Original Research Article

Prevalance of Nasal Carriage of Methicillin Resistant *Staphyloccocus aureus* in Health Care Workers

Krishan Kumar Thakur[1], Tukaram Prabhu[2], Deepti Agarwal[3*],Harsha Shahi[4], Dhruv Jain[5]

[1]Assistant Professor ,Department of Anaesthesiology,PCMS and RC Bhopal,M.P,India
[2]Associate Professor,Department of Microbiology ,PCMS and RC Bhopal, M.P,India
[3]Assistant Professor ,Department of Anaesthesiology, PCMS and RC Bhopal, M.P,India
[4]Intern 2015 Batch PCMS and RC Bhopal , M.P,India
[5]Intern 2015 Batch PCMS and RC Bhopal, M.P,India

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Abstract

Background: Prevalence of Methicillin resistant Staphylococcus aureus (MRSA) among healthcare workers is a known risk factor for nosocomial infections. In developing countries like India, this risk factor can have serious socioeconomic impact and hence there is need of data and also policy for MRSA infection control.**Aim and Objectives:** Present study was aimed at establishing the carriage of MRSA among healthcare workers of Peoples College of Medical Sciences, Bhopal M.P and at formulating an MRSA control policy, based on the outcomes. **Material and methods**: We screened 100 healthcare workers of the Peoples Hospital, Bhopal MP, for MRSA. Swabs taken from both anterior nares were transported, inoculated onto mannitol salt agar (MSA) and incubated aerobically at 37°C for 18-24 hours. Gram positive cocci in clusters, with positive catalase, coagulase and DNAse tests, were identified as S.aureus. Further categorization of S aureus into MRSA was done by using cefoxitin disc diffusion Method.**Results:** The number of strains @ S. aureus which was isolated from our 100 participants was nine. Three of the nine isolates of S. aureus, were MRSA as identified by cefoxitin disc diffusion method.**Conclusion:** MRSA carriage among healthcare workers at Peoples Hospital was 3%, which is comfortably low. The existing infection control policy in our hospital are effective in controlling carrier and transmission risk.

Keywords: Urinary Tract Infection, Microscopic Urine Analysis, Febrile Children

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Introduction

Asymptomatic nasal carriers of MRSA are major source of nosocomial infections.Methicillin resistance is usually acquired during hospital exposure. Worldwide incidence of community acquired and hospital aquired MRSA is increasing and hence becoming endemic in past two dacade."In India prevalence of MRSA in health care workers range from 0-40 percent". Infection with MRSA is associated with prior clinical outcomes, increased hospital stay, increased cost of treatment and increased mortality. Nasal carriage is most common source of transmission of MRSA among healthcare works and patients. Nasal carriage rates of MRSA have been reported to be between 0.8% and 3.0% and 6% to 17.8% among adults in the community and healthcare workers in hospital settings elsewhere in the world respectively. Screening of healthcare workers is first step towards infection control practices in hospital[1-3]. Present study, was aimed at establishing the carriage rate of MRSA among healthcare workers of Peoples College of Medical Sciences, Bhopal MP, India.

Materials and Methods

Methodology

This study was conducted at Peoples College of Medical Sciences Bhopal MP, from 1st July 2020 to 31st July 2020. All volunteering staff members who were working in the hospital units were conveniently included in the study. Approval was obtained by the research ethics committee of the institution for carrying out the study. A total of 100 participants who gave consent, were included in the study. The age, sex, designation, years of working in institute and other relevant information about the consenting participants were obtained in a proforma which was made for this purpose.

Swabs from both anterior nares of consenting participants were taken by using sterile cotton swabs moistened with sterile physiological saline and transported to the microbiology laboratory unit of the hospital for bacteriological analysis. The samples were processed within 2 hours after their collection. The swabs were inoculated onto mannitol salt agar (MSA) plates and incubated at 37°C for 18-24 hours[4].

Any growth was identified as S. aureus by using standard procedures to study colony morphology, microscopic appearance on gram stained smears,catalase test,tube coagulase test and deoxyribo-nuclease test.The isolated strains of S. aureus were screened for methicillin susceptibility by modified Kirby- Bauer method by using cefoxitin (30 pg) discs on Mueller-Hinton agar (MHA) by using an inoculum density which is equivalent to McFarland' s 0.5 standard (I .5 • 10' CFR/ml).'Isolates which were showing inhibition zone sizes of diameter <21 rum were considered as MRSA strains.

Consent: Written consent was obtained from the relatives of patients after explaining them the nature and purpose of the study. They were assured that confidentiality would be strictly maintained. The option to withdraw from the study was always open.

