

## Original Article

# Nasal Carriage of Methicillin Resistant *Staphylococcus aureus* Among Health Care Workers At Tertiary Care Hospital In Dhaka.

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### Abstract

Nasal carriage of MRSA among hospital staff act as a source of endogenous infection and becomes a source for hospital and community acquired infection. The study was conducted to determine the rate antibiotic resistance pattern of nasal carriage of MRSA among the hospital staff of Sir Salimullah Medical College and Mitford Hospital, Dhaka.

Pre moistened nasal swabs from hospital staff (doctor, nurses, lab technicians and other helping staff were obtained. These swabs were inoculated into Blood agar and Mannitol salt agar media. Antibiogram was done by modified Kirby Bauer disc diffusion method. MRSA were detected by oxacillin and cefoxitin disc diffusion method. The resistance was confirmed by MIC of oxacillin agar dilution method.

Out of 142 samples 34 strains of *Staphylococcus* were isolated among them 07 (4.93%) were MRSA and 27 (19.01%) were MSSA. The carriage rate of MRSA was higher among nurse than other healthcare provider.

Nasal carriage of MRSA is responsible for spreading infection from healthcare personnel to normal individual. So, regular screening of carrier is required from prevention of hospital acquired infection.

**Key words:** *Staphylococcus aureus*, MRSA, MIC

### Introduction:

Nasal carriage of *Staphylococcus aureus* is an important source of nosocomial infection among healthcare worker. Emergence of drug resistance strains especially methicillin resistant *Staphylococcus aureus* is a serious problem in hospital environment. Healthcare worker act as interface *Staph aureus* between the hospital and community may serve as agent of cross transmission of Hospital acquired MRSA and Community acquired MRSA.<sup>1</sup> They carry the pathogenic strain in their nose and spread to the community leading to more dreadful condition.<sup>2</sup> The strain of shows resistance to methicillin demonstrated by MRSA strains implies resistance to all antibiotics to beta lactam group.<sup>3</sup> Healthcare worker have direct contact with persistently colonized patients or contaminated objects can transmit the organism to the other patient by their hand.<sup>4</sup> Important risk factor for acquisition of nasal colonization of MRSA are indiscriminate use of antibiotic, prolong hospital stay and intravenous drug use.<sup>5</sup>

The aimed of the present study was to determine the carriage rate of MRSA among healthcare personnel and their antimicrobial resistant pattern for control of hospital infection.

### Materials and method:

**Study design:** The present study was a cross sectional study conducted at Sir Salimullah Medical College and Mitford Hospital from July 2016-June 2017.

**Sample size:** 142 healthcare providers were screened from various clinical departments of SSMC and MH.

**Inclusion criteria:** Healthcare personnel including doctor, nurse, lab technician, ward boy, sweeper, OT staff and other supporting staff related to patient care, were included in the study.

**Exclusion criteria:** Person who has history of recent nasal surgery or medication was excluded from the study.

**Sample collection:** Sterile plastic test tube with cotton tipped swab stick (disposable) had been taken for collection of sample. The cotton swabs were moistened with normal saline and inserted into each nostril to a depth of approximately 1 cm, rotated five times over the inner wall of ala and nasal septum. After collection, the tube was properly capped, labeled and transferred to lab immediately processed for culture.

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**Culture and identification:** Samples were inoculated into Blood agar, Chocolate agar and Mannitol salt agar media within one hour after collection and were incubated aerobically at 37°C for 18- 48 hours. Isolated organism was subjected to microscopy, catalase, slide and tube coagulase test. Gram positive cocci arranged in cluster form and positive catalase and tube coagulase test helps to diagnosed *Staph aureus*.

**Antimicrobial susceptibility test:**

The isolated *S. aureus* were screened for methicillin susceptibility by modified Kirby-Bauer disc diffusion method by using oxacillin and cefoxitin disc on Muller- Hinton agar by using inoculums which density was equivalent to McFarland’s 0.5 standard. All MRSA isolates were tested for susceptibility against Penicillin (10µg), Erythromycin (15µg), Ciprofloxacin (5µg), Doxycycline (30µg), Rifampicin (5µg), Co-trimoxazol (1.25/23.75mg), Gentamicin (10µg), Vancomycin (30µg), Linezolid (30µg) according to CLSI, 2016. *S. aureus* ATCC-25923 was used for negative control.<sup>6</sup>

**Result:**

Out of 142 nasals swab samples 34 (23.94%) were *Staph aureus* among them with 07 (4.93%) MRSA strains were detected. MRSA carriage rate was highest among nurses (6.11%) followed by doctor (4.72%) and other helping stuff (2.86%), (Table- I).

