Section: Microbiology

Original Research Article

PREVALENCE OF METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS NASAL CARRIAGE AMONG HEALTHCARE WORKERS OF CRITICAL CARE UNITS IN A TERTIARY CARE HOSPITAL

Jisa J S[1], Jijith J S[2], Meena Jinwal[3], Sadhna Sodani[4], Manish Purohit[4]

[1]*PG Resident, Department of Microbiology, M.G.M. Medical College, Indore, Madhya Pradesh, India*
[2]*PG Resident, Department of Forensic Medicine, M.G.M. Medical College, Indore, Madhya Pradesh, India*
[3]*Assistant Professor, Department of Microbiology, M.G.M. Medical College, Indore, Madhya Pradesh, India*
[4]*Associate Professor, Department of Microbiology, M.G.M. Medical College, Indore, Madhya Pradesh, India*

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Corresponding Author:
Dr. Jisa J S,
PG Resident, Department of Microbiology, M.G.M. Medical College, Indore, Madhya Pradesh, India.
Email: jisajesus@gmail.com

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ABSTRACT

Background: Screening for MRSA in hospitals plays a vital role in early detection and maintaining effective infection control. As MRSA can be present in individuals without causing any symptoms, regular screening especially of high-risk patients and healthcare personnel is crucial for identifying asymptomatic carriers who might otherwise spread the infection. This study aims to establish the prevalence of Methicillin-Resistant Staphylococcus aureus (MRSA) nasal carriage among healthcare workers in the critical care units of a tertiary care hospital. The primary objective is to assess the extent of MRSA nasal carriage in healthcare workers and the secondary objectives, is to increase awareness among HCWs about MRSA nasal carriage through targeted education initiatives.

Materials and Methods: Nasal swabs were collected from the anterior nares of healthcare workers using sterile swabs pre-moistened with peptone water. The swabs were transported to the microbiology laboratory and inoculated onto blood agar plates. Isolates were identified through Gram staining, followed by biochemical tests including catalase, slide and tube coagulase, and mannitol fermentation tests. Methicillin resistance was confirmed using the Kirby-Bauer disc diffusion method with a 30 µg cefoxitin disc according to CLSI guidelines (M100, 35th edition, 2025). Minimum inhibitory concentrations (MICs) for vancomycin were determined using the E-test. Healthcare workers identified as MRSA nasal carriers were advised topical treatment with 2% mupirocin ointment, applied three times daily for five days.

Results: A total of 230 healthcare workers were screened for MRSA nasal carriage. The prevalence of MRSA was 11.2%.MRSA carriage was notably higher in M.Y. Hospital (14.97%) compared to S.S.H Hospital (1.58%). Among professional groups, nurses had the highest MRSA carriage rate (19%), followed by doctors (11.47%), other hospital staff (8.1%), and nursing students (7.1%). The Medicine ICU recorded the highest MRSA prevalence (17%), followed by the Surgical ICU (12%), while several other ICUs showed no MRSA cases. Following mupirocin treatment, 92% of MRSA-positive individuals showed successful decolonization, though 8% remained carriers. These findings underscore the importance of regular screening, targeted decolonization, and ongoing education to reduce MRSA transmission among healthcare workers in critical care settings.

Conclusion: This study highlights a significant prevalence of MRSA nasal carriage among healthcare workers in critical care units, particularly among nurses and in high-risk areas like the Medicine ICU. The successful decolonization observed in the majority of MRSA-positive individuals

following mupirocin treatment demonstrates its effectiveness. However, persistent colonization in a small percentage emphasizes the need for continued surveillance. Regular screening, targeted decolonization, and ongoing education on infection control practices are essential to minimize MRSA transmission and enhance patient safety in tertiary care settings.
Keywords: Nasal Carriers, Mupirocin, Methicillin resistant Staphylococcus aureus (MRSA).

INTRODUCTION

Staphylococcus aureus is a versatile pathogen known for its ability to colonize both asymptomatic healthy individuals and hospitalized patients. These asymptomatic carriers, especially in healthcare environments, can act as vectors, facilitating the spread of Methicillin-Resistant Staphylococcus aureus (MRSA) within hospitals.[1] Healthcare workers (HCWs), due to their interactions with patients across critical care units, long-term care facilities, and community settings, are at particular risk of becoming reservoirs or transmission agents of MRSA.[2]

MRSA is a strain of S. aureus resistant to all beta-lactam antibiotics, including penicillins and cephalosporins, with the exception of ceftobiprole and ceftaroline.[3] Many strains also exhibit resistance to aminoglycosides, making infections harder to treat. MRSA is now one of the leading causes of both healthcare-associated (HA-MRSA) and community-associated (CA-MRSA) infections globally.[4] Most infections are endogenous, arising from an individual's own colonizing flora, and can result in a range of clinical manifestations including skin and soft tissue infections, osteomyelitis, pneumonia, infective endocarditis, and other pyogenic conditions.[5]

