

## Progressive Rise of Nasal Carriage of MRSA among Health Care Personnel in Eastern India: The Need for Periodic Screening

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Methicillin-resistant *Staphylococcus aureus* (MRSA) has become an established pathogen in most health care facilities worldwide. Health care personnel who are asymptomatic MRSA carrier serve as the major reservoir of MRSA<sup>1</sup>. This can be associated with MRSA transmission to both hospitalized patients and community<sup>2</sup>. The study is aimed at finding out prevalence of nasal carriage of MRSA among hospital personnel and to analyse their antibiogram. Nasal swabs of all personnel involved in direct patient care (n=544) at Institute of Post Graduate Medical Education & Research (IPGME&R), Kolkata, taken. Standard procedures were followed for isolation and antibiotic susceptibility testing of *S. aureus*. MRSA was detected by disc diffusion method, as per Clinical and Laboratory Standards Institute (CLSI) guidelines. Out of 544 samples tested, 182(33.46 %) were nasal carriers of *S. aureus* and 63(34.62%) of them were found to be carriers of MRSA. All MRSA isolates were multidrug resistant but were sensitive to Vancomycin and Linezolid. The high rate of MRSA carriage found in this study indicates potential risk of MRSA transmission. This study suggests need for periodic screening of hospital personnel in order to monitor trends and treatment of carriers.

**Key words:** MRSA, Nasal Swab, Health Care Personnel, Kolkata.

*Staphylococcus aureus* (*S. aureus*), an important human pathogen causing nosocomial infections, colonizes in multiple body sites; anterior nares being the most frequent carriage site. Transmission of *S. aureus* occurs mainly through person to person contact. Methicillin resistant *Staphylococcus aureus* (MRSA) is well known to be a significant risk factor wherever *S. aureus* colonization is present. The incidence of hospital

acquired *S. aureus* infections is rising with increasing emergence of MRSA, a major health problem, causing both asymptomatic colonization and infections ranging from simple folliculitis to life threatening conditions. The incidence and prevalence of MRSA varies widely between countries, geographical regions, hospitals and even wards in the same hospital<sup>1</sup> Recent outbreaks of MRSA infections among hospitalized patients without evident pre-existing risk factors have been reported, suggesting the emergence of hospital acquired MRSA<sup>1,2</sup> This necessitated initiation of the current study for finding out the prevalence of nasal carriage of MRSA among hospital personnel. Antibiogram of isolated MRSA strains were also performed to facilitate patient management.

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## METHODOLOGY

The study was conducted at Institute of Post Graduate Medical Education and Research, Kolkata, a tertiary care hospital in West Bengal between June 2009 to May 2010. All 544 doctors, nurses, other staffs who were directly involved in patient care in Medicine, Surgery, Orthopaedics and Gynaecology departments were the study subjects.

### Bacterial investigations

#### Samples

Nasal swabs were collected by repeatedly swabbing circularly both anterior nares with sterile cotton-tipped moistened swabs and placing the swabs into tubes of transport media or sterile normal saline and kept at 4° C. The swabs were inoculated and streaked on to Mannitol salt agar and Blood agar plates and incubated aerobically at 37° C for up to 72 hours. Mannitol fermenting yellow colonies on Mannitol salt agar and beta haemolytic golden yellow colonies on Blood agar was Gram stained and further screened for

identification as *S. aureus* following conventional procedures. Colony morphology, Catalase test, Slide coagulase test, Tube coagulase test were used for identification. In Deoxyribonuclease test, the test organism is streaked onto the DNA agar medium (0.2% DNA). Then the DNA plate is incubated overnight at 37° C. After incubation, 3.6% hydrochloric acid is added to the medium to determine the DNase activity. Organism produces halo around the growth, indicating hydrolysis of DNA<sup>3,4,5</sup>

*S. aureus* ATCC 25923 and MRSA ATCC 33591 strains were used as quality control reference strains. Methicillin resistance was tested according to CLSI guidelines with Kirby-Bauer disc diffusion method using a 1 µg Oxacillin disc. Zone diameter on Muller Hinton agar was measured after incubation at 37° C for 24 hrs. Strains with zone diameter less than 10 mm. were regarded as Methicillin resistant<sup>4,5</sup>. Antimicrobial susceptibility testing of MRSA strains were done by Kirby Bauer's disc diffusion technique, following CLSI guidelines. Antibiotics used were, Cephalexin (10

**Table 1.** Distribution of *S. aureus* nasal carriers according to gender. (n=544)

Health Care Personnel	<i>S. aureus</i> Positive			<i>S. aureus</i> Negative			Total No.(%)
	Male No.(%)	Female No.(%)	Total No.(%)	Male No.(%)	Female No.(%)	Total No.(%)	
Doctors	31(21.53)	7(4.86)	38(26.39)	71(49.31)	35(24.31)	106(73.61)	144(100.00)
Nurses	--	48(26.67)	48(26.67)	--	132(73.33)	132(73.33)	180(100.00)
Other Health Care Workers	74(33.64)	22(10.00)	96(43.64)	83(37.73)	41(18.64)	124(56.36)	220(100.00)
Total	105(19.30)	77(14.15)	182(33.46)	154(28.31)	208(38.24)	362(66.54)	544(100.00)

