Original Article

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Screening for nasal carriage *Staphylococcus aureus* and their antibiotic susceptibility pattern among the health care workers in a tertiary care hospital, Nepal

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Abstract

Background: The presence of *Staphylococcus aureus* in anterior nares of health care workers may serve as a major source of infection in hospital environment and act as a reservoir for the spread of Methicillin Resistant *S. aureus* between patients.
Objective: The present study was conducted to determine the frequency of nasal carriage of *S. aureus* among the health care workers of Kathmandu Medical College Teaching Hospital and to assess the antibioticsusceptibility patterns of the Methicillin Resistant *S. aureus* isolates.
Methodology: A total of 200 health care workers involved in the management of patients from the intensive care unit, Operation Theatre, postoperative wards, different wards and emergency department were screened for *S. aureus* by collecting their nasal swabs.
Results: Out of 200 health care workers, only 10(5%) were *S. aureus* nasal carriers. Out of 10 *S. aureus* strains isolated six (60%) were methicillin sensitive *S. aureus*whereas four (40%) were methicillin resistant *S. aureus*. The isolates were 100% sensitive to Linezolid, Vancomycin and Amikacin but showed highest resistant to Azithromycin (100%), followed by Cefixime (60%).
Conclusion: This study concluded that 5% of health care workers were *S. aureus* carriers and proportion of Methicillin Resistant *S. aureus* and Methicillin sensitive *S. aureus* was 60% and 40% respectively.

Key words: Cefoxitin; HCWs; MRSA; MSSA; *Staphylococcus aureus*.

INTRODUCTION

The presence of *S. aureus* in anterior nares of health care workers (HCWs) may serve as a major source of infection in hospital environment and act as reservoir for the spread of methicillin resistant *S. aureus* (MRSA) between patients[1]. The screening of the nasal carriage in HCWs plays a very important role in infection control of MRSA in any health care setting. The identification of colonized staff members and their proper management prevents the spread of MRSA strains among the patients as well as other hospital staffs[2]. In Nepal several reports have been published with the MRSA prevalence rate of nasal carriage among HCWs ranging from 20.37-43.80%[3].

Infections caused by MRSA strains, which are most often multidrug resistant are increasing and therapy has become problematic[4]. The horizontal transfer of *mec A* gene is the major mechanism responsible for conferring resistance to Methicillin and other beta-lactam antibiotics[5]. Active surveillance for patients colonized with MRSA is recommended to prevent MRSA infections in health care settings[3,6]. Identification of HCWs colonized with MRSA, combined with other precaution and taking care of hand hygiene will be helpful in reducing the transmission and controlling the spread of infection.

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METHODOLOGY

Institutional ethical clearance was obtained from Institutional Review Committee before this study

was conducted. A total of 200 HCWs involved in the management of patients from the intensive care unit, Operation Theatre (OT), postoperative wards, orthopaedic, obstetrics and gynaecology, paediatrics, medicine, surgical wards and emergency department were screened for MRSA by collecting their nasal swabs. Sterile swab stick was pre-moistened with sterile normal saline and specimens were collected from the anterior nares of both the nostrils of HCWs. The swabs were inserted in the tube labelled and were transported at room temperature to the Microbiology laboratory of Kathmandu Medical College Teaching Hospital (KMCTH) Sinamangal without any delay in processing of sample for culture and sensitivity.

The nasal swabs thus obtained were inoculated on 10% blood agar, MacConkey's agar and Mannitol salt agar medium. The plates were incubated aerobically at 35°C in ambient air for 24 hours and were examined for growth. *S. aureus* was identified by standard methods. Colonies suggestive of *S. aureus* showing golden yellow colonies on mannitol salt agar were identified using Gram stain, catalase test, slide and tube coagulase tests[7]. The isolates were confirmed as MRSA by lawn culture in Muller Hinton Agar (MHA) plate with Cefoxitin disc 30µg and incubated at 35˚C for 24 hours. Result was interpreted according to the Clinical Laboratory Standards Institute Guidelines (CLSI) 2013[8]. Zone of inhibition of ≥ 22 were considered Methicillin sensitive and zone of inhibition ≤ 21 were considered methicillin resistant. Antimicrobial susceptibility testing were performed using modified Kirby Bauer disc diffusion method on MHA; zone size were measured and interpreted as sensitive, intermediate and resistant. Antibiotic discs used were from HiMedia: Cefoxitin (30 µg), Ciprofloxacin (5 µg), Gentamycin (10 µg)), Linezolid (30µg), Azithromycin (30µg), Cefixime (30 µg)), and Vancomycin (30 g) and Amoxyclav (30/10µg).

RESULTS

This study revealed that 10(5%) of 200 HCWs are carriers of *S. aureus* in their anterior nares among which six (2%) were methicillin resistant.

Nasal swabs obtained from 200 HCWs were processed for bacteriological culture and sensitivity of which 85(42.5%) were male and 115(57.5%) female. Most of the HCWs were among the age group 20-40 years. Out of 200 nasal swab samples, *S. aureus* were isolated from 10 HCWs. MRSA isolates of total nasal swab was four (2%). Out of 10 *S. aureus* strains isolated 6(60%) were methicillin sensitive *S. aureus* (MSSA) whereas four (40%) were methicillin resistant *S. aureus* (MRSA).

