



NASAL SCREENING FOR METHICILLIN RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA) AMONG HEALTH CARE WORKERS AT A TERTIARY CARE HOSPITAL

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ABSTRACT **BACKGROUND AND OBJECTIVES:** Methicillin-resistant *Staphylococcus aureus* (MRSA) is an important cause of Hospital-acquired infections in many countries. Mainly Health Care workers (HCWs) are at risk for Methicillin-Resistant *Staphylococcus aureus* (MRSA) carriage.

MATERIALS AND METHODS: A Cross-sectional study was conducted among 50 Health Care Workers (HCWs) screened for carriage of MRSA. Swabs of Anterior nares were taken, transported and inoculated on blood agar and incubated at 37°C for 24 hours. After incubation, growth was identified as *Staphylococcus aureus* on the basis of colony morphology, Gram stain, and catalase and coagulase test. (Slide and Tube)MRSA was identified using Cefoxitin disc diffusion methods.

RESULTS: Overall carriage rate was 4% with 2% in theatre staffs and nursing staffs. All the MRSA isolates were resistant to Penicillin sensitive to all the tested antibiotics. Health Care workers were the potential colonizers of Methicillin Resistant *Staphylococcus aureus*.

CONCLUSIONS: These carriers may serve as reservoir and disseminator of MRSA, and should be treated with Mupirocin 3 times daily for 5 days prolonged hospital stay and improper hand washing were found to be the major risk factors for MRSA colonization, although it would require screening of larger numbers before arriving at any definite conclusions. There is need for MRSA control policies in hospitals.

KEYWORDS : Methicillinresistant *Staphylococcus aureus*(MRSA),HealthCare workers,Carriage,Anterior nares,Cefoxitin Disc Diffusion test

INTRODUCTION:

Staphylococcus aureus is a common cause of community and hospital acquired infections. Methicillin Resistant *Staphylococcus aureus* is a common Nosocomial pathogen in the intensive care units and other parts of the hospital and presents a challenge for virtually all healthcare institutions. One of the important sources of *Staphylococci* for Nosocomial infection is nasal carriage among health care workers (HCWs). Treatment option for MRSA is limited as they are resistant to most of the Beta Lactam antibiotics.

Nosocomial acquired MRSA is also resistant to other antibiotics like Amino glycosides, Erythromycin, Clindamycin, Ciprofloxacin and Trimethoprim. In short they are multi-drug resistant organisms and they are susceptible to Vancomycin and Mupirocin. Infections caused by MRSA strains are associated with longer hospital stay, prolonged antibiotic administration and higher costs than infections caused by Methicillin susceptible *Staphylococcus aureus* (MSSA) strains [1-4]. Rates of nasal carriage of MRSA among HCWs vary greatly from 1-2% and 6-8% [5].

Screening for MRSA among this population is necessary for Nosocomial infection control, because they serve as reservoirs and disseminators of MRSA. Identification of healthcare workers colonized with MRSA, combined with other precautions and taking care of hand hygiene has been helpful in reducing transmission and controlling spread of MRSA. [6] This forms the ultimate basis for our study and the staunch importance to screen the health care workers for MRSA. The present study was undertaken to estimate the nasal carriage among health care workers for MRSA and to determine the antibiotic susceptibility pattern of MRSA.

MATERIALS AND METHODS

Study Population

Health care workers working in different departments of a tertiary care hospital were selected based on the inclusion and exclusion criteria. Data including age, sex, demographic profile, work profile, and medical history were recorded in a preformed questionnaire from each volunteer. Ethical clearance was obtained prior to the commencement of the study.

INCLUSION CRITERIA

1. Health care workers including Doctors, Nursing staff, Nursing assistants, Laboratory personnels.
2. Not suffering from any upper respiratory tract infection.
3. Who have not received any antibiotics for the past 1 week.
4. Willing to participate

EXCLUSION CRITERIA

Health care workers

1. Those hospitalized within the previous 1 year.
2. On antibiotics within last 1 week of collection of the swab.
3. Reluctant to participate

Sample Collection and Processing

Nasal swabs were collected using a sterile cotton swab moisturized with sterile normal saline. Swab was inserted into each anterior nares and was rotated for 5-10 times over the inner wall of ala and nasal septum of both nostrils. Samples were transported within 2 hours to the microbiology laboratory for further processing. All the swabs were inoculated on blood agar and incubated at 37°C for 24 h. After incubation, growth was identified as *Staphylococcus aureus* on the basis of colony morphology, Gram stain, catalase and coagulase test (slide and tube). Kirby-Bauer disc diffusion method was done. Antibiotic discs used were Amikacin (30µg), Gentamicin (5µg), Ciprofloxacin (5µg), Clindamycin (2µg), Erythromycin (15µg), Penicillin (10units), and Cephalexin (30µg). Zone diameter interpretation for determining sensitive, intermediate or resistant was done as per CLSI guidelines [7].

Estimation of Methicillin Resistant *Staphylococcus aureus*

All confirmed *Staphylococcus aureus* isolates were further tested for detection of Methicillin resistance by Kirby-Bauer disc diffusion method using Cefoxitin 30 µg discs (HiMedia Laboratories, Mumbai, Maharashtra, India) as per Clinical and Laboratory Standards Institute (CLSI) 2013 guidelines [7]. Zone of inhibition of size of ≤ 21 mm was taken as resistant and ≥ 22 mm as sensitive.

