

## Screening for Methicillin Resistant Staphylococcus aureus (MRSA) colonization in health care workers, working in critical care areas at a tertiary care hospital, Karnataka, India

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### Abstract

**Introduction:** Rise of MRSA infection in hospitals is a matter of concern. MRSA infection in hospitals is acquired either by MRSA colonizers i.e. health care worker or fomites which are heavily contaminated with MRSA. It is necessary to detect MRSA carriers among health care workers in order to cut down the increasing rate of MRSA infection in hospitalized patients, especially in intensive care units.

**Aims & objectives:** To find the MRSA carriage rate among health care workers in intensive care units. To find out the antibiotic susceptibility pattern in these MRSA isolates.

**Materials & methods:** Hand & nasal swabs were collected from the health care workers of critical care units. The isolation of MRSA & their antimicrobial susceptibility were carried out by standard bacteriological procedures.

**Result:** MRSA carriage rate was 6.35% by nasal swab method whereas it was 4.76% by hand swab method. MRSA isolates were resistant to most of the antibiotics.

**Conclusion:** Strict adherence to infection control practices is the single most important factor in preventing MRSA infection. Simple preventive measures like hand washing before & after patient examination, the use of sterile aprons & masks can reduce the disease transmission rate considerably.

**Key words:** MRSA, health care workers, nasal carriage

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### Introduction

*Staphylococcus aureus* is one of the most versatile nosocomial pathogen<sup>[1]</sup>. Because of the widespread use of penicillin, MRSA emerged as a major pathogen world-wide. Several surveys have confirmed that the incidence of MRSA varies by region; during the last 20 years, the proportion of isolates, resistant to methicillin has ranged from 0% to 30% all over the world.<sup>[2,3,4,5]</sup> In recent years, MRSA has become a particularly significant problem in the hospitals in India. In one of the studies conducted in a tertiary care hospital in India, MRSA carriage rate ranged between 28.4% in outpatients to 33.5% in in-patients.<sup>[6]</sup> MRSA is often seen in tertiary care hospitals with special care units such as burns, surgical, pulmonary and trauma units. This leads to increased mortality risk & prolonged hospital stay resulting in increased financial burden as compared to those who do not have MRSA infection.<sup>[7]</sup>

MRSA is usually introduced into an institution by a colonized or infected patient or health care workers (HCW). Modes of transmission include transient

colonization of hospital staff and contact with heavily contaminated fomites and environmental surfaces around the infected patient. Approximately 25- 30% of HCW carry this organism on their skin and in their nostrils. Thus in most of the situations HCW acts as a vector for acquisition of MRSA infections. Anterior nares are the main reservoir of MRSA, although other body sites are frequently colonised such as hands skin, axillae and intestinal tract.<sup>[8,9]</sup> Nasal carriage of MRSA serves as a significant risk factor in acquiring the infection.<sup>[10,11]</sup> Nasal carriage rate of MRSA has been reported to be 0.8% - 3% among the community whereas in HCW it ranges from 6% -17.8%.<sup>[11,12,13]</sup> Identification of healthcare workers colonized with MRSA, educating them with infection control practices along with their treatment becomes very helpful in reducing the transmission & controlling the spread of MRSA.<sup>[8,14]</sup>

The present study was carried out to find the MRSA carriage rate among HCW in intensive care units and to find out the antibiotic susceptibility pattern in these MRSA isolates.

### Materials and Methods

The prospective study was conducted at a tertiary care teaching hospital at Belagavi(North Karnataka). The study was approved by the research ethical committee of the institute. HCW in critical care units were approached during their day shifts. Samples were

collected using a sterile cotton swab from nostrils & palms only after taking their informed consent. All the information collected was kept confidential. After collection of these swabs, they were transported to microbiology laboratory for processing. In the laboratory, the swabs were cultured on 10% blood agar medium & were incubated at 37°C for 24 hrs. Following day *Staphylococcus aureus* was identified using colony morphology, gram staining, catalase test, the slide & tube coagulase test.<sup>[15]</sup> MRSA were detected by the disc diffusion method by using cefoxitin (30mcg) and antibiotic sensitivity testing was performed by disc diffusion method for penicillin,

gentamicin, cotrimoxazole, erythromycin, tetracycline, teicoplanin and netilmicin with *S. aureus* ATCC 25923 as control. Vancomycin susceptibility testing was performed by using E test with *S. aureus* ATCC 29213 as control.<sup>[16]</sup>

### Results

A total of 126 samples from 63 HCW (63 hand swabs and 63 nasal swabs) were included in this study. Table 1 shows the results obtained in the types of specimens noted above.