**Table-I: Distribution of staph aureus and MRSA carriage among healthcare worker (n= 142)**

Occupation	Population	<i>Staph aureus</i>	MRSA
Doctors	42	11 (26.19)	02 (4.72)
Nurses	65	18 (27.69)	04 (6.11)
Helping staff	35	05 (14.28)	01 (2.86)
<b>Total</b>	<b>142</b>	<b>34 (23.94)</b>	<b>07 (4.93)</b>

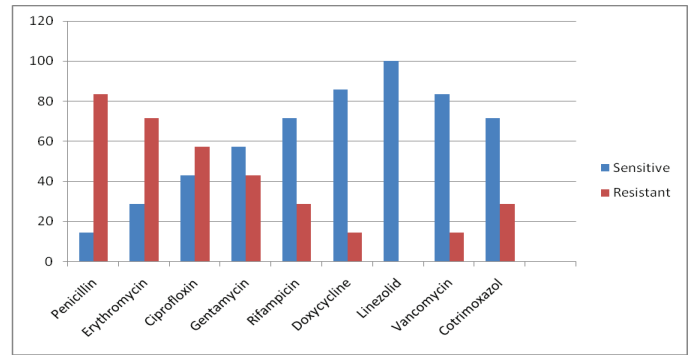
Figure within parentheses indicate percentage.

The highest rate of MRSA carrier were found in orthopaedics and ICU (8.82%) followed by surgery (5.56%), Obs and Gynae department (3.12%) (Table-II).

**Table-II: Distribution of MRSA among healthcare worker of different ward (n=142)**

Ward distribution	Population	<i>Staphylococcus aureus</i>	MRSA
Orthopaedics	34	12 (35.29)	03 (8.82)
Surgery	36	08 (22.22)	02 (5.56)
Medicine	28	05 (17.85)	00 (00.00)
Obs and Gynae	32	06 (18.75)	01 (3.12)
ICU	12	03 (25.00)	01 (8.33)
<b>Total</b>	<b>142</b>	<b>34 (23.94)</b>	<b>07 (4.93)</b>

Among 34 *Staphylococcus* isolated 7 (20.59%) were MRSA as detected by oxacillin and cefoxitin disc diffusion method. Penicillin showed highest resistance to MRSA (83.33%) followed by Erythromycin (71.42%), Ciprofloxacin (57.14%), Gentamycin (42.85%), Rifampicin (28.57%). Vancomycin showed 14.28% resistance where as all the isolates were sensitive to Linezolid.



**Figure-I: Antimicrobial susceptibility pattern of MRSA**

**Discussion:**

In the study, nasal carriage rate of *Staphylococcus aureus* were identified 34 (23.94%) among healthcare worker. Among the isolated *Staph aureus*, MRSA were detected 07 (4.93%) by different phenotypic methods (Table-I). Similar study was conducted 4.6% and 6%.<sup>1,7</sup> Higher rate were reported 29%, 34.2% and 41%<sup>8,9,10</sup>. Lower rate were reported by 1.8% in India.<sup>11</sup> The difference may be due to variation in microbiological methods such as sampling technique, culture and identification method of MRSA. In Bangladesh, study conducted in Dhaka Medical College, 7.2% MRSA were detected among hospital staff.<sup>12</sup> In our country, higher rate of MRSA colonization is probably due to lack of knowledge about personal hygiene and overcrowding environment.

In the present study, among healthcare persone l 4.72% doctor, 6.1% nurse, 4.54% helping staff were colonized with MRSA (Table-I). Similar study were conducted in Bangladesh<sup>12</sup>, in India.<sup>13</sup> In other studies MRSA carriage rates varies from 2.5-25% in doctor, 7.5%- 16.7% among nurse and 5.8- 12.5% among other helping staff.<sup>1,4,15,10,7</sup> In this current study, MRSA colonization was higher among nurse (6.1%). This might be due to more exposure to hospital environment and their frequent patient contact.

Highest rate of MRSA were detected in Orthopaedics and ICU ward followed by surgery, Obs and Gynae, medicine ward (table-II).<sup>16</sup> Higher rate in orthopaedic may be due to traumatic and ICU due to immunological suppression of the patient. Most identified in surgery ward due to the vulnerability of surgical wound infection with MRSA among the patient, following transmission from healthcare worker, further complicating the treatment and recovery.

MRSA were highly resistance to Penicillin (83.33%) followed by Erythromycin (71.47%); Ciprofloxacin (57.14%); Gentamycin (17.64%). MRSA strains were sensitive to Rifampicin (71.42%); Vacomycin (83.33%); Doxycycline (85.71%) (Table- III). Similar susceptibility was reported in Pakistan and Colombia.<sup>8,17</sup> All MRSA isolates were sensitive to Linezolid (100%).<sup>7</sup> Varying degree of resistance towards different antibiotics by MRSA were due to production and become resistance to many commonly used antimicrobials via spontaneous mutation in plasmid chromosome and exposure to high selective pressure.<sup>18</sup>

### Conclusion:

This study revealed that highest MRSA carriage rate among nursing staff and most frequent in orthopaedic and surgery ward. Every staff of all health centres will be reinforced about proper hand washing, using sterile mask and gown and contact percussion.

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