

Nasal Carriage Of MRSA And Antibigram In Healthcare Workers Of A Tertiary Care Hospital

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Abstract

Introduction

Methicillin - resistant Staphylococcus aureus (MRSA) is defined as a strain of Staphylococcus aureus (S. aureus) that is resistant to β -lactam antibiotics including penicillin's, cephalosporin's and carbapenems. It occurs due to an alteration in the PBP2a protein in S.aureus. MRSA is recognized as a major nosocomial pathogen that causes severe morbidity and mortality worldwide. Healthcare workers(HCWs) form an important link between hospitals and communities in the development of nosocomial infections. Colonized HCWs are usually asymptomatic, but can be a potential reservoir of infection for susceptible patients. This necessitates the need for early identification of colonized HCWs and implementation of control measures.

Aims and Objectives

To determine the prevalence of MRSA nasal carriage among HCWs and to determine antibiotic susceptibility pattern of these isolates.

Material and Methods

This prospective study was conducted in the Department of Microbiology, MIMS, Mandya after obtaining approval from Institutional Ethical Committee. The samples were collected randomly from Healthcare workers who were available on the day of sample collection. The nasal swabs collected from them were processed in the Department of

Microbiology on the same day. The antimicrobial susceptibility of S. aureus isolates was done by modified Kirby Bauer disk-diffusion test, according to the Clinical Laboratory Standards Institute guidelines.

Statistical analysis: Descriptive statistics like frequency and percentage was used and association was found out by chi-square test. Statistical significant difference was considered if p value is < 0.05

Results

Among 300 samples collected from healthcare workers, 101(33.7%) were from males & 199 (66.3%) from females. Male : female ratio was 0.5:1. Staphylococcus aureus was isolated in 97 HCWs. Among 199 females, 20(10%) were MRSA carriers. Among 101 males, 12(11.8%) were MRSA carriers. So total of 32 (10.6%) samples yielded MRSA .In our study, MRSA showed high resistance to commonly used antibiotics. All the isolates(100%) were resistant to Penicillin. More than 60% were resistant to erythromycin, cotrimoxazole and gentamicin (65.6%, 62.5% , 68.8%respectively). 71.9% were resistant to clindamycin.

More than 80% were resistant to tetracycline &ciprofloxacin (81.2 &84.4% respectively).Among all antibiotics used, vancomycin & linezolid had 100% sensitivity in both MRSA & MSSA.

Conclusion

In our study, MRSA nasal carriage in HCWs was 10.6% and these MRSA were resistant to commonly used antibiotics. This highlights the fact that we need to adhere to infection control practices to reduce the spread of MRSA to susceptible individuals.

Keywords: MRSA, Healthcare workers, nasal carriage, antibiogram, erythromycin, linezolid

Introduction

Methicillin-resistant *Staphylococcus aureus* (MRSA) is defined as a strain of *Staphylococcus aureus* (S. aureus) that is resistant to β -lactam antibiotics including penicillins, cephalosporins and carbapenems. It occurs due to an alteration in the PBP2a protein in S.aureus^[1] The anterior nares are the main reservoirs of MRSA, although other body sites such as the hands, skin, axillae, and intestinal tract are frequently colonized.^[2] MRSA is recognized as a major nosocomial pathogen that causes severe morbidity and mortality worldwide.^[3]

Healthcare workers (HCWs) form an important link between hospitals and communities in the development of nosocomial infections.^[4] MRSA can be transmitted to a patient from another patient or through the hands, clothes and equipments of health care workers.^[5]

Colonized HCWs are usually asymptomatic, but can be a potential reservoir of infection for susceptible patients. Also, it has been reported that HCWs have been the source of MRSA outbreaks in several hospital settings^[6]. The spread of MRSA strains in resource-limited settings can cause devastating consequences because of the lack of adequate facilities for laboratory detection and patient management^[7]. MRSA carriage among HCWs can render other methods of infection control ineffective^[8].

This necessitates the need for early identification of colonized HCWs and implementation of control measures. Knowledge of MRSA prevalence and recent antimicrobial

susceptibility pattern is essential for appropriate selection of the antimicrobial agents for treatment.

Aims and Objectives

To determine the prevalence of MRSA nasal carriage among HCWs and to determine antibiotic susceptibility pattern of these isolates.

Material and Methods

Study Design: Cross-sectional study

Study Period: 1 year (April 2015- March 2016)

Sample size: 300

Inclusion Criteria

1. Healthcare workers irrespective of any Department.

Exclusion Criteria

1. Those who had Sino nasal symptoms like Rhinitis, headache, cough and post nasal discharge.
2. Those on nasal medication
3. Those on antibiotic therapy within last 1 week of collection of the swab.