Observation Chart

**Correspondence*
Dr.Deepti Agarwal
Assistant Professor,Department of Anaesthesiology,PCMS and RC Bhopal,M.P,India
E-mail: agrawaldeeptigmc@gmail.com

Table 1: Demographic Distribution of Study Subjects According to Age & Gender

Age Category	Males	Females	Total
18-30 Years	4	41	45
31-50 Years	7	45	52
>51 Years	-	3	03
Total (n)	11	89	100
Chi Square Value	0.897		
Significance 'P' Value	0.638(NS)		

Table 2: Demographic Distribution of Study Subjects According to Year of Experience & Gender

Year of Experience	Male	Female	Total
<1 Year	0	20	20
1-5 Year	2	31	33
>5 Yfar	9	38	47
Total(n)	11	89	1011
Chi Square Value	Fi.048		
Significance 'P' Value	0.039(s)		

Table 3: Distribution of S.Aureus Strains (MSSA &MRSA) among carriers according to gender

Gender	Number	MSSA	MRSA
Male	11	0	1
Female	89	3	5
i»"‘	100	3	Fi
Chi Square Value		0.562	
Significance 'P' Value		0.453(NS)	

Table 4: Distribubon of S. Aureus Strains (MSSA & MRSA) Among Carriers According to Age

Age C.groups	Number	MSSA	MRSA
18-30	45	1	1
31-50	52	2	4
>51	3	0	1
Total	100	3	6
Chi Square Value		0.750	
Significance 'P' Value		0.687(NS)	

Table 5: Distribution of S. Aureus Strains (MSSA & MRSA) among carriers

Department	Number	MSSA	MRSA
Resident Doctor	3	0	0
Nursing	63	3	2
Attendant	6	0	2
Housekeeping	28	0	2
P"‘	100	3	6
Chi Square Value		5.62	
Significance 'P' Value		0.131(NS)	

Results

Total of 100 healthcare workers, whose ages ranged from 18-60 years (mean = 33.79+ 8.72), were screened for MRSA. Eleven (11 %) were males and 89 (89%) were females. Number of years of work in hospital ranged between < 1 year to >5 years (mean 6.92). Nursing (63) and Housekeeping (28) were the major contributor. MSSA and MRSA were isolated from the anterior nares of the participants, have been shown in(Table). Out of 100 healthcare workers who were screened, 9(9°/e) were positive for nasal cases of S. aureus. Among these,3(3%) were MSSA carriers and 6 (6%) were MRSA carriers. Overall, MRSA nasal carriage rate was 6% in our study. The distribution of S. aureus and MRSA carriage in relation to department has been presented[5-7].

Statistical Analysis

A convenient sampling technique was used for sample selection. Results were compiled, tabulated and all data were subjected to SPSS,version 22.0 software statistical package for analysis. Association was done by using Chi-square test. Frequency and percentage were calculated & statistical test (Chi Square) was applied wherever applicable; $p<0.05$ was taken as statistically significant[8-10]

Discussion

MRSA infection is a serious health issue. MRSA carriers are potential source of infection to their patient causing nosocornial infections and thereby, causing extended stays in the hospital. With help of regular screening of the HCWs taking the appropriate preventive measures, this nosocomial infection can be controlled. The prevalence of MRSA varies between institutions and regions. Few Indian studies have revealed an MRSA carriage rate of 1.8% to 12 % in various clinical settings. According to the findings of our study, nasal carriage of S.aureus among healthcare workers who were involved in the management of patients was 9%. The S aureus carriage was particularly high among nursing staff (55%) and housekeeping personnel (22%).Ray P, Manchanda V et al studied prevalence & susceptibility pattern of Methicillin resistant Staphylococcus aureus (MRSA) in India. This study was conducted

in 15 Indian tertiary care centres during a two year period from January 2008 to December 2009 to determine the prevalence of MRSA and susceptibility pattern of *S. aureus* isolates in India. The overall prevalence of methicillin resistance during the study period was 41 per cent. Isolation rates for MRSA from outpatients, ward inpatients and ICU were 28, 42 and 43 per cent, MSSA isolates showed a higher susceptibility to gentamicin, co-trimoxazole, erythromycin and clindamycin as compared to MRSA isolates. No isolate was found resistant to vancomycin or linezolid. The study showed a high level of MRSA in our country.

