# FREQUENCY OF NASAL CARRIAGE OF METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS IN ORTHOPAEDIC STAFF

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## ABSTRACT

**Objective:** To determine the frequency of nasal carriage of methicillin resistant staphylococcus aureus among orthopedic staff.

**Material and Methods:** This Cross sectional (Descriptive study) was conducted in orthopedic staff of Hayat Abad Medical Complex Peshawar from Oct 2011 till March 2012. 73 orthopaedic staff members of either age and gender were included. The included staff memebers were those who come in regular contact with orthopaedic patients were regular employees of orthopedic department. Those were excluded who were not coming in contact with patients and were not responsible in direct patient care like clerical staff, computer operators were excluded. Culture specimens were taken from anterior nares of orthopedic staff member and send to the local hospital laboratory for culture. All the information of orthopedic staff, their culture specimen and their results were recorded in a pre-designed proforma. All the data collected was entered and analyzed in SPSS (version 17).

**Results:** Out of 73 orthopedic staff members 72(98.6%) were culture negative and 1(1.4%) was culture positive. Sixty one (83.6%) were male and 12(16.4%) were female. Out of all included orthopedic staff in this study, 62(84.9%) were health care workers and 11(15.1%) were non health care workers. All the health care workers were culture negative for MRSA. 1(9.09%) out of all included non health care workers from orthopedic staff was culture positive for MRSA. All the included orthopedic staff was within the age range 25 to 55 years. Mean age was 35.01 years ± 7.074.

**Conclusion:** The frequency of MRSA in orthopedic staff was lower in our study. Factors of low frequency in this region may be frequent nose wash as in ablution. Muporicin application was found affective in MRSA positive orthopedic staff member.

**Key Words:** Frequency, Nasal carriage, Methicllin Resistant staphylococcus aureus (MRSA) Orthopedic staff.

## INTRODUCTION

Staphylococcus is a gram positive bacterium which grows in clusters. It was classified into two primary species in 1884 by Rosenbach, Staphylococcus Aureus and Staphylococcus Albus. Staphylococcus aureus grows in deep yellow colonies on blood agar and is coagulase positive while staphylococcus albus forms white colonies and lacking the ability to clot blood. Staphylococcus aureus can be part of the microbial flora or cause a variety of illnesses ranging from mild infections compromising skin and soft-tissues to severe life-threatening diseases such as necrotizing pneumonia, bacteremia, osteomyelitis, toxic shock syndrome, and meningitis[1]. Staphylococcus aureus initially sensitive to penicillin has developed resistance by producing penicillinase, because of widespread use of penicillin. To combate this resistance, in 1960s methicillin was introduced. Now methicillin resistant species are also developed. Methicillin-resistant Staphylococcus aureus (MRSA) is subclassified into community-acquired and healthcare-acquired methicillin resistant staphylococcus aureus. Each type differs in its pathogenic capacity, virulence and antibiotic resistance profile[2]. Hospital acquired MRSA generally affects acutely and chronically ill patients who require indwelling devices, such as catheter, central line and orthopedic implants. Health care-acquired MRSA colonization has important implications regarding the overall health and prognosis of the patient. MRSA carriers are known contributory factor in the transmission of MRSA to patients during their contact. There are three types of MRSA carrier status for healthcare staff: non-carriers; persistent carriers chronically colonised with the same strain; and intermittent or transient carriers, who are colonised with varying strains for short time periods[3]. Nares are the most common consistent site of health-care acquired MRSA colonization. MRSA surgical infections are clinically and financially more costly than non-MRSA infections.

MRSA patients have a longer hospital stay and a higher hospitalization charges than methicillin sensitive staph aureus[4]. The increasing number of elderly and

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trauma patients who require orthopedic surgery has resulted in an increase in the rate of MRSA infection[5]. MRSA is one of the most common cause of osteomyelitis in orthopedic patients[6]. MRSA produce a biofilm which predispose it to cause infection in orthopedic implants. The bacteria adhere to the implant, become sessile, reduce their metabolic rate, and secrete a glycalyx layer which protect them from antibiotic, phagocytosis and opsonisation. Within a colony, cell to cell interaction is mediated by polysaccharide adhesion molecules, inhibiting further bacterial reproduction once an ideal colony number has been reached[7]. It is difficult to eradicate, costly to be treated and it also has risk of transmission to other patients. Mupirocin, an antibiotic produced from pseudomonas fluorescens, has formed the cornerstone of the treatment of MRSA. Application intra nasal mupirocin ointment twice daily for five days has been shown to eliminate MRSA in nasal carriers[8].