This prospective study was conducted in the Department of Microbiology, MIMS, Mandya after obtaining approval from Institutional Ethical Committee. The samples were collected randomly from Healthcare workers who were available on the day of sample collection and who satisfied inclusion & exclusion criteria. Informed written consent was taken from them. Nasal swabs were collected from all the participants by using sterile cotton swabs which was soaked in sterile normal saline, by rotating the swabs in both the anterior nares consecutively. The nasal swabs collected from them were processed in the Department of Microbiology on the same day.

The swabs were inoculated onto Nutrient agar, Blood agar and Mannitol salt agar and incubated at 37°C in ambient air for 24–48 h. Colonies suggestive of S. aureus (golden yellow opaque colonies on nutrient agar, white or cream haemolytic or nonhaemolytic colonies on blood agar and yellow colonies on mannitol salt agar) were identified

using standard laboratory procedures.^[9] The antimicrobial susceptibility of *S. aureus* isolates was done by disk-diffusion tests, according to the Clinical Laboratory Standards Institute guidelines. The following antimicrobial discs were used: Penicillin (10 Units), Chloramphenicol, Cefoxitin(30µg), Ciprofloxacin (5µg), Gentamicin (10µg), Cotrimoxazole (25µg), Clindamycin (2µg), Erythromycin(15µg), Tetracycline(30µg), Linezolid (30 µg) and Vancomycin (30 µg). (Hi-media, Mumbai, India). *S. aureus* ATCC 25923 was used as the control. All isolates whose zone diameter was less than 21mm for cefoxitin(30 µg) discs were considered MRSA as per CLSI guidelines.^[10]

Statistical Analysis

Descriptive statistics like frequency and percentage was

used and association was found out by chi-square test. Statistical significant difference was considered if p value is < 0.05 at 95% confidence interval.

Results

Among 300 samples collected from healthcare workers, 101(33.7%) were from males & 199 (66.3%) from females. Male : female ratio was 0.5:1. *Staphylococcus aureus* was isolated in 97 HCWs . Among 199 females, 20(10%) were MRSA carriers. Among 101 males, 12(11.8%) were MRSA carriers(Fig 1 &2). So total of 32 (10.6%) samples yielded MRSA . MRSA carriage was more in males, but not statistically significant (p>0.05). The antibiogram of MRSA revealed that they were more resistant to majority of the antibiotics compared to MSSA. (Table 1)

