

## Nasal Colonization of Staphylococcus Aureus, MRSA and VRSA among Health care workers in a tertiary care hospital

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**Objective:** This study was proposed to determine the nasal carrier rate of Staphylococcus aureus among different health care professionals working in our hospital and identify MRSA and VRSA.

**Material and methods:** Nasal swabs were collected from the healthcare workers of various clinical departments and labs of the hospital over six months. Staphylococcus aureus was isolated, and their antimicrobial susceptibility patterns along with MRSA and VRSA were identified; a total of 310 nasal swabs were collected and processed. **Results:** Out of 310 nasal swabs, 85 (27.41%) had positive growth for Staphylococcus aureus. Among them, 32 (35.55%) were nursing staff, 43 (28.66%) non-nursing ward staff and 10 (14.28%) lab, technicians. MRSA was isolated 07 (21.8%) from nursing professionals, 10 (23.25%) from non-nursing ward staff and 02 (20%) from lab technicians. None of the strains was found to be VRSA. **Conclusion:** Health care workers are always at risk of nosocomial infection. Proper aseptic precautions with standard antibiotic policy and improved personal hygiene wounds are paramount in controlling nosocomial infections among health care workers.

**Keywords:** MRSA, VRSA, Nasal swab, Health Care Worker

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## Introduction

Health care workers are always at risk of nosocomial infections. Nasal colonization by *Staphylococcus aureus* is a well-known fact and lead to the spread of diseases to others. MRSA is a major nosocomial pathogen that causes severe morbidity and mortality worldwide [1]. It has emerged as one of the commonest causes of hospital-acquired infection and remains an essential factor contributing to the failure of management [2]. The nasal carriage of *S. aureus* appears to play a key role in the epidemiology and pathogenesis of infection [3]. HCWs at the interface between the hospital and the community may serve as agents of cross-contamination of hospital-acquired and community-acquired MRSA [4]. Knowledge of the prevalence of MRSA and its antimicrobial profile is necessary to select the appropriate empirical antimicrobial treatment for *S. aureus* infections [5]. In particular, screening for and eradication of MRSA from colonized HCWs have been recognized and recommended as an important part of a comprehensive infection control policy for this organism.

In this follow up study, we report the prevalence of *S. aureus* and MRSA carriage in a larger group of HCWs from GMC Ratlam hospital, Ratlam, MP with emphasis on its distribution based on different health care professions. Furthermore, we describe the antibiotic susceptibility patterns of the *S. aureus* and MRSA isolates. The study outcomes help formulate an MRSA infection control policy in hospitals of the GMC Ratlam, MP.

## Materials and Methods

This study was conducted over health care workers working in a tertiary care centre hospital in various departments. A nasal swab was collected from doctors, ward boys and different technicians and staff working in a hospital laboratory. The duration of the study was six months. All the samples were collected from healthy persons. Persons with any associated disease or co-morbidities were excluded from the study. Nasal swabs from anterior nares were taken only from those who were not having any clinical signs and symptoms of infections.

Procedure: After proper consent, a sterile swab was inserted carefully in both the nostrils and rolled gently 4-5 times. The swab was transported immediately for culture over appropriate media for *Staphylococcus aureus*. The organism cultured was analyzed, and identification of *Staphylococcus aureus* was by colony morphology and standard biochemical tests. Antimicrobial susceptibility testing was done by Kirby-Bauer disk diffusion method with special consideration for detecting MRSA and VRSA. Growth inhibition zone diameters were measured in millilitres, and results were interpreted as recommended by the Clinical laboratory standards institute (CLSI) guidelines. Minimal inhibitory concentration (MIC) determination was done by the Broth microdilution technique and was interpreted as per CLSI guidelines.

**Consent:** Written consent was obtained from the relatives of patients after explaining to them the nature and purpose of the study. They were assured that confidentiality would be strictly maintained. The option to withdraw from the study was always open.

**Statistical Analysis:** After getting the required information, the collected data were coded, tabulated and analyzed. The various statistical techniques, i.e. the mean, standard deviation and test of significance (t-test and chi-square test), were used for drawing valid conclusions. Statistical analysis was done using the Student t test. SPSS 13.0 software was used to calculate the p-value.  $P < 0.05$  was taken as statistically. A descriptive analysis was done on all variables to obtain a frequency distribution. The mean + SD and ranges were calculated for quantitative variables. The Student t-test compared continuous variables. Proportions were analyzed with the chi-square test.