**Table 2.** Distribution of MRSA and Methicillin sensitive *S. aureus*. (n=182)

Health Care Personnel	MRSA No.(%)	MSSA No.(%)	Total No.(%)
Doctors	12(31.58)	26(68.42)	38(100.00)
Nurses	14(29.17)	34(70.83)	48(100.00)
Other Health Care Workers	37(38.54)	59(61.46)	96(100.00)
Total	63(34.62)	119(65.38)	182(100.00)

**Table 3.** Antibiotic sensitivity pattern of MRSA isolates. (n=41)

Antibiotics	Sensitive	Resistant
Cephalexin	--	41
Ofloxacin	--	41
Fusidic acid	--	41
Penicillin	--	41
Vancomycin	41	--
Erythromycin	--	41
Gentamycin	--	41
Linezolid	41	--
Teicoplanin	--	41
Amikacin	--	41
Clindamycin	--	41

µg), Ofloxacin (5 µg), Fusidic acid (10 µg), Penicillin (10 µg), Vancomycin (30 µg), Erythromycin (15 µg), Gentamycin (10 µg), Linezolid (30 µg), Teicoplanin (30 µg), Amikacin (30 µg), Clindamycin (2 µg).

## RESULTS

Among 544 total study subjects, 182 (33.46 %) were nasal carriers of *S. aureus*. Out of *S. aureus* carriers, 105 (57.69 %) were male, 77 (42.31 %) were female. The prevalence of *S. aureus* nasal carriers was 26.39% among doctors and 26.67% was in nurses. But the prevalence of *S. aureus* nasal carrier was higher in other health care workers (43.64%) compared to doctors and nurses. [Table 1] The prevalence of *S. aureus* carrier was higher in male doctors compared to lady doctors. Out of 182 nasal carriers of *S. aureus*, 63 (34.62 %) carried MRSA and 119 (65.38 %) carried Methicillin sensitive *Staphylococcus aureus* (MSSA). [Table 2] All MRSA isolates were multidrug resistant but all were sensitive to Vancomycin and Linezolid. [Table 3].

## DISCUSSION

*S. aureus* is a common nosocomial pathogen of growing concern due to multidrug resistant clones of MRSA. Unrecognised colonization of *Staphylococcus* on the skin or mucous membranes may be significant reservoir accounting for the spread of MRSA infections. The nasal colonization of MRSA in health care workers and transient carriage on the hands of health care workers is the predominant mode for patient to patient transmission<sup>1,2</sup> Asensio *et al.* showed that the prevalence of MRSA related nosocomial infections had increased from 22% to 41% within the last decade<sup>6</sup> The study of Citak *et al.*, showed overall prevalence of nasal carriers of *S. aureus* and MRSA were 24.2% and 23.6% respectively<sup>1</sup> The study of Kumar *et al.*, showed, 78.6% healthcare workers were positive for *S. aureus*. Out of them 60.6% were Coagulase Positive Staphylococci (CoPS) and 39.3% were Coagulase Negative Staphylococci (CoNS). Among CoPS 45% were found to be resistant to methicillin. Nasal carriage of MRSA among doctors and technicians were 83.8% and 16.6% respectively<sup>7</sup> The study of Kakhandki and Peerapur, showed 43.6% healthcare

workers were positive for *S. aureus*; out of which, 12% were MRSA. The overall carriage rate of MRSA was 12% with the highest rate being seen among the nursing staff (12.2%) and clinical staff carriage rate was slightly less (11.7%) as compared to the nursing staff<sup>8</sup>. The current study showed, 33.46% hospital staffs were nasal carriers of *S. aureus*; male prevalence (57.69%) being more than female (42.31%). Among nasal carriers of *S. aureus* 34.62% carried MRSA. High prevalence of MRSA among health care staffs as seen in this study is similar with other study. The study of Perwaiz S *et al.* showed MRSA were resistant to most antibiotics except Vancomycin, Teichoplanin, Fusidic acid, Amikacin<sup>9</sup>. Similarly, the current study showed, all MRSA isolates were multidrug resistant but all were sensitive to Vancomycin and Linezolid.

Although, nasal carriage of *S. aureus* is harmless in healthy individuals, health care worker may become carriers who could pose the risk of spreading nosocomial infections and infections to the community at large.

## CONCLUSION

Hospital staff is at high risk in terms of MRSA carriage. Patients can acquire MRSA after hospitalization. Therefore, even a tertiary referral hospital can be the source of methicillin resistance as well as transmission of the resistance. Screening for methicillin resistant strains of Staphylococci among healthcare workers and antibiotic sensitivity testing of MRSA strains should be adopted as a protocol in tertiary care hospitals, in order to curb the spread of drug resistant Staphylococci from the hospital to community.

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