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Original Article

Methicillin resistant *Staphylococcus aureus* colonisation: A three year experience with a surveillance program, in a tertiary neurocare centre

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ABSTRACT

Background: Methicillin resistant *Staphylococcus aureus* (MRSA) is an important nosocomial pathogen. A strong correlation between the invasive and the nasal carriage strains in the patients has been well established indicating the need to eliminate the carriage of MRSA to prevent the transmission. The objectives of this study are to assess the prevalence of MRSA colonisation in patients from ICUs and high risk wards for a period of 33 months, (2011–2013) by routine active surveillance culture, and also to evaluate the role of extra-nasal sites in the screening.

Methods: The nasal and extra-nasal specimens were obtained from patients using sterile cotton swab. Staphylococci were identified based on colony morphology on blood agar, Gram's staining and coagulase test. The *Staphylococcus aureus* (*S. aureus*) isolates were screened for methicillin resistance by Kirby–Bauer disc diffusion method using oxacillin (1 μg) and cefoxitin (30 μg) discs and reported according to CLSI guidelines.

Results: Out of the 5372 nasal samples tested, *S. aureus* was identified in 14.1% patients. The rate of methicillin resistance was 31.7% of the total *S. aureus* isolates. The overall prevalence of MRSA was 4.5%.

Out of 219 extra-nasal samples tested, 4.1% of the patients carried MRSA in sites like axilla and groin without nasal carriage.

Conclusion: Our results encourage us to continue with the screening program so as to prevent the high risk patients contracting endogenous infections thus controlling the transmission and spread and also the addition of extra-nasal site; either axilla or groin might increase the screening efficiency in non nasal colonisers.

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1. Introduction

The most predominant pathogen causing nosocomial infections is *Staphylococcus aureus* with nearly 60% of the isolates being resistant to methicillin – MRSA, making the therapy problematic and limiting the treatment options associated along with increased morbidity, mortality and a heavy financial burden on the health care system.[1] Indian Network for Surveillance of Antimicrobial Resistance (INSAR) group, in a multicentre study showed the prevalence of MRSA in India as 41%.[2]

The risk of developing the infection is more in health care settings. The problem of health care associated infections (HCAI), is increasing in an alarming rate due to the increase in multi and pan drug resistant organisms[3] making it necessary to implement control programs to reduce the prevalence of infections caused by them.

As an endogenous reservoir, nasal carriage of *S. aureus* acts a significant risk factor for developing invasive infections.[4] A strong correlation between the invasive strain and the nasal carriage strain in the patients has been well established indicating the need to eliminate the nasal carriage to prevent the transmission.[5,6]

Centers for Disease Control and Prevention (CDC) and Society for Healthcare Epidemiology of America (SHEA) guidelines for the management of multidrug resistant organisms in health care settings, recommend Active Surveillance Cultures (ASC) as one of the approaches in infection control, which along with decolonisation has been shown to reduce the incidence of nosocomial infections limiting the spread of antibiotic resistant pathogens.[7,8]

Our institute being a referral centre for neurocare, with varied population nationwide, we do encounter problems related to health-care associated infections. The hospital infection surveillance system has implemented admission screening for MRSA nasal carriage in the patients admitted in different ICUs, high risk wards and preoperative screening, followed by decolonisation.

Though anterior nares are well known niche for staphylococci and nose is routinely the site for screening, colonisation in other sites have also been noted and regarded as risk factors for dissemination. About 40% of the individuals with nasal colonisation are also colonised in other areas including the throat, axilla etc.[9] In our own earlier observation, we have found nearly 14% of MRSA nasal carriers also tested positive for axilla and groin screening. Hence, this led us to conduct a study on MRSA carriage predictivity of these extra-nasal sites, as missing out the extra-nasal colonisers may result in inefficiency of the infection control measures.

The study has the following objectives:

i) To assess the prevalence of MRSA nasal colonisation hence discuss the role of screening for MRSA carriage, over a period of 33 months, by active surveillance culture as a part of infection control program.
ii) To evaluate the extra-nasal carriage rates and analyse the importance of sampling these additional sites in the surveillance program

2. Methods

The surveillance activity was conducted for a period of 33 months, in patients admitted in ICUs (emergency, surgical and medical), surgical wards (male, female and paediatric), head injury ward (HIW), neurorehabilitation (NRW) and other wards like recovery, short stay, step down, neurology. The demographic characteristics of the patients and relevant clinical history were documented.

2.1. Surveillance cultures

The surveillance cultures were performed as a routine procedure during admission (within 24–48 hrs). The specimen was obtained from both anterior nares using a sterile cotton swab moistened with saline. The extra-nasal specimens like axilla and groin swabs were also obtained from few patients as per accessibility.

The specimens were transported to the microbiology laboratory and processed immediately. The swabs were inoculated in thioglycollate broth, incubated at 37 °C overnight. The positive cultures were further subcultured on blood agar plates and incubated at 37 °C and reviewed at 24 hrs. Golden yellow or whitish opaque colonies on blood agar plates were subjected to Gram's staining and tube coagulase test. The isolates showing Gram-positive cocci and coagulase positive were considered as *S. aureus*.

The *S. aureus* isolates were screened for methicillin resistance by Kirby–Bauer disc diffusion method using oxacillin (1 μg) and cefoxitin (30 μg) discs on Mueller-Hinton agar and reported as MRSA according to CLSI guidelines.

2.2. Infection control strategies

Measures taken to control MRSA spread included standard contact precautions (gloves, gowns etc), isolation, decolonisation with topical mupirocin and chlorhexidine bath, dedicated equipments in ICUs, accentuation on the number and use of bed side alcohol hand rubs, regular orientation sessions for healthcare personnel on hand hygiene, environmental sanitation and other infection control strategies.

2.3. Statistical analysis

The statistical analysis was carried out using R software version 3.1.1.

3. Results

A total of 5372 patients [1834 in 2011, 1939 in 2012 and 1599 in 2013], were screened for MRSA nasal colonisation, in ICU's (1398 patients), surgical wards (2579), HIW (522), NRW (424) and other wards (449). Among the patients who were screened, 3420 (63.7%) were male and 1952 (36.3%) were female.

Out of the total 5372 nasal samples tested, 5054 showed growth (94.1%). Of the total isolates, 48% were from the patients admitted in surgical wards followed by ICU's with