Asymptomatic MRSA carriage among HCWs, especially in high-risk areas like ICUs, remains a significant concern. Studies have reported MRSA carriage rates among healthcare personnel ranging from 4.6% to 5.1% over the past decades.[6-8] In India, the overall prevalence of MRSA was estimated at 37% during 2015–2020,[9] reflecting a serious public health burden. Additionally, the growing incidence of CA-MRSA, once confined to community settings, is now leading to outbreaks in hospitals, even among healthy individuals with no traditional risk factors.[10] Frequent screening and decolonization strategies are therefore essential to interrupt the transmission chain of MRSA. HCWs play a pivotal role—not always as the source of infection, but often as carriers or vectors who may unknowingly contribute to nosocomial outbreaks.[11]

This study aims to evaluate the prevalence of nasal MRSA carriage among healthcare workers in critical care units of a tertiary care hospital, with the goal of informing better infection control practices and reducing the spread of MRSA in healthcare settings.

MATERIALS AND METHODS

This prospective, cross-sectional study was conducted over one year in the Department of Microbiology at Mahatma Gandhi Memorial Medical College and its affiliated hospitals in Indore (M.P). The study aimed to determine the prevalence of MRSA nasal carriage among healthcare workers in critical care units. A minimum sample size of 230 was calculated using Cochran's formula. Eligible participants included doctors, nurses, and support staff working in critical care units. Exclusion criteria encompassed individuals with recent nasal surgery, upper respiratory tract infections, ongoing or recent antibiotic therapy, or those who declined consent.

Nasal swabs were collected aseptically from the anterior nares using sterile swabs pre-moistened with peptone water. Samples were cultured on blood agar, and colonies with typical morphology were subjected to Gram staining and standard biochemical tests (catalase, coagulase, and mannitol fermentation) for identification of Staphylococcus aureus. Antimicrobial susceptibility testing (AST) was performed using the Kirby-Bauer disc diffusion method on Mueller-Hinton agar, following CLSI guidelines (M100, 34th ed., 2024). Additionally, MIC values for vancomycin were determined using the E-test method.

RESULTS

A total of 230 healthcare workers participated, with the majority aged 25–29 years (33.9%) and a mean age of 37.29 years. MRSA nasal carriage was detected in 26 individuals (11.3%), with similar prevalence across age groups (<30 years: 11.2%; >30 years: 11.4%). Female participants had a higher representation (60%) and a slightly higher MRSA carriage rate (11.59%) compared to males (10.86%). Among different designations, nurses had the highest MRSA carriage rate (19%), followed by doctors (11.47%), other staff (8.1%), and nursing students (7.1%). The majority of isolates were Coagulase-Negative Staphylococci while 72 isolates were Staphylococcus aureus (26 MRSA and 46 MSSA). MRSA prevalence was highest in the Medical ICU (17%), followed by the Surgical ICU (12%), with no cases reported in several specialized ICUs. Hospital-wise, M.Y. Hospital showed a significantly higher MRSA carriage rate (14.97%) compared to S.S.H Hospital (1.58%). Antibiotic sensitivity testing revealed 100% MRSA resistance to cefoxitin and penicillin, with full sensitivity to linezolid and vancomycin. Post-treatment follow-up

showed 92% success in MRSA decolonization after mupirocin therapy. Additionally, MRSA was more prevalent among healthcare workers with over three years of experience, while MSSA was more frequent in those with less than three years, indicating a statistically significant association (p = 0.0103).

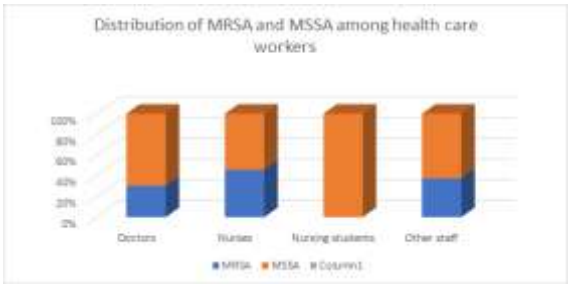

Figure 1: Distribution of nasal carriage of MRSA and MSSA among healthcare workers

