

**Original article**

## Resistant strain of staphylococcus among health care providers: A looming threat

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### Abstract:

**Introduction:** Healthcare workers and medical students who are at the interface between the hospital and the community may serve as a carrier of cross transmission for resistant bacterial strains like Methicillin resistant staphylococcus aureus (MRSA). MRSA infection is a potentially severe event hence early diagnosis is essential. This study was aimed to identify Health care workers (HCWs) and medical students who harboring resistant strain MRSA.

**Methods:** This study was conducted at College Of Medicine and JNM hospital kalyani, West Bengal during August 2013 to October 2013 at Microbiology Department. HCWs and Medical students were voluntarily participated in this study. Nasal swabs were collected from all the participants and culture was done on Mannitol Salt Agar (MSA). Staphylococcus aureus (S.aureus) were identified accordingly and antibiotic susceptibility testing was done. MRSA was detected using 30 microgram of Cefoxitin disc.

**Observations and results:** Nasal swabs from 350 health personnel's were checked for the presence of MRSA. Resistant strain was detected among 2.92% of HCWs. Special attendant came out to be a major group to harbor MRSA in the nostrils.

**Conclusion:** Screening of resistant strains among healthcare workers and medical students should be adopted as a mandatory protocol in medical colleges so as to identify such carriers to curb the spread of circulating drug resistant bacteria from hospital personnel to patient and community.

Key words: MRSA, HCWs, carrier

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### Introduction:

*Staphylococcus aureus* is a potentially pathogenic organism <sup>[1]</sup> can cause spectrum of diseases <sup>[2]</sup> which become accustomed to selective pressure of antibiotics and has resulted in the emergence of resistant strain, MRSA. MRSA is a strain of *S. aureus* that is resistant to a large group of antibiotics called  $\beta$ -lactams , include penicillin and cephalosporin<sup>[3]</sup>. First isolation of MRSA was made in 1960 <sup>[4]</sup> from clinical samples however MRSA is known to colonise in nasopharynx, skin, and vagina of healthy asymptomatic individuals. Anterior nares of human serve as a potent and rich site of colonisation and transmission of MRSA <sup>[6]</sup>. HCWs and medical students act as a reservoir for the spread of MRSA to un-colonized patients who are associated with longer hospital stay and prolonged antibiotic administration. Lack of studies and paucity of data regarding

MRSA nasal carrier among HCWs and medical students in India specially at West Bengal was a driving force to conduct such a study in our set up.

**Aim and objectives:** This study was designed to detect the carrier rate of MRSA among health care personnel and medical students at college of Medicine and JNM hospital, kalyani west Bengal.

### Materials and methods:

This present study was conducted during August to October 2013 at Microbiology department of College of medicine and JNM Hospital, kalyani, Nadia west Bengal. A total of 350 nasal swabs were collected from voluntarily participated 171 HCWs and 179 Medical students. Immediately after collection swabs were cultured on Mannitol Salt Agar (MSA), Himedia. All yellow coloured colonies were confirmed as *s. aureus* by Gram staining, Catalase test,

Coagulase test (Tube and Slide), DNase test and showing haemolysis on blood agar. Antibiotic sensitivity testing was done on Mueller- Hinton agar by Kirby-Bauer disc diffusion method according to CLSI guidelines [7]. All the isolates were tested for Azithromycin, Chloramphenicol, Cotrimoxazole, Ceftriaxone, Gentamicin, Ciprofloxacin, Clindamycin, Linezolid. All antibiotic discs were procured from Hi-media. Detection of MRSA was done on Mueller-Hinton Agar using 30 microgram Cefoxitin disc (Hi-Media). At first confirmed *Staphylococcus aureus* colony was inoculated in nutrient broth and turbidity was matched with 0.5 McFarland. After lawn culture, Cefoxitin disc 30µg was put on Mueller Hinton agar. After incubation inhibition zone of < 19mm was considered as methicillin resistant and > 20 mm was considered as methicillin sensitive [7]. Oxacillin resistance was also tested on Mueller Hinton agar supplemented with 2%NaCl. *Staphylococcus aureus* ATCC 25923 and *Staphylococcus aureus* ATCC 43300 was used as control strains. All the laboratory work was done in a bio safety cabinet. Chi-square test and Spearman Correlation test was used to see any statistical significance and correlation in between study subjects and isolates.

#### Observation and Results:

Total 350 Health care personnel were participated including 179 medical students [Table1]. Isolation rate of staphylococci from the anterior nares was found to be 43 (12.29%) [Table1]. Of the total 43 isolates tested 18 (41.9%) was *staphylococcus aureus* and 27.78% strains was MRSA [Table 1]. No MRSA was detected among medical students. However carrier rate of MRSA in our setup was found to be 2.9 % among HCWs and 1.4% among whole study groups. All groups of health care personnel showed to carry *S aureus* in the nostrils however all isolated strains of *S. aureus* was found to be MRSA (100%) among special attendants [Table 2]. It was showed that more no of MRSA was isolated among special attendant group when exposure is 2-5 yrs [Table 3]. MRSA isolates were 100% sensitive to vancomycin and linezolid compare to cotrimaxazole 94.5%. Highest resistant showed in Ciprofloxacin 61.2% followed by Azithromycin 44.4% among all isolated strains.