Health-care workers who are nasal carriers of MRSA having prevalence of about 38.9% in critical care unit[9]. Rationale of this study is that MRSA infection in orthopedic patients is a very serious problem. MRSA related osteomyelitis and implant infections are really difficult to treat problems. MRSA cross infection is very common and usually transmitted through orthopedic staff. The results of this study will be shared with all orthopedic health care workers. Depending upon the frequency of MRSA found in our study, we will suggest recommendations for regular screening of all orthopedic staff for MRSA and eradication and prophylactic therapy will also be advised, which will help us in reducing the debilitating complications associated with MRSA.

## MATERIAL AND METHODS

This Cross sectional (Descriptive study) was conducted in orthopedic staff of Hayat Abad Medical Complex Peshawar in about six months. The sample size was 73, keeping 38.9% frequency of MRSA in health care workers of critical care unit[9] and assuming it to be 25% among orthopedic staff, 95% confidence level and 10% margin of error, under WHO software for sample size determination. Sampling technique was non probability consective sampling.

All orthopedic staff of (a) either gender (ii) any age group and (iii) who come in contact with orthopedic patients was included and the following subjects was excluded:

1. Who are regular employs of orthopedic department and are not coming in contact with patients like clerical staff, computer operators.
2. Who are not regular employs of orthopedic department like house officers, interns, medical students.
3. Who are working in MRSA isolation room.
4. Who have recently taken MRSA prophylaxis or treatment.

The above mentioned conditions act as confounders and if included would introduce bias in the study result.

An informed written consent will be taken from the participants and subjects was enrolled from staff of orthopedic department Hayat abad medical complex Peshawar. Culture specimen was taken using commercially prepared Dacron tipped swab from anterior nares of health-care workers. One swab was rotated in both nares of each worker. After labeling, the specimen was send to hospital laboratory for culture. Specimen was plated on Blood agar and Mac Konkey agar as per laboratory protocol. The inoculated plate was incubated at 35-37c$^0$ aerobically. Plates was read for growth 18-48 hours.

Suspected colonies of staphylococcus aureus was gram stained to confirm gram positive cocci. Catalase test was performed to differentiate streptococci from staphylococci. Coagulase test was performed to separate staphylococcus aureus from other staphylococcal species. Methicillin resistance of the organism was tested by disc diffusion method. The plate was incubated at 30c$^o$ for 24 hours and the results was recorded to detect MRSA. All the laboratory investigations was done under the supervision of expert microbiologists having at least 5 years of experience. All the above mentioned information including name, age and sex was recorded in a pre-designed proforma. Strictly exclusion criteria was followed to control confounder and bias in the study results.

All the data was entered and analyzed in SPSS(version 10). Frequency and percentage was calculated for categorical variable having type of orthopedic staff, sex and nasal swab culture. Mean ± S.D was calculated for continues variable like age. Nasal swab was stratified among the age, sex and type of orthopedic staff to see effect modifiers.

All the results was presented as tables and graphs.

## RESULTS

In this study 73 orthopedic staff members were included. 72(98.6%) were culture negative and 1(1.4%) was culture positive (Table no 1). In these 73 orthopedic staff members, 61(83.6%) were male and 12(16.4%) were female (Table no 2). All female orthopedic staff members were culture negative and one (1.64%) out of total male orthopedic staff was culture positive for MRSA(Table no 5). Out of all included orthopedic staff in this study, 62(84.9%) were health care workers and 11(15.1%) were non health care workers (Table no 3). All the health care workers were culture negative for MRSA. 1(9.09%) out of all included non health care workers from orthopedic staff was culture positive for MRSA (Table no 6). All the included orthopedic staff was within the age range 25 to 55 years. Most of the staff member were in the age range of 31 to 40 years (Table

**Table No 1: Age Distribution**

| Age | No of Staff | %Age |
|---|---|---|
| 25-30 | 24 | 32.88 |
| 31-40 | 33 | 45.02 |
| 41-50 | 13 | 17.80 |
| 51-55 | 3 | 4.11 |

Mean age 35.01 ± 7.074 SD

**Table No 2: Sex Distribution**

| Sex | No of staff | Percent |
|---|---|---|
| Female | 12 | 16.4 |
| Male | 61 | 83.6 |
| Total | 73 | 100.0 |

**Table No 3: Type of Staff Distribution**

| Type of staff | No of staff | Percent |
|---|---|---|
| Health Care Worker | 62 | 84.9 |
| Non Health Care Worker | 11 | 15.1 |
| Total | 73 | 100.0 |

**Table No 4: Culture Distribution**

| Culture | No of staff | Percent |
|---|---|---|
| Negative | 72 | 98.6 |
| Positive | 1 | 1.4 |
| Total | 73 | 100.0 |

