



Colonization of Methicillin Resistant Staphylococcus Aureus Among Nursing Staff at a Tertiary Care Hospital

KEYWORDS

MRSA, Nasal Carriage

Miss.Vaidehee Naik

Dr. (Mrs) Kalpana Date

Dr.Sonia Philip

Final M.B.B.S. Student

M.B.B.S., M.D. (Micro), Associate Professor

(M.B.B.S.) Tutor

ABSTRACT *OBJECTIVES:* Nosocomial outbreaks of Methicillin Resistant Staphylococcus Aureus (MRSA) have become a major infection control problem. This cross sectional study was undertaken to investigate the prevalence of MRSA among nursing staff, the association between risk factors and colonization and to determine the antibiotic susceptibility pattern of the isolates. *METHODS:* Hundred Nursing staff from a Tertiary Care Hospital were included in the study, nasal swab and hand swabs were collected. *RESULTS:* Out of 100, 21 individuals were found to be carriers of MRSA. The highest prevalence of MRSA carriage was found in NICU (35.7%). MRSA showed resistance to commonly used antibiotics like, Penicillin (48%), Erythromycin (76%), Clindamycin (76%), Ciprofloxacin (48%). *CONCLUSION:* The observed prevalence of MRSA colonization among Nursing Staff exceeds previously reported prevalence and showed more resistance to the commonly used antibiotics.

INTRODUCTION:

Staphylococcus aureus (S.aureus) has been recognized as an epidemiologically important pathogen. Despite antibiotic therapy, staphylococcal infections occur more frequently in hospitalized patients and have severe consequences ranging from benign, superficial skin eruptions to life-threatening infections with bacteraemia, endocarditis, pneumonia and toxic shock syndrome (1).

Methicillin was introduced to treat these infections, but in 1961, S.aureus isolates that had acquired resistance to methicillin (methicillin-resistant S.aureus) were reported (1). In recent years, nosocomial outbreaks of Methicillin Resistant Staphylococcus Aureus (MRSA) have become a major infection control problem. Although, MRSA strains have not been shown to be more virulent than S.aureus, very high mortality rates have been reported from several centres (2). Initially MRSA was limited to hospitals; however it is now increasingly recovered from nursing homes and the community. The emergence of MRSA which is also often multidrug-resistant renders the treatment of staphylococcal infections more challenging (1).

Healthcare Workers (HCWs) constitute an important reservoir for S.aureus. Several studies have reported that the rate of nasal carriage of S.aureus among HCWs ranges from 16.8% to 56.1%. Transient colonization has been documented up to 50% among the HCWs. Colonized employees are generally asymptomatic, although they are a potential reservoir of infections acquired by patients. Colonized or infected personnel may serve as a reservoir and disseminator of MRSA in hospitals (2).

The present study was undertaken to investigate the colonization and prevalence of MRSA among HCWs from clinical departments and to determine the antibiotic susceptibility pattern of the recovered isolates.

MATERIAL AND METHODS:

The cross-sectional study was carried out in the Department of Microbiology at a Tertiary Care Hospital, NKP-SIMS & RC, an 840 bedded hospital for two months as a part of Short term Studentship Research Program of the Institute. Samples were collected from 100 HCWs from anterior nares and dorsum of the hand. Any person with upper respiratory tract infection, current skin infections, currently on mupirocin or any other nasal medications, history of nasal bleed or signs of rhinitis and/or using antibiotics in the past 2 weeks were not

included in the study.

History regarding risk factors like nasal prick, history of previous hospitalization was taken from each participant. Samples were collected from each participant by twice rotating a sterile cotton swab pre-matted with sterile saline in the vestibule of both the anterior nares and from the dorsum of the hand. The collected samples were inoculated on the Robertson cooked meat medium containing 10% NaCl immediately and then transported to the Microbiology Laboratory. Subcultures were done after overnight incubation on Blood Agar and Mannitol Salt Agar. Staphylococcus Aureus was identified by colony morphology, Gram stain, Catalase Test, Slide Coagulase Test, Tube Coagulase Test and Mannitol Fermentation Test. Each isolate was screened for Methicillin resistance by cefoxitin disc diffusion method using 30µg cefoxitin disks (CLSI 2006). The Antimicrobial Susceptibility Test was performed according to the standardized disc diffusion method as recommended by CLSI guidelines (2006) by Modified Kirby Bauer Method. Statistical analysis was done by Epi info version 3.4.3.

RESULTS:

A total of 200 samples were taken from 100 Healthcare Workers. From these samples 100 were nasal swabs and 100 were swabs from hands. Nasal screening identified 53 S.aureus carriers. Of these 53 nasal carriers of S.aureus, 16 carried MRSA. Hand screening identified 33 S.aureus carriers, of these 33 hand carriers of S.aureus, 9 carried MRSA. Total 21 individuals were found to be carriers of MRSA (Table 1).