Rongpharpi SR, Hazarika NK et al studied the prevalence of nasal carriage of Staphylococcus aureus among healthcare workers at a tertiary care hospital in Assam with special reference to MRSA. They concluded that the compliance with the sanitary and the antibacterial guidelines of the health professionals is the single most important factor in preventing nosocomial infections. Simple preventive measures like hand washing before and after the patient examination, the use of sterile aprons and masks in the postoperative wards, awareness during the examination of the immuno-compromised patients, and avoiding touching one's nose during work, can reduce the disease transmission rate considerably. All inferences were similar as our study.Chacko J et al studied factors affecting the nasal carriage of methicillin-resistant Staphylococcus aureus in human immunodeficiency virus-infected patients. Human immunodeficiency virus-infected patients attending skin outpatient department were studied for nasal carriage of methicillin-resistant Staphylococcus aureus (MRSA) and associated factors affecting nasal colonization. Nasal swabs were used for isolation of S. aureus. Significant number of S. aureus carriers were in the 31-40 year age group. Methicillin resistance was found in eight (17.39%) isolates. Hospital stay for more than 10 days was a risk factor for methicillin resistance whereas stay for more than 25 days was found to be a highly significant risk factor. Dermatophytosis and herpes simplex virus infection were other risk factors for nasal carriage of S. aureus.A study similar to ours was done by Khanal R, Sah P et al. This study aimed to determine the nasal carriage rate of S. aureus and MRSA among healthcare workers at Universal College of Medical Sciences and Teaching Hospital, Nepal . High nasal carriage of S. aureus and MRSA among healthcare workers (especially in surgery ward and operating room) necessitates improved infection control measures to be employed to control MRSA transmission in our setting. Askarian M et al studied prevalence of nasal carriage of methicillin-resistant Staphylococcus aureus and its antibiotic susceptibility pattern in healthcare workers at Namazi Hospital, Shiraz, Iran. This study revealed the prevalence of nasal carriage of *S. aureus* strains among HCWs to be lower than that found in other studies from Iran. The antibiotic susceptibility patterns also differed, perhaps as a result of the excessive use of antibiotics at our hospital. Only the occupation of nurse was an independent risk factor for MRSA carriage.

Many similar studies on nasal carriage of methicillin resistant Staphylococcus aureus among health care workers in Gaza Strip, Northeast Ethiopia, Iranian hospital and Peru. These studies aimed to describe the frequency and dynamics of methicillin-resistant Staphylococcus aureus(MRSA) carriage among healthcare workers(HCWs),and to compare the molecular epidemiology of MRSA isolates from HCWs with those from patients with bacteremia. HCWs were interviewed and three nasal swabs were collected. Consecutive S. aureus blood culture isolates from patients with bacteremia in the same hospital were also collected. In conclusion, all these studies found high proportions of MRSA among persistent and intermittent S. aureus nasal carriers among HCWs in a hospital.They belonged to similar genetic lineages as those recovered from patients with bacteremia. A high rate of nasal carriage and multidrug-resistant *S. aureus* was found in this study, indicating the need for standard infection control to prevent transmission in our health care setting [11,12]

Parras F, Guerrero MD et al did comparative study of mupirocin and oral co-trimoxazole plus topical fusidic acid in eradication of nasal carriage of methicillin-resistant Staphylococcus aureus.The MRSA isolates were not resistant to the study drugs either at the baseline or at follow-up. These results suggest that mupirocin and co-trimoxazole plus fusidic acid, both used in conjunction with a chlorhexidine soap bath, are equally effective and safe for the eradication of MRSA from nasal and extranasal MRSA carriers. Mupirocin was easier to use but was more expensive.

Legese H et al studied nasal carriage, risk factors and antimicrobial susceptibility pattern of methicillin resistant Staphylococcus aureus among healthcare workers Increasing rates of antibiotic resistance owing to an incautious use of antimicrobials lead to decrease treatment options for MRSA infection. The increasing of MRSA strains becomes a public health problem. This has a negative effect on the treatment cost, long hospitalization, and increased morbidity and mortality especially among the critically ill patients . The problem of MRSA is observed all over the world, although, the burden of infection is high in developing countries.Therefore, this current study was aimed to determine nasal carriage, antimicrobial susceptibility patterns and associated factors of MRSA colonization among healthcare workers.This evidence based information in the study area will contribute a role for the prevention and control of MRSA by responsible bodies.Our finding for MRSA was high as compared to the earlier report (1.8%) which was obtained from Pondicherry, but it was low as compared to the findings of Assam (1.48%) and Bangalore (10%) respectively. We did not do the further antibiotic susceptibility testing on our isolates.There is a need to study epidemiology of such infections. Robust antimicrobial stewardship and strengthened infection control measures are required to prevent spread and reduce emergence of resistance.We shared our findings with Hospital Infection Control Committee so that they can take appropriate action. Mupirocin is the topical antibiotic of choice for the decolonization of MRSA, as it is very effective for this use.

Conclusion

Equal MRSA carriage rate observed among nursing staff (33%), housekeeping staff (33%) and attendant (33%). This underscores not only the need to develop more stringent hospital infection control policies, but also to create awareness among hospital staff by educating them, to eradicate MRSA carriage. Further, such actions would help in the prevention of MRSA transmission to their family members.

What this Study add to existing knowledge

The financial burden of handling such nosocomial and community spreads of MRSA infection would be considerable and hence, MRSA has been considered a public health issue with economic consequences. The compliance with the sanitary and the antibacterial guidelines of the health professionals is the single most important factor in preventing MRSA. Simple preventive measures like hand washing before and after the patient examination, the use of sterile aprons and masks in the postoperative wards, awareness during the examination of the immunocompromised patients, and avoiding touching one's nose during work, can reduce the disease transmission rate considerably.

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