## Results

In the present study, out of 310 nasal swabs of health care personnel, 85 (27.41%) had positive growth for *Staphylococcus aureus* on the culture of their nasal swab. Among them, 32 (35.55%) were nursing staff, 43 (28.66%) in persons involved in non-nursing ward staffs like ward boys, dressers, sweepers etc. and 10 (14.28%) were among lab technicians. (Table-1)

In the present study, health care workers posted in ICU were found to carry more Staphylococcus aureus in their nares than those posted in general wards. Out of 32 nursing staff with S.aureus, 14 (43.75%) were posted in ICU, while 10 (31.23%) were in general wards. The positive isolates among non-nursing ward staff were 41.86% in ICU and 30.23% among general ward. (Table-2)

MRSA was isolated 07 (21.8%) from nursing staff, 10 (23.25%) from non-nursing ward staff and 02 (20%) from lab technicians. MRSA was found among 21.8 % among nursing staff while 23.25 % among non nursing ward staff. Two lab technicians were also found to carry MRSA strain. None of the strains was found to be VRSA. (Table-3)

**Table-1 Staphylococcus Aureus Isolated Among Health Care Workers**

Health Care Personnel	Sample Collected	Staphylococcus aureus ISOLATED
Nursing Staffs	90	32 (35.55%)
Non nursing Ward Staffs	150	43 (28.66%)
Lab Technicians	70	10 (14.28%)
Total	310	85 (27.41%)

**Table-2. Department Wise Distribution of Staphylococcus Aureus**

Department	Nursing Staffs	Non nursing Ward Staffs	Lab Technicians
Icu	14 (43.75%)	18 (41.86%)	00
General Ward	10 (31.25%)	13 (30.23%)	00
Opd	08 (25%)	12 (27.90%)	00
Total	32	43	10

**Table-3. Different Strain of Staphylococcus Aureus Isolated**

#### Among Health Care Workers

Health Care Personnel	MSSA	MRSA	VRSA
Nursing Staffs	25 (78.12%)	07 (21.8%)	0
Non nursing Ward Staffs	33(76.74%)	10 (23.25%)	0
Lab Technicians	09(80%)	02 (20%)	0

## Discussion

Resistance to antimicrobial agents is a primary concern worldwide and is exemplified by the global spread of the Methicillin-resistant Staphylococcus aureus (MRSA). Health care workers (HCWs) and

Asymptomatically colonized patients are important sources of nosocomial MRSA infections. They colonized with Staphylococcus aureus may transmit the organism to patients and the community. This study was carried out to determine the rate of nasal colonization of Methicillin-resistant Staphylococcus aureus (MRSA) and Vancomycin-resistant Staphylococcus aureus (VRSA) among healthcare providers.

Nasal Colonization of Methicillin-Resistant Staphylococcus aureus among Healthcare Providers in a Tertiary Care Hospital, Bangladesh was studied by Taz KA. This cross-sectional study was conducted among healthcare providers in a tertiary care hospital, Bangladesh. Nasal swabs from anterior nares of 250 physicians, nurses, and helping staff working in Dhaka Medical College Hospital were analyzed. Methicillin resistance among MRSA was detected by disc diffusion technique using oxacillin, cefoxitin disc and MIC of oxacillin and methicillin resistance was confirmed by PCR detecting mec-A gene. Nasal colonization by S. aureus was found among 23.2% of healthcare providers, and 7.2% were colonized with MRSA, and no VRSA was detected. MRSA colonization was detected among 5% physicians, 6.43% nurses and 16.67% of helping staff. Isolated MRSA strains were highly resistant to ciprofloxacin (88.9%), gentamicin (77.8%), erythromycin (72.2%) and Co-trimoxazole (72.2%). All the isolated MRSA were sensitive to linezolid and vancomycin. Mondal H et al., In a similar study, did the nasal screening of healthcare workers for nasal carriage of methicillin-resistant staphylococcus aureus, vancomycin resistance staphylococcus aureus and prevalence of nasal colonization with Staphylococcus aureus in Burdwan Medical College and Hospital. [1,2].

El Aila NA et al. studied nasal carriage of methicillin-resistant staphylococcus aureus among health care workers at Al Shifa hospital in Gaza Strip. This study aimed to determine the nasal carriage rate of S. aureus and MRSA among Health Care Workers (HCWs). A cross-sectional study was conducted on 200 HCWs. Nasal swabs were collected and cultured on blood and mannitol salt agar. The isolates were identified as S. aureus based on morphology, coagulase test, DNase test and mannitol salt agar fermentation. Of the 200 healthcare

Workers, 62 (31%) carried *S. aureus*, 51 (82.3%) were MRSA. Therefore, 25.5% of all HCWs were identified as MRSA carriers. MRSA carriage rate was highest among nurses (30.4%), whereas the carriage rate among doctors was (16%). Penicillin showed the highest rate of resistance among MRSA and MSSA isolates (100%).[3]

