



Original Research Article

Screening for Methicillin Resistant *Staphylococcus Aureus* among Healthcare Workers in a Tertiary Care Hospital

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Received: 27/03/2013

Revised: 20/04/2013

Accepted: 26/04/2013

ABSTRACT

Methicillin resistant *Staphylococcus aureus* (MRSA) is a problem within healthcare organizations and in the community. The aim of the study was to screen for MRSA carriage among healthcare workers. The study involved 150 healthcare workers, which included 83 doctors, 51 nurses and 16 laboratory technicians. 300 swabs (150 each for nasal and web spaces of both hands) were collected and processed. Identification of the isolate as *Staph. aureus* was done using Gram stain, coagulase test and Catalase test. *Staph. aureus* isolates were confirmed as MRSA using cefoxitin (30µg) disc by Kirby-Bauer disc diffusion method on Muller Hinton agar. From 150 nasal swabs, 113 coagulase negative *Staphylococci*, 14 methicillin sensitive *Staph.aureus* and 3 Methicillin resistant *Staphylococcus aureus* were isolated. From 150 web space swabs, 37 coagulase negative *Staphylococci* and 1 methicillin sensitive *Staph.aureus* were isolated. All strains of MRSA were isolated from doctors. Overall rate of isolation of MRSA among healthcare workers was found to be 2.00%.

Keywords: MRSA, MSSA, CoNS, CoPS, MRSA carrier

INTRODUCTION

Staph.aureus is a versatile pathogen capable of causing a wide variety of infections. ⁽¹⁾ With the development of resistance to all β -lactam antibiotics, treatment of these infections has become problematic. In recent years MRSA remains one of the most prevalent multidrug resistant organism causing healthcare associated infections. In healthcare settings, patients who are colonized by or infected with MRSA act as a reservoir and a source for the spread of this organism occurring mainly through transiently colonized healthcare

workers (HCWs). ^(2, 3) Asymptotically colonized patients and healthcare workers are the major sources of MRSA in hospital environment, with the latter being more commonly identified as links in the transmission of MRSA between patients. ⁽⁴⁾ The severity of infections by MRSA adds to the economic burden of the patient due to longer hospital stay and prolonged antibiotic administration. It is therefore imperative for health services to carry out systematic MRSA surveillance and disseminate the findings to health professionals. ⁽⁵⁾ Most colonized health professionals are transient

carriers but may become persistent carriers, especially when they have skin lesions. Thus the identification and treatment of colonized health professionals can reduce the incidence of MRSA. ⁽⁵⁾

In this study, we investigated the probable MRSA carrier rate among the healthcare workers in our hospital.

MATERIAL AND METHODS

This was a cross sectional study conducted at a tertiary care hospital, Pune from June,2011 to May,2012. Physicians and nurses working in the intensive care unit, NICU, HDU and dialysis unit and technicians working in laboratory were included in the study. Only those who gave their consent to participate in the study were screened. This project was approved by the Institutional ethics committee. (Reference: BVDU/MC/01 dated-15/02/2011).

Premoisturised sterile swabs were used to collect samples from the anterior nares of both sides and web spaces. Swabs were transported to the laboratory in the Microbiology department within 30 minutes without employing any transport medium. Following all sterile precautions, the samples were inoculated onto blood agar

plates and were incubated overnight at 37⁰C. The suspected *Staph.aureus* colonies were confirmed by Gram staining, mannitol fermentation and by both slide and tube coagulase test. ⁽⁷⁾ Antibiotic susceptibility testing was performed using Kirby-Bauer's disc diffusion method as per CLSI guidelines. ⁽⁷⁾ Methicillin resistance was checked for all isolates of *Staph.aureus* using cefoxitin 30µg disc as well as Hi-Chrome MeReSA agar.(Hi Media, Mumbai, India)The prevalence of CoNS was identified using standard procedures.

RESULTS

A total of 300 swabs (nasal and web space - 150 each) collected from healthcare workers were inoculated on blood agar. From these, 168 swabs showed growth while no growth was observed in 132 swabs. No dual isolates were obtained in any swab. Out of 168 isolates, 150 were coagulase negative *Staphylococci*, 15 were methicillin sensitive *Staphylococci* and 3 were methicillin resistant *Staphylococci*. Out of 150 nasal swabs screened 3(2.00%) MRSA, 14(9.3%) MSSA and 113(75.3%) CoNS were isolated while 20(13.4%) showed no growth. (Table No.-1)

Table 1: Percentage isolation of *Staphylococci* from the anterior nares of healthcare workers.