The MRSA isolates were sensitive to Linezolid, Vancomycin and Amikacin, resistant to Azithromycin, followed by Cefixime. Reports were dispatched to the respective HCWs who were nasal colonizers of *S. aureus* and advised to apply Mupirocin topically in both the nostrils twice a day for seven days. Those HCWs were asked to give their repeat nasal swab samples to look for any resistance towards Mupirocin.

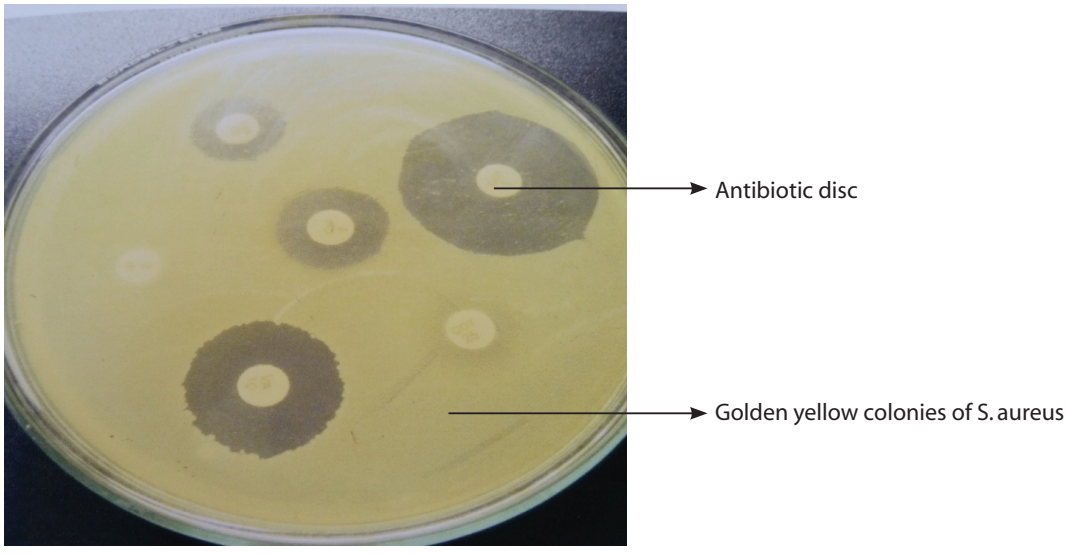

Figure 1: Antibiotic susceptibility pattern of *S.aureus* on MHA plate

Table 1: Antibiotic susceptibility pattern in isolates from *S. aureus* sample

Antibiotics	Sensitive	Intermediate	Resistant
Gentamycin	10 (100%)	0 (0%)	0 (0%)
Ciprofloxacin	5 (50%)	3 (30%)	2 (20%)
Azithromycin	0 (0%)	0 (0%)	10 (100%)
Linezolid	10 (100%)	0 (0%)	0 (0%)
Cefixime	4 (40%)	0 (0%)	6 (60%)
Vancomycin	10 (100%)	0 (0%)	0 (0%)
Amoxyclav	5 (50%)	1 (10%)	4 (40%)

DISCUSSION

Nasal carriage rate of MRSA have been reported in a range of 6% to 17.8% among the health care workers in hospital settings elsewhere in the world[9]. In a similar study done in India by V. Rutvi *et al.* and Y. Sharma showed nasal carriage rate of MRSA to be 6% and 5% respectively, whereas the study done in Australia by Munckhof *et al.* showed only 0.7%[10-12]. In contrast to this study, a higher propensity was observed amongst MRSA strains reported in a study done by A. Currie *et al.* USA (24.15%)[13]. All the MRSA isolates were sensitive to Linezolid, Vancomycin and Amikacin and were resistant to Azithromycin followed by Cefixime. These findings are consistent with a study done by Chatterjee *et al.* in which resistance to Ciprofloxacin being 12.5% but in sharp contrast to the results by Goyal R. *et al* where 60% MRSA were resistant to Ciprofloxacin[14,15]. Both the above studies showed 100% sensitivity towards Vancomycin which is in accordance to our study. None of the isolates were multidrug resistant in the present study unlike Goyal *et al.* who reported 3/10 (30%)-resistance to all the antibiotics tested[14].

Low MRSA nasal carriage prevalence could be related to active and periodic surveillance for MRSA nasal carriers among the HCWs at KMCTH. Periodic screening for MRSA nasal carriage among the HCWs and fumigation of operation theatre, intensive care units, post operative and other wards is conducted routinely. Pre and post fumigation culture of different wards are performed and report dispatched to the respective department which also helps to reduce the spread of MRSA strains circulating in the hospital environment.

CONCLUSION

This study concluded that 5% of HCWs were *S. aureus* carriers and proportion of MRSA and MSSA was 60% and 40% respectively. Regular surveillance of hospital-associated infection and monitoring of antibiotic sensitivity pattern is required to reduce MRSA prevalence[16]. Screening and decolonization may be effective in decreasing the MRSA carriage rate among the HCWs. Standard infection control precautions should be employed to minimize either the carriage or the transmission rate.

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