A study on antimicrobial resistance profile of methicillin-resistant *Staphylococcus aureus* colonizing the anterior nares of healthcare workers and outpatients attending the remotely located tertiary care hospital of North India by Singh S et al. To determine the prevalence of MRSA colonization, two hundred HCWs and 200 consecutive outpatients attending our tertiary care hospital were studied. The nasal carriage of MRSA among HCWs was found to be 7.5% and in outpatients 3%. All strains of MRSA from HCWs and outpatients grew on three selective media, and the *mecA* gene was amplified in all of them. All the isolated strains of MRSA showed a high degree of resistance to co-trimoxazole (93.3%), ciprofloxacin (80%) and erythromycin (66.66%). However, there was 100% susceptibility to vancomycin, teicoplanin, linezolid and Rifampicin. It could be assumed that the transmission from colonized healthcare workers is responsible, at least in part,, for MRSA infection among patients. Therefore emphasis should be laid on strict implementation of standard infection control practices, which would help minimize the carriage and transmission of MRSA in the hospital. [4]

Sharma A et al. did screening for methicillin-resistant *Staphylococcus aureus* carriage on the hands of healthcare workers: an assessment for hand hygiene practices. This study was conducted to detect the carriage of MRSA in the hands of HCWs during patient care to check awareness among HCWs to follow proper hand hygiene protocol. This study was a cross-sectional point prevalence study done in wards and intensive care units (ICUs) of a tertiary care hospital. Hand cultures were collected from HCWs after the clinical rounds without prior information about the procedure. Regular monitoring of hand hygiene compliance is vital to prevent the spread of nosocomial infections. The MRSA screening agar is rapid, simple, cost-effective, and valuable to identify the carriage of MRSA in the hands of HCWs.[5].

## Conclusion

Periodic screening of healthcare providers should be done to find out MRSA carrier and should be treated accordingly to terminate the chain of transmission of the multi-drug resistant organism. Methicillin-resistant *Staphylococcus aureus* (MRSA) is capable of causing a wide range of infections. Colonized healthcare workers (HCWs) and contaminated hand-touch surfaces act as potential sources of MRSA in hospitals.

### What This Study Add To Existing Knowledge

Nasal carriage of *Staphylococcus aureus* among hospital personnel is a common cause of hospital-acquired infections. The emergence of drug-resistant strains, especially methicillin-resistant *S. aureus* (MRSA), is a severe problem in a hospital environment. The high rate of nasal MRSA carriage among healthcare workers found in this study is alarming. It highlights the need for adjusted infection control measures to prevent MRSA transmission from HCWs to vulnerable patients.

### Contribution By Different Authors

**First and Corresponding Author** Dr Shivani Sinha Demonstrator, Department of Microbiology Government Medical College, Ratlam drshivani1705@gmail.com Data collection and statistical analysis **Second author** Dr Atul Kumar Associate Professor, Department of Surgery, Government Medical College, Ratlam Concept and data collection.

## Reference

01. Taz KA, Jobayer M, Shamsuzzaman SM. Nasal Colonization of Methicillin-Resistant *Staphylococcus aureus* among Healthcare Providers in a Tertiary Care Hospital, Bangladesh. *Mymensingh Med J.* 2019 Jul;28(3):627-633. [[Crossref](#)][[PubMed](#)] [[Google Scholar](#)]
02. Mondal, Himadri, et al. Nasal screening of healthcare workers for nasal carriage of methicillin resistance *staphylococcus aureus*, vancomycin resistance *staphylococcus aureus* and prevalence of nasal colonization with *staphylococcus aureus* in Burdwan Medical College and Hospital. *Int J Contemp Med Res* 3. 11 (2016): 3342-6. [[Crossref](#)] [[PubMed](#)][[Google Scholar](#)]

03. El Aila NA, Al Laham NA, Ayesb BM. Nasal carriage of methicillin resistant Staphylococcus aureus among health care workers at Al Shifa hospital in Gaza Strip. BMC Infect Dis. 2017 Jan 5;17(1):28. doi: 10.1186/s12879-016-2139-1 [Crossref][PubMed][Google Scholar]

04. Singh S, Malhotra R, Grover P, Bansal R, Galhotra S, Kaur R, Jindal N. Antimicrobial resistance profile of Methicillin-resistant Staphylococcus aureus colonizing the anterior nares of healthcare workers and outpatients attending the remotely located tertiary care hospital of North India. J Lab Physicians. 2017 Oct-Dec;9(4):317-321. doi: 10.4103/JLP.JLP\_8\_17 [Crossref][PubMed][Google Scholar]

05. Sharma A, Kalita JM, Nag VL. Screening for Methicillin-resistant Staphylococcus aureus Carriage on the Hands of Healthcare Workers: An Assessment for Hand Hygiene Practices. Indian J Crit Care Med. 2019 Dec;23(12):590-592. doi: 10.5005/jp-journals-10071-23296 [Crossref][PubMed][Google Scholar]