Original Article

Nasal carrier state of METHICILLIN resistant staphylococcus AUREUS (MRSA) in healthy medical students in a tertiary care hospital

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Abstract

Introduction: As *Staphylococcus aureus*, important nosocomial pathogen, normally present in the nasal cavity of healthy individuals, can be transmitted to the patients during routine patients care by the health care workers. **Objective:** To assess the nasal carrier state of Methicillin Resistant *Staphylococcus aureus* (MRSA) in healthy Medical students. **Methodology:** Nasal swabs were collected from the anterior nares of eighty seven medical students. Bacterial isolation and identification were carried out using standard microbiological methods. Resistance to Methicillin was determined using Methicillin Resistant Selective agar (MeReSa Agar) and compared with standard susceptibility to Cefoxitin disc on Mueller Hinton agar. **Results:** Among the 87 medical students, 34 (39.1%) were found to be colonized with Staphylococcus aureus in their anterior nares. Nasal carrier rate of MRSA among medical students was found to be 33.33%. Methicillin was detected in 29 *Staphylococcus aureus* isolates by screening in MeReSa agar. Concordant results were obtained with Cefoxitin resistance on routine Disc diffusion testing. All the *Staphylococcus aureus* were susceptible to Vancomycin. **Conclusion:** It's worrisome that the present study reports an alarmingly high prevalence of MRSA nasal colonization (33.33%) among the medical students. This heaves a serious concern about the possibility of transmission of MRSA from the medical students to the patients and hospital staff during their clinical postings.

Keywords: MRSA, nasal carriage, *Staphylococcus aureu.*

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INTRODUCTION

Methicillin resistant *Staphylococcus aureus* (MRSA) are highly virulent strains which are able to cause epidemics of nosocomial infections. Since its first identification, methicillin-resistant *Staphylococcus aureus* (MRSA) has become one of the most exigent nosocomial pathogens[1].MR SA shows resistance to a wide variety of antimicrobial agents including non beta-lactam antimicrobials, which makes it complex to treat MRSA infections. *Staphylococcus aureus* is an important nosocomial pathogen normally present in the nasal cavity of healthy individuals. Some groups of individuals seem to be predominantly susceptible to colonization with *Staphylococcus aureus*. For example, physicians, nurses, and hospital ward attendants may be nasopharyngeal carriers in a higher percentage of cases (50, 70, and 90%, respectively) than the general population (33%).[1] Transmission to the patients occurs during routine patients care by the health care workers, thereby increasing the proportion of nosocomial infections. Although a diversity of studies had examined the nasal carrier state of Staphylococcus aureus and MRSA in different healthcare subpopulations (nurses, paramedics, and clerical workers), a very few studies in India had examined the potential role of medical students who are regularly exposed to hospital environment, thus acting as a reservoirs. Rapid Detection of Methicillin-Resistant Staphylococcus aureus (MRSA) in clinical samples continues to be an important task for microbiologist, since infections due to MRSA pose a serious threat. Standard

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methods available are time consuming, delaying the treatment of patients. Ideally they should have high sensitivity and a short time to report. The present study was aimed at understanding the prevalence rate of Staphylococcus aureus in the nasal cavity of medical students in our hospital and also to identify the Methicillin resistance Staphylococcus aureus (MRSA) among the carriers by using a chromogenic selective agar (Methicillin Resistant Selective agar) which is a specific and selective method for detection of MRSA.

MATERIALS AND METHODS

This study was a cross sectional study conducted in Sri Lakshmi Narayana Institute of Medical sciences, Puducherry, South India. A total of 87 medical students, attending their clinical postings, were included in this study. Healthy students, without any upper respiratory tract infections, were included. They were neither on any antibiotic for at least two weeks at the time of sampling, nor had been admitted into any hospitals in the last one year before the study[3]. Informed consent was taken along with their demographic details. Nasal swabs were collected from both the anterior nares by swabbing with a sterile swab, pre-moistened with sterile normal saline solution. Swabs were immediately inoculated on Blood agar and Mannitol Salt agar and incubated at 37^{o}C for 24 hrs. Identification of *Staphylococcus aureus* was carried out using standard microbiological methods, including Gram stain, Catalase test, Slide and Tube coagulase test, Mannitol fermentation, DNAse test etc,.[2] Routine Antibiotic susceptibility testing was done by Kirby Bauer disk diffusion method, as per CLSI guidelines. Antimicrobial susceptibility testing was done on Muller Hinton agar and their susceptibilities to antimicrobials including Cefoxitin (30µg), Trimethoprim-Sulfamethoxazole (1.25/23.75µg), Linezolid (30µg), Erythromycin (15µg), Clindamycin (2µg), Vancomycin (30µg), Teicoplanin (30µg), Chloramphenicol (30µg), Ciprofloxacin (5µg), Penicillin (10units), Gentamycin (10µg), Rifampicin (5µg), Mupirocin (5µg), Fusidic acid (10µg) were recorded. For Cefoxitin, if the zone diameter ≥ 22mm, then the isolate is said to be sensitive, and if the zone diameter is ≤ 21mm, then the isolate is said to be resistant to Cefoxitin.[4] HiChrome MeReSa Agar Base (HIMEDIA) was also used for the identification of the MRSA among the isolates of Staphylococcus aureus. The media was prepared by mixing 41.65 gm of the media into 500 ml of the distilled water. The medium is cooled to around 50-55^{o}C and reconstituted MeReSa Selective Supplement was added as per manufacturer's instruction (HIMEDIA). Staphylococcus aureus isolates were streaked onto the Hi Chrome MeReSa agar and incubated at 37^{o}C for 24 hours. Only methicillin resistant strains grew on Hi Chrome MeReSa agar, while the growth of MSSA was inhibited. All cultures showing bright blue colored growth were taken as Methicillin resistant strains; others were recorded as Methicillin sensitive strains. Descriptive statistics was used to summarize the data.

