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# Nasal carriage of *Staphylococcus aureus* among the interns before and after posting in the department of surgery at a tertiary care hospital

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## ABSTRACT

**Context:** *Staphylococcus aureus* could be a commensal in the anterior nares of a health-care personnel. There are no studies on *Staphylococcal* nasal carriage among interns before and after posting in the department of surgery. **Aims:** To find out the prevalence of Methicillin-sensitive *S. aureus* (MSSA) and Methicillin-resistant *S. aureus* (MRSA) among interns before and after the surgical posting. **Settings and Design:** A cross-sectional study was carried out on interns at the time of entry and exit from their surgical posting in a tertiary care hospital. **Methods and Material:** Paired nasal swabs, collected at the entry and exit, from anterior nares of 130 interns during their 60-day surgical posting, were cultured, and Methicillin-sensitive *S. aureus* (MSSA) and MRSA were detected. The sensitivity pattern of MRSA strains was determined. The knowledge of spread and prevention of MRSA among interns was assessed. **Results:** MSSA was detected in the anterior nares of 36 (27.7%) interns at entry had dropped significantly to 19 (14.6%) by the end of the surgical posting. The prevalence of MRSA rose from 6 (4.6%) to 8 (6.2%) by the end. Autoinfections among two persistent carriers were detected. Out of 88 interns who had normal flora, 84 (95.5%) retained it after the surgery posting. Among the 14 MRSA strains isolated in the study, 12 (85.7%) were resistant to Ciprofloxacin, 7 (50%) were resistant to Erythromycin, and 4 (28.6%) were resistant to Clindamycin. Almost half of the interns, who responded to a questionnaire, were unaware of the mode of spread of MRSA and measures to prevent it. **Conclusions:** Nineteen (14.6%) interns in our study were intermittent carriers of *S. aureus*. Interns need to be educated on the spread and prevention of *Staphylococcal* infections.

**Key words:** Autoinfection, intermittent carriers, interns, Methicillin-resistant *Staphylococcus aureus* (MRSA), nasal carriage, surgical posting

## INTRODUCTION

*Staphylococcus aureus* is an opportunistic pathogen found as a commensal on skin and mucosa. It is known to cause a range of infections varying in severity. Methicillin-resistant *S. aureus* (MRSA) also poses therapeutic problems as it is resistant to many beta-lactam antibiotics. Health-care workers harbouring *S. aureus* in their anterior nares can transmit the organism to the patients.<sup>[1,2]</sup> In this study, we report the nasal carriage of MSSA and MRSA among interns before and after the surgical posting at a teaching hospital. To date, there are no studies from India on nasal carriage of *S. aureus* during the course of internship.

## MATERIALS AND METHODS

Between March 2011 and May 2012, paired nasal swabs (one at the time of entry, and another at the time of exit) were collected from 130 interns, aged between 22 years and 26 years (67 males and 63 females) posted for 60 days in the department of surgery. Interns with rhinitis and

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sinusitis or those who had received antibiotics recently were excluded from the study.

The swabs were inoculated on Mannitol salt agar, and *S. aureus* colonies were identified by colony morphology, Gram stain, and tube coagulase test.<sup>[3]</sup> MRSA were identified as per the Clinical and Laboratory Standards Institute (CLSI) 2010 guidelines using cefoxitin disc.<sup>[4]</sup> The resistance pattern of MRSA was determined for Chloramphenicol (30 µg), Tetracycline (30 µg), Erythromycin (15 µg), Clindamycin (2 µg), Ciprofloxacin (5 µg), Rifampicin (5 µg), Linezolid (15 µg), and Vancomycin (30 µg) using antibiotic discs (HiMedia, Mumbai, India) by Kirby-Bauer disc diffusion method.

Mupirocin ointment was applied for five days, intranasally twice a day, in those whose initial swab culture grew MRSA and repeat cultures were performed two days after stopping the treatment.

The knowledge of the subjects about the sites of colonization, preventive measures, and treatment of MRSA infections was assessed by administering a questionnaire. Chi-square test was used to calculate the significance of difference in proportions; *P*-value of less than 0.05 was considered significant. Informed written consent was taken from the participants and institutional Ethics Committee of Sri Devaraj Urs Medical College, Kolar, Karnataka.

## RESULTS

Between March 2011 and May 2012, paired nasal swabs (one at the time of entry, and another at the time of exit) were collected from 130 interns, aged between 22 years and 26 years (67 males and 63 females) posted for 60 days in the department of surgery.

At the time of entry, 36 (27.7%) had MSSA and 6 (4.6%) had MRSA. At the time of exit, 19 (14.6 %) had MSSA and 8 (6.2%) had MRSA. The carriage of *S. aureus* in the anterior nares of the residents showed significant reduction (*P* = 0.0488). However, an MRSA carrier rate of 4.6% in the beginning of the surgical posting increased to 6.2% by the end of the posting. Among the six MRSA carriers who were advised topical application of mupirocin after detection in the initial swabs, only four interns lost the MRSA. Thus, by the end of the posting, MRSA persisted in two interns, in spite of the treatment, and another six interns who were not carriers developed MRSA nasal carriage during the posting de novo.

The findings on the culture of the nasal swabs of interns at the time of entry and exit from the surgical posting are

presented in Table 1. The changes in the nasal flora of the participants observed before and after the surgical posting are presented in Table 2.