Table 1: Distribution of Nursing Staff according to MRSA

SITE	MRSA (n)	MRSA (%)
Only Hands Carriage	5	5%
Only Nasal Carriage	12	12%
Both Hands and Nasal Carriage	4	4%
Total	21	21%

Table 2: Prevalence of carriage of methicillin-resistant and methicillin-sensitive staphylococcus aureus among Nurs-

ing Staff at a Tertiary Care Hospital in various Departments.

Ward	Total No. Of Specimens	MRSA	MRSA (n %)	MSSA	MSSA (n %)
NS Office	2	0	0	1	50
Dialysis Unit	4	1	25	0	0
Orthopedics ward	20	4	20	4	20
Eye Ward	8	1	12.5	0	0
Emergency OT	4	0	0	2	50
Gynecology Ward	32	3	9.4	6	18.75
Gynecology OT	14	3	21.4	3	21.4
Casualty ward	10	1	10	2	20
Surgery Ward	18	0	0	1	5.5
Surgery OT	10	2	20	0	0
Surgery ICU	8	1	12.5	3	37.5
Medicine ICU	20	2	10	1	5
Pediatric Ward	36	2	5.5	7	19.4
NICU	14	5	35.7	1	7
Total	200	25	12.5	31	15.5

The highest prevalence of hand and nasal carriage of MRSA was in NICU (35.7%) which was followed by Dialysis unit (25%), Gynecology OT (21.4%), Orthopedics ward and Surgery OT with 20% each.

No significant association between the risk factors like previous hospitalization, nasal prick and MRSA carriage was found. Regarding carriage rate in relation to age, MRSA carriage rate was found to be higher in young individuals less than 30 years of age (25%) than those aged 30-50 years (19.6%) and above 50 years (0%).

Figure 1 shows the in-vitro antibiotic sensitivity pattern of 25 isolates of methicillin-resistant S.aureus is shown below. Resistance to commonly used oral antibiotics Penicillin (48%), Erythromycin (76%), Clindamycin (76%), Ciprofloxacin (48%) and Gentamycin (28%) was noted in MRSA isolates. All isolates were sensitive to Vancomycin.

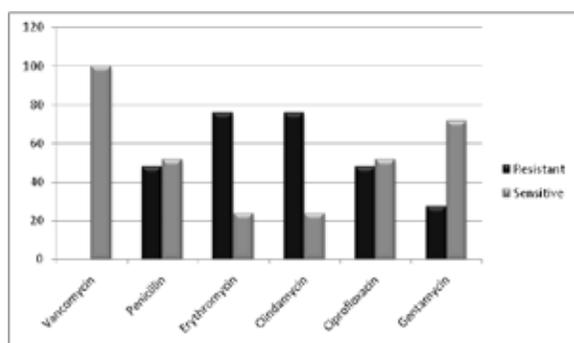


Figure 1: Antibiotic Sensitivity Pattern Of Methicillin resistant S.aureus (in %)

Figure 2 shows the antibiotic sensitivity pattern of 31 isolates of methicillin-sensitive S.aureus is shown below. Resistance to commonly used oral antibiotics Penicillin (16.1%), Erythromycin (64.5%), Clindamycin (29%), Ciprofloxacin (19.36%) and Gentamycin (22.59%) was noted in MSSA. All MSSA iso-

lates were sensitive to Vancomycin.

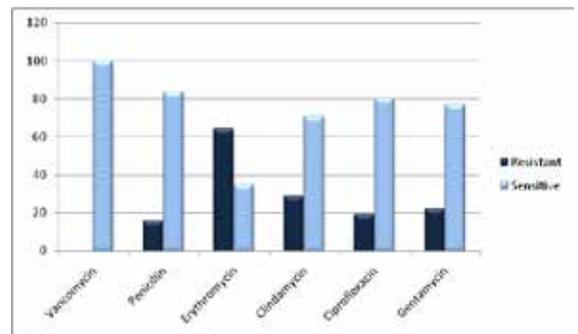


Figure 2: Antibiotic Sensitivity Pattern of Methicillin Sensitive S.aureus (in %)

DISCUSSION:

The prevalence of nasal carriage of MRSA among HCWs at our Hospital has not been determined to date. It is necessary to detect the MRSA carriers among the apparently healthy hospital personnel, particularly those working in the critical care areas. These individuals act as a potential source of infection to their patients, resulting in their extended stay in the hospital (6).

The largest population of S.aureus is found in the regions of the skin and mucous membranes surrounding the openings of the body surface. These include anterior nares, inguinal and perineal areas.

In this study we found the nasal carriage of S.aureus to be 43% and that of MRSA 16% (12% only nasal carriage and 4% both hand and nasal carriage). Hand carriage among HCWs was found to be 9% (5% only hand carriage and 4% both hands and nasal carriage). In our study, the total carriage rate of MRSA was found to be 21%.