**Table No 5: Sex Wise Distribution of Culture**

| Sex | Culture | | Total |
|---|---|---|---|
| | Negative | Positive | |
| Female | 12 (100%) | 0 (0.00%) | 12 (16.43%) |
| Male | 60 (98.36%) | 1 (1.64%) | 61 (83.56%) |
| Total | 72 (98.63%) | 1 (1.37%) | 73 (100%) |

**Table No 6: Type Staff Wise Distribution of Culture**

| Type Staff | Culture | | Total |
|---|---|---|---|
| | Negative | Positive | |
| Health Care Worker | 62(100%) | 0(0.00%) | 62(84.93%) |
| Non Health Care Worker | 10(90.91%) | 1(9.09%) | 11(15.06%) |
| Total | 72(98.64%) | 1(1.36%) | 73 |

**Table No 7: Age Wise Distribution of Culture**

| Age | Culture | | Total |
|---|---|---|---|
| | Negative | Positive | |
| 25-30 | 24(100%) | 0(0.00%) | 24(32.87%) |
| 31-40 | 32(96.97%) | 1(3.03%) | 33(45.20%) |
| 41-50 | 13(100%) | 0(0.00%) | 13(17.80%) |
| 51- above | 3(100%) | 0(0.00%) | 3(4.11%) |

no 1). Mean age was 35.01 years ± 7.074.

## DISCUSSION

The overall frequency of nasal carriage of MRSA in orthopedic staff was 1.4% in the present study with the highest rates seen among non health care workers. Most studies had focused on patients belonging to particular wards like ICU where the likelihood of colonization is high (38.9%)[9]. In intensive care unit most of the patients are very serious and the rate of MRSA related infections are also high in these patients. So the rate of nasal carriage of MRSA in ICU health care workers is high. In our study orthopedic staff included health care works as well as non health care workers. Health care workers were regular employs of orthopedic department who come in close contact with orthopedic patients and actively participate in their health care including orthopedic consultants, trainee medical officers, medical officers, nursing staff, dispencers, theater assistants, physiotherapist and paramedics. Non health-care workers were regular employs of orthpedic department who come in contact with orthopedic patients and do not actively participate in their health care including porters, ward boys, sweepers, dressers. Studies have shown that approximately 25-30% of the population is colonized with methicillin-sensitive S aureus bacteria. Colonization is usually on the skin or in the nasal passages. One study demonstrated a 3% rate of MRSA nasal colonization in adult patients visiting an outpatient clinic for unrelated medical appointments.[10] A similar study in an outpatient pediatric population detected MRSA colonization rates slightly above 1%.[11] Nasal carriage of MRSA in orthopedic non health care worker in this study was 9.09%. The only one non healthcare worker carrier was adult without any antecedent contact with the health care environment at least in the previous year. Wenzel and Perl studied that carrier rates of 11-32% were detected among healthy adult in the general population, and it was 25% in hospital Healthcare workers.[12] In other study nasal carriage of MRSA in healthcare workers is 5.3%.[13] The nasal carriage rate among Health care workers in our study was zero. This is in contrast to other studies where rates of 6-50% have been described in the health care workers, particularly those posted in the burns and in the intensive care units.[14] MRSA-infected patients in burns units are particularly problematic because the big surface area of denuded skin can produce a large inoculum of organ-

isms that can be easily transmitted to other patients via the hands of health care workers. The same is true of dermatology wards where extensive skin lesions also result in heavy shedders of MRSA. In our study the only one nasal carriage of MRSA orthopedic staff was male. This finding was contrary to that observed in the study done in Nigerian population where females harbored S. aureus significantly more often than males.[15] Males were more likely to be MRSA carriers than females. The reasons for this male preponderance need to be further studied, including the possible role of hormones.

Prolonged stay in the hospital is likely with patients in orthopedics and dermatology wards, which would explain the high rates of carriage observed in these patients. Other major risk factors like previous antibiotic use and underlying illnesses were not commonly encountered in our patients. Health care workers do not appear to be a major source of MRSA in our hospital, although it would require screening of larger numbers before arriving at any definite conclusions. Regular screening of all inpatients may neither be feasible nor warranted, but selective screening in high-risk areas may prove beneficial. If performed, nasal screening alone is sufficient.

## CONCLUSION

The frequency of MRSA in orthopedic staff was lower in our study. Factors of low frequency in this region may be frequent nose wash as in ablusion. Recognition and isolation of persons either colonized or infected with MRSA is recommended for minimizing the spread of MRSA within hospitals. Muporicin application was found affective in MRSA positive orthopedic staff member.

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