Chi-square test is found significant for different isolates and MRSA among the study subject ( $P < 0.05$ ). A significant correlation was also found among different study subjects and bacterial isolates by Spearman Correlation test.

#### Discussion:

The section of individuals under this study were healthcare workers hence their interaction and exposure to hospital environment could cause major risks in transmitting the infection to hospital patients and spreading nosocomial infections [8]. Nasal carriage due to *S.aureus* strains should be prevented in order to stem the rate of infection and in preventing the transmission of resistant strains of the organism [8]. Our obtained data of *staphylococcus aureus* colonization was 5.15% however Saroj golia et al [9], Gonsus et al [10], Kumar P et al [8], Preetha arvind et al [11] found 25% , 40.6%, 78.5% and 76% of colonization in their studies.

Differences in the isolation rate of the desired organism depends on study design, sample size and the methods used [12]. Nasal carriage rate of MRSA was found to be 1.4 % (Table1) in our study where as among HCWs it was 2.93%. Even if some studies showed 1.8-2% of MRSA carriage rate, recently some Indian studies [9,3,12,11] showed variation in it. On the other hand multiple site [11,3,10,13] and multiple detection methods [11,3,10,13] were used in above studies [14,15] for the isolation and detection of MRSA which might have increase the carriage rate. Our MRSA detection rate among HCWs was slightly higher than a study conducted by Mathanraj et al [14] in 2008 (1.8%) and near similar to other studies [14,15]. Doctors and nurses always have the highest frequency of contact with the patients and those who mostly transmit the MRSA. Majority of studies [9,3,8,16] showed mass no of MRSA carrier belong to Doctors and nurses but no nasal carrier of MRSA was detected among the doctors in our case. However we detected a new group of HCWs i.e. special attendant having maximum number of MRSA carriage rate (10%), and all isolated strains were MRSA. This group is related with patient's care with limited knowledge of health care and recruit by the patient's relatives. They stay with the patients for day to day care. 80% (4/5) of MRSA among isolated *staphylococcus*

*aureus* strains in this this group indicates the necessity of further emphasis on health education and hand hygiene especially before patient care.

While investigating the carrier MRSA among the medical students, as they are a major source of transmission during their clinical posting nasal carrier of *staph aureus* was found 4% and none of them was MRSA. This finding may be due to short exposure towards the patients while 2-5yrs of exposure in the hospital atmosphere is sufficient to get MRSA in the nostrils among HCWs. Though there are scarcity of studies among Indian medical students our finding were similar like Santhosh D v et al [17] however baliga S et al [18] detected 24% of MRSA carrier among UG and PG students at Mangalore. Incidentally it should be mention that we have included only under graduate students.

While AST highest resistance was found in favor of ciprofloxacin like other studies [16] whereas similar to many

studies [19,16] no Vancomycin resistance was acknowledged among the carriers .

**Conclusion:**

Study revealed the existence of nasal carriage of MRSA among the HCWs but not in medical students. Special attendants came out to be the major group to harbor MRSA in their nostrils. Prolonged exposure for at least 5 yrs to patients , lack of proper health training, improper aseptic measures might be the cause of clustering MRSA in this group. Compulsory participation of HCWs, samples screening from multiple sites and more than one detection method might have give us an actual picture of MRSA carriage rate in our set up. Screening for resistant strains of *Staphylococci* in healthcare workers mainly among special attendant and medical students should be adopted as a protocol in medical colleges in order to curb the spread of drug resistant *Staphylococci* from the hospital to community.

Table 1: MRSA among the HCWS and medical students ( n=350)

<b>HCWs n=171</b>				
	CONS (n=25)	SA (n=12)	Total	MRSA
Doctors (n=37)	1	2	3	0
Nurses(n=54)	2	3	5	1
Group D (n=40)	1	3	4	0
SplAttendant (n=40)	2	4	6	4
<b>Medical students n-179</b>				
2 <sup>nd</sup> year(n=93)	4	2	6	Nil
3 <sup>rd</sup> year(n=86)	15	4	19	Nil
<b>Grand Total</b>	<b>25</b>	<b>18</b>	<b>43</b>	<b>5(27.78%)</b>
<b>Coagulase negative staphylococcus aureus CONS, Staphylococcus aureus SA</b>				

**Table 2: Distribution of COPS and MRSA among HCWs**

HCWs	No. of samples (n=171)	COPS (n=12)	MRSA(n=5)
Doctors	37	2 (5.4%)	0 (0%)
Nurses	54	3 (5.5%)	1 (33.3%)
Group-D	40	3 (7.5%)	0 (0%)
Special attendant	40	4 (10%)	4 (100%)
<b>Total</b>	171	12 (7%)	5 (2.9%)

**Table 3: Analysis of MRSA samples (n=5)**

Age groups	Exposure time (Yrs)		
	2-5yrs	5yrs- 10yrs	>10yrs
20-25 yrs	0	0	0
<b>25-30 yrs</b>	<b>4(special attendant)</b>	<b>1(nurse)</b>	<b>0</b>
30-35 yrs	0	0	0
35-40 yrs	0	0	0
40-45	0	0	0
>45	0	0	0

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