹⁰ Studies have found that screening and eradication of nasal carrier for *S. aureus* decrease the incidence of nosocomial infections.^{11,12} In this study we report the nasal carriage rate of *S. aureus* among healthcare workers at National Medical College and Teaching Hospital (NMCTH), Birgunj, Nepal.

MATERIAL AND METHODS

Sample collection: Nasal swabs from 54 healthcare workers at NMCTH, Birgunj were collected during the period of April to June 2011. Nasal swabs were collected from anterior nares of the staffs by using sterile cotton swabs. The swab was introduced 2-3 cm in the nasal cavity and rotated 4-5 times both clockwise and anticlockwise. The swabs were then immediately transported to the laboratory for further processing.

Sample Processing and Bacterial Identification: Specimens were inoculated onto Mannitol salt agar (MSA) and incubated at 37°C for 48 hours. Mannitol fermenting colonies that were yellow or golden yellow were selected and sub-cultured on Nutrient agar (NA). Colonies on Nutrient Agar were subjected to gram's staining, catalase test and coagulase test.

The gram positive, catalase positive and coagulase positive isolates were identified as *S. aureus*.

Antibiotic susceptibility testing: Antibiotic susceptibility testing of all isolates was performed by modified Kirby Bauer disc diffusion method as recommended by CLSI guidelines.¹³ The antibiotics used in the study were Amikacin, Ceftriaxone, Cotrimoxazole, Ciprofloxacin, Gentamycin, Methicillin, Penicillin, and Vancomycin.

RESULT

A total of 54 nasal swabs were taken from Health Care Workers (HCWs), 11 (20.37%) were positive for *S. aureus* (Figure: 1). Twenty one nasal samples were taken from male HCWs and Thirty three samples from female HCWs. The nasal carriage rate in male and female HCWs were found to be 4 (19%) and 7 (21.2%) respectively (Table 1). The nasal samples were collected from different wards. The wards included ICU, HD unit, Surgery ward (male), Surgery ward (female), POW, Medical ward, Orthopedic and OT. However, *S. aureus* growth was obtained only in samples from ICU, Surgery ward (male), Surgery ward (female), POW, Medical ward and OT. The high number of *S. aureus* was isolated from ICU (n=3) followed by female surgery ward (n=2), POW (n=2), OT (n=2), Medical ward (n=1) and male surgery ward (n=1) (Table 2).

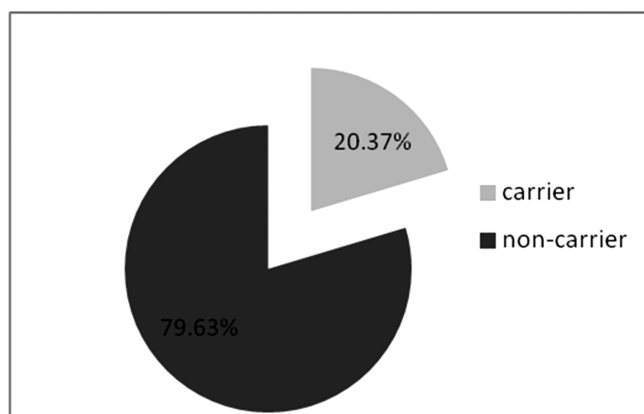


Figure 1: Percentage of nasal carrier and non-carrier of *S. aureus* among staffs under study.

Table 1: Gender-wise distribution of *S. aureus* among health care workers

Gender	Carrier	Non-carrier	Total	p-value
Male	4	17	21	p>0.05
Female	7	26	33	
Total	11	43	54	

All isolates of *S. aureus* from HCWs were subjected for antibiotic susceptibility test. All *S. aureus* isolated from nasal samples were sensitive towards vancomycin and amikacin (Table 3). The resistance rate to erythromycin was 18.2% followed by ceftriaxone (36.4%), gentamycin (27.3%), ciprofloxacin

(36.4%), methicillin (45.5%). Penicillin was found to be the least effective antibiotic with resistance rate of 90.9%.