Bidya Shrestha et al in their study reported only 2.32% MRSA carriage amongst health care workers. R. Goyal et al 2002 and Elie-Turenne MC 2010 in different studies reported a prevalence rate of MRSA carriage among health care workers as 6.6%. In a study conducted by S. Mathanraj 2009 on HCWs and patients reported 15.6% carriage rate amongst in patients and 1.8% amongst HCWs. Bisaga et al 2008 reported 15.23% MRSA carrier rate amongst HCWs. Meherdad Askarian et al 2009 reported a 5.3% MRSA carriage rate amongst HCWs. Shakya et al 2010 in their study reported a prevalence rate of 10.0% amongst health care workers. In study by Malini J 2012, MRSA colonization was found to be 10 % in the HCWs.

Our figure is 21% which is high as compared to other studies. The prevalence of MRSA varies between institutions and geographic areas and from the previous studies an increase in the carrier rate is reported in the recent studies. The differences in the design of the study such as the sample size and the method of MRSA detection may account for the disparity in the carriage rate.

Multidrug resistance is a common feature of MRSA (13, 14). In our study, 47.6% of the MRSA isolates were resistant to multiple drugs.

It is important to assess the prevalence of MRSA among the HCWs and to follow guidelines for preventive measures to reduce the hospital infections. There is a need for a greater awareness among the health professionals regarding the standard precautionary measures which are aimed at the prevention of acquisition of pathogens, especially when considering multi-drug resistance and the potential for the transmission of nosocomial infections from the HCWs who are colonized by MRSA to their patients. HCWs who acquire

MRSA in hospital transmit the organism to their household eventually spreading such nosocomially acquired multidrug resistant bacteria in community. Therefore such carriage study should be conducted at regular basis in all health sectors followed by treatment of the identified carriers.

Although the use of Mupirocin may have a beneficial role in

controlling the MRSA infection, the use of additional infection prevention practices is very important and it cannot be understated. The need is to educate the nursing staff regarding the Hospital infection control practices, as once introduced in hospital MRSA are very difficult to eradicate.

REFERENCE

- (1)-Mehdad Askarian et al - Prevalence of nasal carriage of methicillin-resistant *Staphylococcus aureus* and its antibiotic susceptibility pattern in healthcare workers at Nazmi Hospital, Shiran, Iran. *International Journal of Infectious Diseases* 2009; 13: e241-e247. | (2)-R Goyal et al- Colonization of methicillin resistant *Staphylococcus aureus* among healthcare workers in a tertiary care hospital at Delhi. *Indian Journal of Medical Sciences* 2002; 56(7): 321-324. | (3)-Mackie Mc Cartney *Practical Medical Microbiology*, 14th edition, Churchill Livingstone, p. 245-260. | (4)-Koneman EW, Allen SD, Janda WM, Schreckenberger PC, Winn WC. *The Gram Positive Cocci: Part 1: Staphylococci and related organisms: In colour atlas and textbook of Diagnostic Microbiology*; 6th edition. Lippincott, Philadelphia, New York, 1997:539-576. | (5)-Bauer AW, Kirby MM, Sherris JC, Tenckhoff M -Antibiotic Susceptibility Testing by a Standardized Single Disk Method. *The American Journal Of Clinical Pathology* 1966; 45, 4: 493-496. | (6)-Malini J et al- Methicillin Resistant *Staphylococcus aureus* among the health care workers in a tertiary care hospital. *Journal of Clinical and Diagnostic Research* 2012 June-6(5): 791-793. | (7)-Sonal Saxena et al- Methicillin-Resistant *Staphylococcus aureus* Prevalence in a Community in east Delhi Area. *Jpn. J. Infect. Dis.* 2003; 56: 54-56. | (8)-Bidya Shrestha et al- *Staphylococcus aureus* nasal carriage among healthcare workers in a Nepal hospital. *Braz J Infect Dis* vol.13 no.5. Oct 2009. | (9)-Elie-Turenne MC et al- Prevalence and characteristics of *Staphylococcus aureus* colonization among healthcare professionals in a urban teaching hospital. *Infect Control Hosp Epidemiol* 2010; 31(6): 574-80. | (10)-S Mantharaj et al- Screening for methicillin-resistant *Staphylococcus aureus* carriers among patients and healthcare workers of a tertiary care hospital in south india. *Indian Journal of Medical Microbiology* 2009; 27(1): 62-64. | (11)-Bisaga A et al- Prevalence study of methicillin-resistant *Staphylococcus aureus* colonization in emergency department healthcare workers. *Ann Emerg Med* 2008 Nov; 52(5):525-8. | (12)-Shakya B et al- Nasal carriage rate of methicillin resistant *Staphylococcus aureus* among at national Medical College Teaching hospital, Birgunj, Nepal. *Nepal Med Coll J.* 2010 Mar; 12(1):26-9. | (13)-Uday Shankar C, Harish BN, Umesh Kumar PM, et al. Prevalence of methicillin resistant *Staphylococcus aureus* in JIPMER Hospital- A Preliminary report. *Indian J Med Microbiol* 1997; 15: 137-138. | (14)-Paul N, Ayyagari A. Drug resistance pattern of methicillin resistant *Staphylococcus aureus*. *Ind paed*, 1991; 28:725-730. |