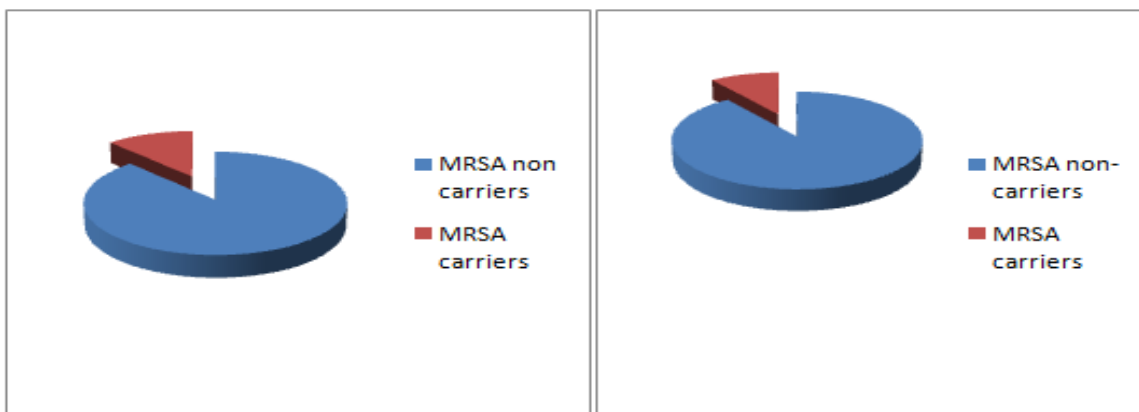


Fig1: Percentage MRSA carriers in Male HCWs

Fig2: Percentage MRSA carriers in Male HCW

Antibiotics	MRSA (n=32)		MSSA(n=65)		p value
	Sensitive (%)	Resistant (%)	Sensitive (%)	Resistant (%)	
Penicillin	-	32(100)	9(13.8)	56(86.2)	>0.05
Erythromycin	11(34.4)	21(65.6)	37(56.9)	28(43.1)	<0.05
Cotrimoxazole	12(37.5)	20(62.5)	34(52.3)	31(47.7)	>0.05
Tetracycline	6(18.8)	26(81.2)	32(49.2)	33(50.8)	<0.05
Ciprofloxacin	5(15.6)	27(84.4)	34(52.3)	31(47.7)	<0.05
Clindamycin	9(28.1)	23(71.9)	37(56.9)	28(43.1)	<0.05
Chloramphenicol	13(40.6)	19(59.4)	38(58.5)	27(41.5)	>0.05
Gentamicin	10(31.2)	22(68.8)	39(60.0)	26(40.0)	<0.05
Vancomycin	32(100)	-	65(100)	-	
Linezolid	32(100)	-	65(100)	-	

Discussion

MRSA has become endemic worldwide in the last two decades and HCWs act as a potential source of nosocomial MRSA infection to their patients, thereby extending hospital stay and cost.^[11]

In our study, nasal MRSA carriage was more in males (11.8%) compared to females (10%). But the difference was not statistically different ($p > 0.05$). Singh et al^[12] reported carriage rate of MRSA among males as 9.1% whereas it was 6.5% among females which is comparable to our study. Askarian et al and Rana et al also found no significant difference in gender wise distribution of MRSA in their studies.^[13,14]

In our study, MRSA prevalence in HCWs was 10.6%. Khalili et al.^[15] and Singh et al^[12] have reported nasal carriage rate of 12.67% and 7.5% respectively in their studies on healthcare workers.

Various studies in Indian health care settings have different rates of MRSA carriage among health care workers. An MRSA carriage rate of 1.8% from Pondicherry, 6.6% in Delhi and 2% in Madurai was reported. Outside India, nasal carriage was 2% in Nepal and 38.9% in Nigeria.^[16-20] These differences in prevalence of MRSA are due to the variability in geographical distribution, hospital settings, hospital policies and areas within hospital where the study was conducted.

A very high rate of MRSA colonisation has been reported by Iyer et al., in Saudi Arabia, who found an MRSA colonisation of 76% in the hospital staff and 0% colonisation among university students not exposed to the hospital environment^[21].

In our study, MRSA showed high resistance to commonly used antibiotics. All the isolates (100%) were resistant to Penicillin. More than 60% were resistant to erythromycin, cotrimoxazole and gentamicin (65.6%, 62.5%, 68.8% respectively). 71.9% were resistant to clindamycin.

More than 80% were resistant to tetracycline & ciprofloxacin (81.2% & 84.4% respectively).

Among all antibiotics used, vancomycin & linezolid had 100% sensitivity in both MRSA & MSSA. It is to be noted that chloramphenicol among MRSA and Gentamicin among MSSA showed 40.6% & 60% sensitivity respectively which was highest sensitivity next to vancomycin & linezolid. The difference in susceptibilities between MRSA and MSSA was statistically significant for erythromycin, tetracycline, ciprofloxacin, clindamycin and gentamicin ($p < 0.05$).

Singh et al^[12] reported that all the MRSA isolates were 100% resistant to penicillin, 60% resistant to cotrimoxazole, erythromycin and 50% to clindamycin. 100% resistance to penicillin was reported by Bala K et al^[22] and Goyal et al^[23]. Bala K et al. observed 66.6% resistance to erythromycin.

Our study is comparable to the studies of Radhakrishnan et al.^[11], Bala K et al^[22] and Pathak et al^[24] who reported 100% sensitivity to vancomycin and linezolid of MRSA.

Cotrimoxazole resistance (62.5%) in our study was comparable with corresponding reports of Shibabawa et al (66.7%)^[25]

This resistance pattern of our study might be due to excessive use of these antibiotics for many other infections thus replacing sensitive strains by resistant strains in the hospital settings.

The healthcare personnel require awareness regarding the nosocomial infections as well as bacterial colonization and should know their status of carriage of MRSA and accordingly, take necessary measures to prevent possible transmission.^[19]

Conclusion: In our study, MRSA nasal carriage in HCWs was 10.6% and these MRSA were resistant to commonly used antibiotics. This highlights the fact that we need to adhere to infection control practices to reduce the spread of

MRSA to susceptible individuals. Hand Hygiene is the most important and simple Measure that should be practiced in an appropriate manner. In hospitals, HCWs must be regularly screened for MRSA. Measures should be taken to control the spread of MRSA infection including laboratory based surveillance, isolation & treatment of MRSA-positive HCWs.

Limitation: Small sample size, single centre study, only nasal carriage was studied not other sites.

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