Source	Number of samples		Growth of <i>Staphylococci</i>			No growth
			MRSA	MSSA	CoNS	
Nasal swab	Doctors	83	3	4	73	3
	Laboratory technicians	16	0	1	15	0
	Nurses	51	0	9	25	17
Total		150	3(2.0%)	14(9.3%)	113(75.3%)	20(13.4%)

Out of 150 web space swab, 1(0.66%) MSSA and 37(24.6%) CoNS were isolated while 112 (74.66%) showed no growth. (Table No.-2)

Table 2: Percentage isolation of *Staphylococci* from the finger web spaces of healthcare workers.

Source	Number of samples		Growth of <i>Staphylococci</i>			No growth
			MRSA	MSSA	CoNS	
Web space swab	Doctors	83	0	0	30	53
	Laboratory technicians	16	0	1	4	11
	Nurses	51	0	0	3	48
Total		150	0.0(0.0%)	1(0.66%)	37(24.66%)	112(74.66%)

All 3 MRSA (2.00%) were isolated from doctors.

DISCUSSION

It is necessary to detect MRSA in HCWs as they can act as carriers and thus act as a potential source of microorganisms. Carriage of *Staph.aureus* appears to play a key role in the epidemiology and pathogenesis of infection. In healthy subjects, over time, three patterns of carriage can be distinguished: about 20% of people are persistent carriers, 60% are intermittent carriers, and approximately 20% almost never carry *Staph. aureus*. Also Staphylococcal carrier status can lead to nosocomial infection. ⁽⁸⁾

In the present study, 18(6%) HCWs carried *Staph.aureus*. These 18 carriers included 7 doctors, 9 nurses and 2 laboratory technicians. MRSA carrier rate among HCWs was found to be 2% which is in concordance with other findings. ⁽¹⁰⁻¹²⁾ Blok H.E.et al ⁽¹³⁾ reported less than 5% HCWs to be colonized with MRSA. Higher MRSA carrier rate of 15% and 13.6% is reported by Bisaga A et al ⁽¹⁴⁾ and Suffoletto B P et al ⁽¹⁵⁾ respectively in USA. Milton Jorge de Carvalho et al ⁽¹⁶⁾, in their study isolated 14/340(4.1%) MRSA from saliva of the health professionals. Kumar P. et al, 2011 ⁽¹⁷⁾ reported 4.66% MRSA carrier rate among HCWs. He observed that among them 83.4% were doctors and 16.6% were laboratory technicians while in our study MRSA carrier state was reported only among doctors. P.E.B.Verwer et al, ⁽¹⁸⁾ from Western Australian acute care Hospital reported lower rate of 3.4% MRSA carriage among HCWs. He observed MRSA colonization of HCWS primarily in HCWs caring for patients infected or colonized with MRSA

Further 17(11.3%) of healthcare workers showed nasal carriage of *Staph.aureus* while 113(75.3%) had nasal colonization with CoNS. The ecological niche for the colonization of *Staphylococci* is the anterior nares, as most of the nasal

specimens showed Staphylococcal growth on culture. The greater amount of bacteremia cases recorded, have been due to *Staph.aureus* of endogenous origin, since they originate from colonies of nasal mucosa. Most invasive infections are assumed to originate from nasal mucosa. Hence it is imperative that nasal colonization due to *Staph.aureus* should be prevented in order to stem the rate of infection and in preventing the transmission of resistant strains of the organism. Although nasal carriage of *Staph.aureus* is harmless in healthy individuals, they can become carriers who could pose the risk of spreading infection. Nasal carriage, particularly in case of healthcare workers could pose a major risk in transmission of infection to patient because of their interaction and exposure to them.

Health professional's compliance with sanitary and antibacterial guidelines is essential to prevent nosocomial infection. To achieve this, health professionals should be informed about the potential consequences of nosocomial infections both inside and outside the hospital and their co operation should be sought to diminish the carriage of *Staph.aureus*. To reduce the transmission rate, simple preventive measures like hand washing before and after patient examination, the use of sterile aprons and masks, and awareness while examining immunocompromised patients should be implemented strictly. Simultaneous monitoring and surveillance of nosocomial infections by the Hospital infection control committee can help to further reduce transmission.

CONCLUSION

The study showed overall MRSA carrier rate among Health care workers to be 2%. Only doctors were reported to be MRSA carriers. MRSA were isolated from nasal swabs obtained from doctors. CoNS

(150/168) were the predominant isolate. This study restricted to screening of healthcare workers working only from intensive care units was the limitation of the study. In future we intend to screen health care workers from all the wards also. As the role of HCWs in maintenance and the spread of MRSA within hospital are increasingly being recognized, this study supports regular screening of HCWs with significant patient contact to prevent further transmission in centres.