RESULTS

Among the 87 medical students, 34 (39.1%) were found to be colonized with *Staphylococcus aureus* in their anterior nares. (Figure 1) 48 (55.17%) of them were females and 39 (44.83%) were male students. Difference between nasal carriage in male and female was not statistically significant (P > 0.05). Other organisms isolated in Blood agar were Coagulase negative Staphylococcus, Diphtheroids, Micrococci, etc. Nasal carrier rate of MRSA among medical students was found to be 33.33%. Resistance to Methicillin was detected in 29 out of 34 (85.3%) Staphylococcus aureus isolates by screening in MeReSa agar. Concordant results were obtained with Cefoxitin resistance on routine disc diffusion method. Among MRSA strains, more than 70% strains were resistant to Ampicillin, Amoxyclav, Co-Trimoxazole and Erythromycin. Moderate level of resistance was detected in Ciprofloxacin and Gentamycin. However the strains were highly sensitive to Chloramphenicol and Clindamycin. 100% sensitivity was observed to Vancomycin, Teicoplanin and Linezolid. The above data is summarized in Table-1.

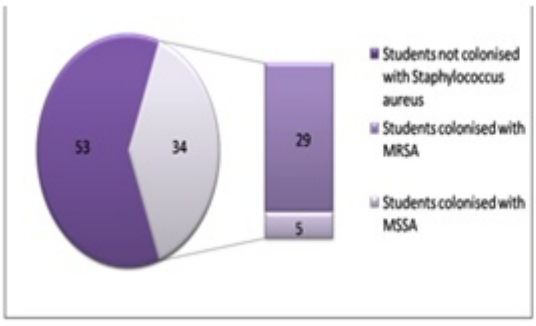

Figure 1: Nasal carrier state among medical students

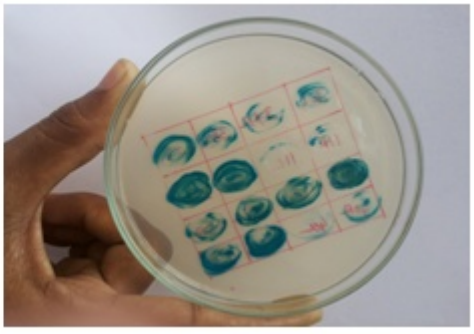

Figure 2: Growth of MRSA strains in MeReSa agar

Table 1: Antibiotic sensitivity pattern of MRSA (n=29)

ANTIBIOTICS	Resistant		Intermediate		Sensitive	
	No.	%	No.	%	No.	%
Ampicillin	29	100	0	0	0	0
Amoxyclav	26	89.7	0	0	3	10.3
Ciprofloxacin	17	58.6	5	17.2	7	24.1
Co-Trimoxazole	22	75.9	0	0	7	24.1
Chloramphenicol	3	10.3	0	0	26	89.7
Clindamycin	4	13.8	1	3.4	24	82.8
Gentamycin	14	48.3	3	10.3	12	41.4
Erythromycin	21	72.4	2	6.9	6	20.7
Cefoxitin	29	100	0	0	0	0
Vancomycin	0	0	0	0	29	100
Teicoplanin	0	0	0	0	29	100
Linizolid	0	0	0	0	29	100

DISCUSSION

Nasal carriage of *Staphylococcus aureus* among healthy population, have been implicated in community associated infections like soft tissue infections, whereas nasal carriage of *Staphylococcus aureus* among medical students and health care workers, attribute to nosocomial infections like surgical site infections, bacteremia, etc. Our study showed a prevalence of 33.33% of MRSA in the anterior nares of the healthy medical students, which is in accordance with the findings of Kuehnert *et al*. in U.S.A[6] and Kakinohana S *et al*[5] in Japan who reported a nasal colonization in healthy adults of 32.4% and 36.0% respectively. Among medical students, the prevalence of MRSA carrier state differs in various publications. (Adesida *et al*. Nigeria 2007[7] – 14 %, Onanuga A. *et al* 2007[8]– 22%, Santhosh *et al*. India 2007 – 23.7 %). It's worrisome that the present study reports an alarmingly high prevalence of MRSA nasal colonization among the medical students. This arises a serious concern about the possibility of transmission of MRSA from the medical students to the patients and hospital staff during their clinical postings. So due to the prevalence of nasal carriers of S.aureus, awareness should be triggered in the medical and nursing students to follow precautionary measures such as washing hand after touching the nose and before touching any patient. In the present study MRSA strains were found more multidrug resistant as compared to MSSA strains. (Table 1). All Staph aureus isolates, irrespective of their methicillin status were, sensitive to Vancomycin, Linezolid and Teicoplanin. This goes hand in hand with Jawad R *et al*[9]. Concordant results were obtained with Cefoxitin resistance on routine disc diffusion method and MeRSA medium in accordance with Jawad R *et al*[9]. Thereby, we can reduce the turnaround time for the detection of MRSA strains by directly inoculating in MeReSa agar.

CONCLUSION

Most of the Hospital acquired invasive infections commonly originate from nasal carriage of health care workers. Although nasal carriage of S. aureus is harmless in healthy medical individuals, they can become carriers who could pose the risk of spreading infections to the patients. It's worrisome that the present study reports an alarmingly high prevalence of MRSA nasal colonization (33.3%) among the medical students. This heaves a serious concern about the possibility of transmission of MRSA from the medical students to the patients and hospital staff during their clinical postings. Hence, it is imperative that nasal carriage, due to S. aureus strains, among medical students should be promptly addressed. Thereby, a major proportion of nosocomial infections can be controlled.

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