RESULTS

A total of 50 Health Care workers (HCWs), age range 20-50 years were screened for MRSA Carriage. Among them 11 (22%) were Males and

39 (78%) were Females. 5 Laboratory personnels (10%), 5 theatre staffs (10%), 20 Doctors (40%) and 20 Nursing Staffs (40%) were included in this study (Table 1).

Out of 50 HCWs, 8 Health Care workers were positive for *Staphylococcus aureus* giving a nasal carriage rate of 16%. Among them 6 (12%) were MSSA and 2 (4%) were MRSA (Table 2). Most of the MRSA isolates were 100% resistant to penicillin and were sensitive to all the tested antibiotics.

DISCUSSION

Staphylococcus aureus are commonly found in hospital settings and can colonize hospital personnel at various body sites including the throat, nasal mucosa, axillae, perineum and this can lead to Nosocomial infection to patients^[8]. Although MRSA usually spreads in hospitals via the hands of staff members, outbreaks caused by colonized HCW have been reported^[9].

MRSA strains are well known for their high tendency to spread among the HCWs and from the HCWs to the patients which may in turn lead to the increase in the treatment cost burden by prolonging the duration of hospital stay and or administration of expensive medications. This highlights the importance of MRSA screening among the health care workers.

In the present study, nasal carriage of MRSA was found in 8 (16%) of the HCWs. These 8 carriers included 1 laboratory personnel, 1 theatre staff, 3 doctors and 3 nursing staffs. This study finding almost correlates with studies in China among health care workers 15.4% and in Turkey among midwifery students 17.03%^[10,11] and is lesser than the study conducted by Truong *et al.* (35.8%) and Yazgi *et al.* (34.9%) and comparable to other studies conducted by Al-Abdli and Baiu.^[4,12,13] Jadhavar *et al.* in a study conducted in Maharashtra in 2013, reported a lesser prevalence of *S. aureus* nasal carriage of 6%^[14].

In this study, the MRSA carriage was 4% and it was found particularly among the theatre staffs and nursing orderlies. This was consistent with the study by Nagarajan *et al* in Chennai which reported the overall nasal MRSA carriage to around 3.7%^[15]. A study conducted by Chinmoy Sahu *et al* in Kolkata reported a higher nasal MRSA carriage of 30%^[16]. The lesser prevalence of nasal MRSA in the current study could be ascertained to the better and stringent infection control practices being practiced in our hospital. Also the higher prevalence of MRSA among theatre staffs and nursing orderlies could be due to their lack of knowledge with regard to hand hygiene, contact precautions and infection control policies. Most of the MRSA isolates were resistant to penicillin and sensitive to all the tested antibiotics.

The overall MRSA carriage rate in our study was 4% in the health care workers. This indicates that they are potential colonizers and disseminators of MRSA in the hospital settings. The staffs who were positive for the growth of MRSA were advised to apply Mupirocin ointment to the anterior nares 3 times daily for 5 days.

Mupirocin nasal ointment is presently the treatment of choice for decolonizing the anterior nares. Mupirocin apparently exerts its antimicrobial activity by reversibly inhibiting isoleucyl-transfer RNA, thereby inhibiting bacterial protein and RNA synthesis. It is effective in temporarily eradicating *S. aureus* from the nose. When Mupirocin is applied to the nose twice daily for 5 consecutive days, it has been reported to result in elimination rates of 91% directly after therapy.

CONCLUSION

Identification of the carrier and treating the carrier with Mupirocin ointment is an important measure in preventing outbreaks of MRSA infection in hospitals. In corroboration with the above studies, the present study also showed that the Cefoxitin 30µg disc method appears to be an acceptable alternative for rapid identification of MRSA. However, further confirmatory study can be done by detection of *mecA* by PCR method, which is considered as the gold standard. There is need for the development, adoption and enforcement of appropriate control policies in hospitals with many points of critical care like where there are no existing or effective MRSA control programs.

Table 1: Age, Sex and Cadre Wise Distribution of the Participants

| Parameter | Description |
|-----------|-------------|
| Age | Frequency |
| 20-30 | 11 |

| | |
|-------------------------|----|
| 30-40 | 29 |
| 40-50 | 10 |
| Sex | |
| Males | 11 |
| Females | 39 |
| Category of Work | |
| Laboratory personnels | 5 |
| Theatre staffs | 5 |
| Doctors | 20 |
| Nursing staffs | 20 |

Table 2: Cadre wise Distribution of *Staphylococcus aureus*

| Cadre | No. of samples processed | No. of samples in which <i>Staphylococcus aureus</i> was isolated | MSSA | MRSA |
|-----------------------|--------------------------|---|---------|--------|
| Laboratory personnels | 5 | 1 (2%) | 1 (2%) | - |
| Theatre staffs | 5 | 1 (2%) | - | 1(2%) |
| Doctors | 20 | 3 (6%) | 3 (6%) | - |
| Nursing staffs | 20 | 3 (6%) | 2 (4%) | 1 (2%) |
| | 50 | 8 (16%) | 6 (12%) | 2(4%) |

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