ACKNOWLEDGEMENT

The authors want to thank all the healthcare workers of Bharati Hospital who participated in this study. We are thankful to all the technical staff for their support. This study was supported by Department of Microbiology, Bharati Vidyapeeth Deemed University Medical College.

REFERENCES

1. Gordon RJ, Lowy FD. 2008. Pathogenesis of methicillin-resistant *Staphylococcus aureus* infection. *Clin. Infect Dis.* 49, S: 350-359.
2. Harbarth S, Masuet-Aumatell C, Schrenzel J, et al. 2006. Evaluation of rapid screening and pre-emptive contact isolation for detecting and controlling methicillin-resistant *Staphylococcus aureus* in critical care: an interventional cohort study. *Crit. Care.* Feb;10(1):R25.
3. Albrich WC, Harbarth S. 2008. Health-care workers: source, vector, or victim of MRSA? *Lancet Infect Dis.* 8:289-301.
4. Safdar N, Maki DG. 2002. The commonality of risk factors for nosocomial colonization and infection with antimicrobial resistant *Staphylococcus aureus*, *Enterococcus*, Gram negative bacilli, *Clostridium difficile* and *Candida*. *Ann Intern Med* 136:834-844.
5. Coia J E, Duckworth D I, Farrington M, et al. 2006. Guidelines for the control and prevention of Methicillin resistant *Staph.aureus* (MRSA) in healthcare facilities. *J.Hosp.Infect.* 64 (1):97-98.
6. Ben David D, Mermel L A, Parenteau S. 2008. Methicillin resistant *Staphylococcus aureus* transmission: the possible importance of unrecognized healthcare worker carriage. *Am.J.Infect. Control*, 36(2):93-97.
7. Bannerman T L. 2003. *Staphylococci and other Catalase positive cocci that grow aerobically.* Manual of Clinical microbiology 8th edition. In: Murray P R, Baron E J, Jorgensen J H, Washington D C: press 2003, pg 384-404.
8. Clinical and Laboratory Standard Institute. 2009. Performance standards for antibacterial disc diffusion tests. Approved standards 9th edition. CLSI document M2-M9, Wayne Pa; CLSI.
9. The Kluytmans, Belkum A, Verbrugh H. 1997. Nasal carriage of *S. aureus*: epidemiology, underlying mechanisms and associated risks. *Clin.Microbiol. Reviews.* 10(3):505-520.
10. Mathanraj S, Sujatha S, Sivasangeetha K, et al, 2009. Screening for methicillin resistant *Staphylococcus aureus* among patients and health care workers of a tertiary care hospital in south India. *Ind. J.Med. Micro-biology.* 27(1):62-64.
11. Vinodkumaraditya A, Uma A, Srinivasan M, et al. 2009. Nasal carriage of methicillin resistant *staphylococcus aureus* among

- surgical unit staff. Jpn.J.Infect. Dis.64(3):228-229.
12. Johnston C P, Stokes AK, Ross T, et al. 2007. S. aureus colonization among healthcare workers at a tertiary care hospital. Infect Control Hosp. Epidemiol.28 (12):1404-1407.
 13. Blok HE, Troelstra A, Kamp-Hopmans TE, et al.2003. Role of healthcare workers in outbreaks of methicillin-resistant S. aureus: a 10-year evaluation from a Dutch university hospital. Infect Control Hosp Epidemiol. 24(9):679-685.
 14. Bisaga A, Paquette K, Sabatini L, et al.2008. A prevalence study of methicillin-resistant S. aureus colonization in emergency department health care workers. Ann Emerg Med. 52(5):525-528.
 15. Suffoletto BP, Cannon EH, Ilkhanipour K, et al. 2008.Prevalence of S. aureus nasal colonization in Emergency Department Personnel. Ann Emerg Med.52 (5):529-533.
 16. Milton Jorge de Carvalho, Fabiana C P, Hayashida M .2009. Prevalence of methicillin resistant and methicillin susceptible S.aureus in the saliva of health professionals. Clinic 64(4):295-302.
 17. Kumar P, Shukla I, Varshney S.2011.Nasal screening of healthcare workers for nasal carriage of coagulase positive MRSA and prevalence of nasal colonization with Staphylococcus aureus. Biology and Medicine.3 (2) Special issue: 182-186.
 18. Verwer P E B, Robinson J O, Coombs G W, et al.2012.Prevalence of nasal methicillin –resistant Staphylococcus aureus colonization in healthcare workers in a Western Australian acute care Hospital. Eur J Clin Microbio. Infect Dis .31:1067-1072.

How to cite this article: Ravindra JS, Sujeet MM, Habib J. Screening for Methicillin Resistant *Staphylococcus aureus* among healthcare workers in a tertiary care hospital. Int J Health Sci Res. 2013;3(5):14-18.