**Table 1: Shows different types of isolates obtained from nasal & hand swabs**

	Isolates from Nasal swabs	Isolates from hand swabs	$\chi^2$	P value
<b>MRSA</b>	4(6.35)	3(4.76)	0.14	>0.05
<b>MSSA</b>	50(79.36)	40(63.49)	1.12	>0.05
<b>CONS</b>	8(12.70)	7(11.11)	0.06	>0.05
<b>Sterile</b>	1(1.59)	13(20.64)	10.28	<0.001
<b>Total</b>	<b>63</b>	<b>63</b>		

From nasal swab, total *Staphylococcus aureus* isolated were 54 from 63 samples. Total percentage was 85.69%, MRSA carriage being 6.35%.

From hand swab, total *Staphylococcus aureus* isolated were 43 from 63 samples. Total percentage was 68.25%, MRSA carriage being 4.76% [Table 1]. We found total 4 colonizers, out of which 2 were doctors and 2 were nurses [Table 2].

**Table 2: Nasal Carriage among different categories of HCW**

Result	Doctors	Nurses	Other	Total
Positive	02	02	-	4
Negative	19	36	4	59

Majority of MRSA isolates were resistant to most of antibiotics except tetracycline netilmicin vancomycin and teicoplanin [Table 3].

**Table 3: ABST pattern of MRSA samples**

Antibiotics	Nose samples (4 samples)		Hand samples (3 samples)	
	Sensitive	Resistant	Sensitive	Resistant
Penicillin	0	4	0	3
Erythromycin	0	4	0	3
Azithromycin	0	4	0	3
Vancomycin	4	0	3	1
Gentamicin	0	4	0	3
Cotrimoxazole	0	4	0	3
Tetracycline	4	0	3	0
Teicoplanin	2	2	1	2
Netilmicin	4	0	3	0

## Discussion

In our study, 126 samples were studied of total of 63 health care workers for MRSA. 6.35% of MRSA carriers were detected from nasal swab whereas 4.76% were detected from hand swabs. Several studies showed variable prevalence ranging from 0% to 30%.<sup>[2,3,4]</sup> We comparatively found lower prevalence of MRSA in our study. This variation of results amongst various studies could be because of multiple factors such as sampling site, the frequency & timing of health care worker screening.<sup>[17]</sup>

In some of the studies, samples were collected from anterior nares whereas some studies both anterior nares and hand samples were collected. Probability of isolation of MRSA increases with both anterior nare and hand sample collection, though in our study there was no significant difference (P value >0.05).

Sample collection only by single trained personnel also increases the chances of isolation as variation in sample collection is minimised with such practice. Lastly MRSA colonisation is often transient, so timing of collection also affects isolation rates.

In our study only a single trained personnel was allotted for this work to minimise the errors but distinction between transient and permanent colonisation was not possible with our study.

There was no significant difference in antibiotic sensitivity pattern of isolates from nose and hands. All the isolates were sensitive to vancomycin, netilmicin and tetracycline. Carriers are treated with mupirocin local application and rifampicin for systemic treatment.

Our study was mainly intended to screen health care worker in critical care units as these patients are more vulnerable to new infection as compared to others. This finally will lead to increased mortality rate. Further studies are required to find out prevalence of colonization among all health care workers in the hospital. Also we did not conduct a molecular analysis of MRSA strains isolated during study period.

Thus to conclude, health care professionals act as a potential source of infection to their patients, resulting in their extended stay in the hospital. This can be controlled by the regular screening of the health care workers and by taking the appropriate preventive measures like hand washing, use of masks & aprons etc. Also the HCW should be periodically educated & trained about maintained of hygiene & infection control practices.

**Conflict of Interest: None**

**Source of Support: Nil**

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