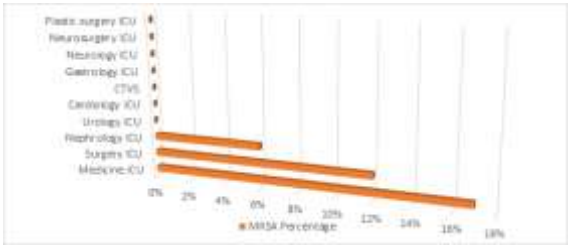

Figure 2: Distribution of nasal carriage rate of MRSA among health care workers

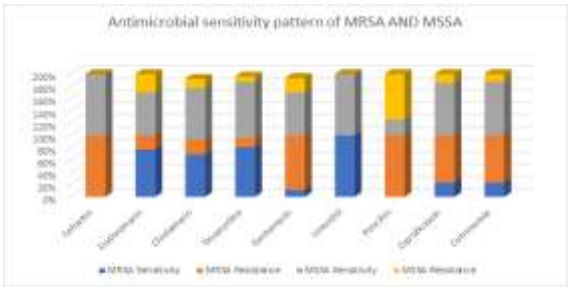

Figure 3: Antibiotic Sensitivity and Resistance Pattern of MRSA and MSSA

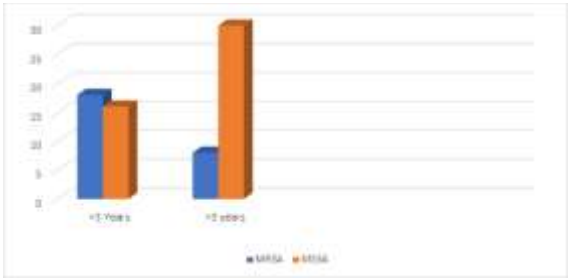

Figure 4: Experience-Wise MRSA & MSSA Frequency Distribution

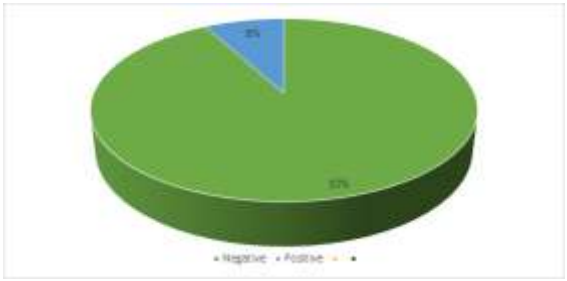

Figure 5: Distribution of Outcome after 5 days of Mupirocin Treatment

DISCUSSION

Among the 230 HCWs screened, 11.3% were found to be MRSA nasal carriers, with the highest prevalence observed among nurses (18.86%), followed by doctors, other staff, and students. The overall MRSA prevalence of 11.3% in our study mirrors that reported by Rongpharpi et al and Ishore et al but remains lower than the exceptionally high rate of 30.1% documented by Duong et al in Vietnam.[11,12] With regard to years of experience, healthcare workers with over 3 years of experience had significantly higher MRSA carriage (14.5%), consistent with findings from Hsin-i-shih et al Bhagavatula S et al and N Singh et al highlighting the cumulative risk of long-term clinical exposure.[13-15] The antimicrobial resistance pattern revealed MRSA strains were uniformly resistant to beta-lactam antibiotics but remained 100% sensitive to Linezolid and Vancomycin, a finding supported by S. Anupurba et al, H.K. Tiwari et al, and Sharon R. Rongpharpi et al.[16-18] Finally, mupirocin resistance in the present study (7.6%) was comparable to the rates reported by Parveen et al and Mittal et al, but notably higher than earlier reports such as Kaur et al (1.43%), signaling an increasing concern over resistance to decolonization agents.[19-21] Comparisons with previous studies showed variability in prevalence based on setting, region, and infection control practices, but consistently indicated that nurses and long-serving HCWs are more at risk. Overall, the study underscores the need for regular MRSA screening, strict hand hygiene, antimicrobial stewardship, and adherence to infection control protocols to minimize the risk of transmission and safeguard both healthcare workers and patients.[22]

CONCLUSION

Monitoring healthcare workers is crucial for identifying carriers of Methicillin-resistant Staphylococcus aureus, who can unknowingly transmit infection between hospitals and the community. Routine screening and treatment help break transmission, with this study showing relatively lower nasal carriage rates of Staphylococcus aureus and MRSA; doctors had higher S. aureus carriage, while nurses showed

higher MRSA carriage. Early detection of asymptomatic carriers enables timely isolation, decolonization using agents like Mupirocin, and appropriate treatment, thereby reducing complications, hospital stay, and costs. Effective prevention requires a comprehensive approach including strict hand hygiene, use of PPE, environmental cleaning, regular screening of high-risk individuals, isolation of carriers, decolonization strategies, and continuous staff training to minimize MRSA transmission in healthcare settings.

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