Table 2: Nasal carriage among staff of different wards

S N.	Wards	No. of Sample	<i>S. aureus</i> isolated
1	ICU	11	3
2	HD	3	0
3	Surgery (male)	7	1
4	Surgery (female)	6	2
5	POW	8	2
6	Medical	7	1
7	Orthopedic	7	0
8	OT	5	2
Total		54	11 (20.37%)

Table 3: Antibiotic susceptibility pattern of *S. aureus*

Antibiotics	Sensitive	Resistant
Penicillin	1 (9.1%)	10 (90.9%)
Methicillin	6 (54.5%)	5 (45.5%)
Ceftriaxone	7 (63.6%)	4 (36.4%)
Amikacin	11 (100%)	0
Gentamycin	8 (72.7%)	3 (27.3%)
Ciprofloxacin	7 (63.6%)	4 (36.4%)
Erythromycin	9 (81.8%)	2 (18.2%)
Vancomycin	11 (100%)	-
Total no of <i>S. aureus</i> isolates	11	

DISCUSSION

The nasal carriage rate of *S. aureus* among HCWs was found to be 20.37%. The carriage rate was higher among female HCWs than the male HCWs ($P>0.05$). In a similar study carried out at National medical college and Teaching Hospital, Birgunj, Shakya and co-workers reported nasal carriage rate of 12.5% among patients, visitors and HCWs with nasal carriage rate among HCWs being 25% which is slightly higher than our finding.⁹ This may be due to the difference in sample size in these studies. Na'was and Fakhoury have reported prevalence of *S. aureus* among general hospital staffs in North Jordan to be 19.8% which is similar to our findings.¹⁴ In another hospital based study, the overall carriage was 34.42 per cent with a significantly higher rate in females (67.53%) than in males (23.81%).¹⁵ Akoua¹⁶ and co-workers conducted a similar study and have reported the carriage rate of *S. aureus* 45.4% whereas Farzana¹⁷ and co-workers have reported carriage rate of *S. aureus* among healthcare workersto be 48%. In other different reports *S. aureus* carriage was 27.5% and 34.9% in health care workers.^{18,19} Pant and Rai reported nasal carriage rate of *S. aureus* among the healthcare staffs at Nepal medical college and teaching hospital to be 43.8%.⁸ In another study carried out at a Tribhuvan University Teaching Hospital, Marajunj, Kathmandu, nasal carriage rate of *S. aureus* was reported to be 27.13% among healthcare workers.¹⁰

S. aureus is one of the most common causes of hospital-acquired infections. It has been found that nasal carriage of *S. aureus* is a well-defined risk factor for subsequent infection in nearly all categories of hospitalized patients. In this study as most of the isolates belonged to the HCWs at ICU, POW, OT, and surgical wards, the vulnerability of the infection *S. aureus* among the patients, following transmission from the healthcare providers, further complicating the treatment and recovery, cannot be ignored. Studies have found that screening and eradication of nasal carrier for *S. aureus* decrease the incidence of nosocomial infections.^{11, 12} Thus surveillance for the determination of carriers and their subsequent treatment for the eradication of the carriers help to significantly decrease the incidence of nosocomial infections. The nasal isolates of *S. aureus* showed a high degree of resistance towards different antibiotics tested. The most effective antibiotic was vancomycin and amikacin

with all isolates being susceptible. Similar results have been reported by Shanmugam *et al.*,²⁰ and by various other workers.^{9, 17} our study showed, 45.5% isolates of *S. aureus* were resistant to methicillin. Shakya *et al.*, have reported a higher rate of resistance of *S. aureus* against methicillin. The difference may be attributed to different sample size in the two studies and also the inclusion of patients and visitor, apart from HCWs, in the study. A high resistance rate was found for ciprofloxacin also which is similar to that reported by Shakya *et al.*, in a similar study at same hospital.⁹ The nasal carriage of methicillin resistant *S. aureus* among HCWs has indicated the chances of transmission of the organism to the patients during patient-care. The healthcare personnel require awareness regarding the nosocomial infection and should know their status of nasal carriage of MRSA and accordingly, take necessary measures to prevent possible transmission.

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