Among the 88 interns with normal flora in the anterior nares at the beginning of the study, 84 (95.5%) had retained the same. There were 16 interns with MSSA who reverted to normal flora by the end of the posting. Among the six carriers of MRSA in the initial swab, two retained it. Of the two interns who had retained MRSA in their anterior nares, one developed gluteal abscess and another developed popliteal abscess, during their surgical posting. The antibiogram of MRSA isolated from their lesions was the same as that separated from their anterior nares.

All the 14 MRSA strains isolated in the study were sensitive to Vancomycin, Linezolid, Rifampicin, Chloramphenicol, and Tetracycline. Twelve (85.7%) isolates were resistant to Ciprofloxacin, seven (50%) were resistant to Erythromycin, and four (28.6%) were resistant to Clindamycin.

The analysis of the response to the questionnaire is presented in Table 3. To the question on measures to prevent spread of MRSA, 39 (47.6%) interns wrote that they were unaware of the measures and 48 (36.9%) interns did not respond.

**Table 1: Results of anterior nasal swab cultures of interns at entry and exit from surgical posting (n = 130)**

Bacteriological findings	At the beginning of surgical posting		At the end of surgical posting	
<i>Staphylococcus aureus</i>				
MSSA	36 (27.7)		19 (14.6)	
MRSA	6 (4.6)	42 (32.3)	8 (6.2)	27 (20.8)
Normal flora without MSSA and MRSA	88 (67.7)		103 (79.2)	

Figures in parentheses indicate percentage

**Table 2: Changes in the nasal flora among the interns after 60 days of surgical posting (n = 130)**

At the beginning of surgical posting	At the end of surgical posting
a) Normal flora* (n = 88)	Normal flora = 84 (95.5) MSSA = 3 (3.4) MRSA = 1 (1.1)
b) MSSA (n = 36)	Normal flora = 16 (44.4) MSSA = 15 (41.7) MRSA = 5 (13.9)
c) MRSA (n = 6)	Normal flora = 3 (50) MSSA = 1 (16.7) MRSA = 2 (33.3)

\*Normal flora without MSSA and MRSA

Figures in parentheses indicate percentage



**Table 3: Response of the interns to the questionnaire**

Sites of colonization of MRSA (n = 130)			Measures to prevent spread of MRSA (n = 130)		
Responders (n = 83)		Non- responders	Responders (n = 82)		Non- responders
Aware	Unaware		Aware	Unaware	
78 (94%)	5 (6%)	47	43 (52.4%)	39 (47.6%)	48

## DISCUSSION

We found a nasal carriage rate of 32.3% for *S. aureus* among the interns at the time of entry into their surgical posting that reduced to 20.8% at the time of completion. Thus, there was a significant drop in the nasal carriage of *S. aureus*. This was mainly due to a drop in MSSA carrier rate from 27.7% to 14.6% during the surgical posting. The phenomenon of intermittent carriage and loss of *S. aureus* has been well documented.<sup>[2]</sup> Intermittent carriers can account for 60% of the carriers in a population. Nevertheless, it has been shown that intermittent carriers can also pose risk of transmission to others.<sup>[5]</sup> Such transmission becomes important in the context of surgical patients with wounds exposed to interns carrying *S. aureus* in their nares. Almost half of the interns, who responded to the questionnaire in this study, were unaware of the methods to prevent the spread of MRSA. Thus, interns need to be educated regarding the spread of staphylococcal infections and preventive measures for the same such as hand washing, avoiding touching nose when handling patients, and the use of gloves and masks.

Among different groups of health-care providers in India, the MRSA detection rates range from 2% to 6.6%.<sup>[6-8]</sup> In our study, the detection rates of MRSA among residents before and after the surgical posting were 4.6% and 6.2%, respectively. The high prevalence of resistance to Ciprofloxacin and Erythromycin noted among the MRSA isolates observed by us is also similar to that reported from other parts of India.<sup>[9,10]</sup>

The average prevalence of MRSA among health-care workers across different geographical regions is 4.6% in contrast to the prevalence of MSSA which is 23.7%.<sup>[2]</sup> However, more than 50% of the hospital-acquired *S. aureus* infections are caused by MRSA.<sup>[11]</sup> MRSA transmission from the health-care workers to patients has been clearly shown.<sup>[2]</sup> Decolonization of MRSA-carrying health-care workers along with other approaches has successfully terminated nosocomial outbreaks. MRSA-carrying health-care workers also run the risk of clinical autoinfections. Thus, there are recommendations for the screening and

decolonization of health-care workers carrying MRSA with mupirocin.<sup>[2]</sup> There are no such recommendations for the decolonization of MSSA-carrying health-care workers. Decolonization is only recommended for MSSA carrier-patients undergoing procedures who run a high risk of subsequent MSSA autoinfections and ensuing complications.<sup>[11]</sup>

Attempts to eradicate MRSA by topical application of Mupirocin were effective in only four of the six carriers in our study. MRSA persisted in two carriers despite the treatment. However, we could not test the isolates from their anterior nares for the resistance to Mupirocin. After the posting, six (4.6%) interns, who did not have MRSA but had normal flora or MSSA initially, developed nasal carriage of MRSA. It could be related to the activities carried out by interns such as aspirating pus and dressing wounds.

MRSA autoinfection occurred in two interns who were persistent carriers in the study. Such carriers, therefore, should be educated on this possibility, and all efforts should be made to eradicate the organisms from their anterior nares.<sup>[1]</sup>

## CONCLUSION

Our study, thus, highlights the changes that occur in the flora of the anterior nares of interns during their posting in the department of surgery, with special reference to MRSA. The questionnaire helped to show the need to educate them about the spread and prevention of staphylococcal infections in order to prevent autoinfections and cross-infections.

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## Conflicts of interest

There are no conflicts of interest.

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