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# NOSOCOMIAL METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS FREQUENCY IN A TERTIARY CARE HOSPITAL, LAHORE, PAKISTAN

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**ABSTRACT**
*Methicillin-resistant Staphylococcus aureus (MRSA) is one of the most important nosocomial pathogens world wide. The present descriptive study was carried out to determine the frequency of MRSA isolates in Jinnah Hospital Lahore, which is a major tertiary care hospital. Staphylococcus aureus (S.aureus) isolates recovered from various clinical samples received from inpatient departments of Jinnah Hospital Lahore (JHL) were included in the study. Screening for MRSA was done by modified Kirby-Bauer disc diffusion technique according to the CLSI guide lines. A total of 864 isolates of S. aureus were cultured. Two hundred and forty (27.77%) were found to be MRSA. Maximum isolation was from endotracheal tubes and ceritral venous (CV) catheters. Conclusion: MRSA infections are emerging as a serious health problem in our set up. Joint efforts by clinicians, clinical microbiologists, hospital management and public health authorities are required to meet the challenge of MRSA on the forefront.*

***Key Words:*** *MRSA, Methicillin, Staphylococcus aureus, Nosocomial pathogen, Frequency.*

## INTRODUCTION

Methicillin-resistant *Staphylococcus aureus* (MRSA) strains were first reported in 1961 in the UK.[1] They are now recognized globally as most important nosocomial pathogens.[2] Serious infections due to MRSA pose an evolving challenge to the physicians, being associated with substantial morbidity and mortality.[3] Risk factors which contribute to MRSA infection and colonisation include excessive use of antibiotics, prolonged hospitalisation especially in intensive care units (ICUs), intravascular catheterization and immuno-compromised states.[4,5] Infected and colonised patients serve as reservoir and transmission occurs primarily through contaminated hands of health care workers.[6]

Hospital acquired MRSA is frequently multidrug resistant. This limits the therapeutic options to a few antimicrobials, which are toxic, complicated to administer and expensive.[7,8] As a consequence patients have to be hospitalized for a longer duration, treatment costs are increased and associated mortality also rises. This has a significant impact on individual patients and institutions.[9] An additional concern of grave significance is the emergence of vancomycin intermediate *S. aureus* (VISA) and more recently vancomysin resistant *S. aureus* (VRSA).[10] To add to this, MRSA has become established outside the hospital environment and is now appearing in community populations with out identifiable risk factors.[11]

Accurate information on the magnitude of MRSA disease therefore becomes vital to set priorities for prevention and control. There is currently little data available regarding frequency of MRSA isolates in Jinnah Hospital Lahore: a tertiary referral hospital. Dearth of such information led us to conduct a study with the objective of determining the frequency of nosocomial MRSA in this hospital, to guide the development of local control and treatment policies.

## MATERIALS AND METHODS

We studied 864 hospital acquired *S. aureus* isolates, recovered from patients admitted to JHL between June 2007 to November 2008. Various clinical samples yielding *S. aureus* comprised pus, wound swabs, blood, body fluids, sputum, throat swabs, urine, high vagnial swabs (HVS), endotracheal secretions and central venous catheters. Study design was descriptive cross sectional and sampling technique was non probability purposive. Consecutive, non duplicate *S. aureus* isolates recovered from patients after 48 h of hospital admission were included, irrespective of age and sex. A positive *S. aureus* culture from the same case 30 days or more after initial culture was excluded to avoid duplication.

Clinical samples were cultured aerobically on blood and MacConkey's agar for 24-48 hours at 37° C. Identification of *S.aureus* was done on the basis of colony characteristics, Gram's stain morphology,

catalase, coagulase and DNAse tests. All the *S.aureus* isolates were screened for oxacillin resistance by modified Kirby-Bauer disc diffusion technique according to the CLSI guide lines.[12] One µg oxacillin disc and Mueller Hinton agar containing 4% NaCl were used for this purpose. A zone of inhibition around the disc measuring 10 mm or less or any growth within zone of inhibition after 24 hours of incubation at 35°C was taken as indicative of methicillin resistance. The isolates were characterized either as methicillin susceptible *S.aureus* (MSSA) or MRSA. Number and percentage of isolation of MRSA from total number of *S.aureus* isolates as well as from different clinical samples was determined to know the frequency of MRSA.

## RESULTS

A total of 864 *S.aureus* isolates were recovered from various clinical samples from patients hospitalised in different wards of JHL. Among these 864 isolates two hundred and forty (27.77%) were found to be MRSA. Maximum percentage of isolation of MRSA was from endotracheal secretions & CV catheters, followed by pus and wound swabs.

Frequency distribution and percentage of isolation of MRSA are given in the Table.

**Table:** *Distribution of isolates of MRSA according to different clinical specimens (number and percentage).*

| Clinical Specimen | Number of *S.aureus* N = 864 | Number of MRSA N = 240 | Percentage of MRSA (% age) 27.77 |
|---|---|---|---|
| Pus | 388 | 105 | 27.06 |
| Wound Swab | 195 | 77 | 39.48 |
| Blood | 165 | 19 | 11.50 |
| Endotracheal secretions and CV catheters | 52 | 30 | 57.69 |
| Sputum | 22 | 5 | 22.72 |
| Body fluids | 20 | 4 | 20 |
| Urine | 8 | -- | -- |
| Throat swab | 8 | -- | -- |
| HVS | 6 | -- | -- |

## DISCUSSION

The frequency of MRSA in JHL is found to be 27.77%. This is lower than the figures of 38.5%,[13] and 34.76%[15] reported respectively in other studies from Lahore. Siddiqui et al reported a lower frequency of 22.3% in PAF Hospital Sargodha in 1999.[16] This is comparable with the frequency of MRSA (27.77%) found in our hospital. A greater percentage (42.01%) of *S. aureus* isolates from Military Hospital Rawalpindi were found to be methicillin resistant by Ali etal in 2005.[17] Very high frequency (68%) of MRSA in skin and soft tissue isolates had been reported from District Head Quarter (DHQ) Hospital Gujranwala.[18] On the other extreme a very low figure of 5.01% was reported by Ayaz et al from Quetta.[19]

Considerable variation in the percentage of isolation of MRSA from different set ups is evident from these studies.[13-19] This is in agreement with the observation that prevalence of MRSA varies from one region to another and also between different institutions in a given area.[18] This difference in prevalence may be a reflection of policies and practices prevailing in different hospitals, regarding prevention, diagnosis and treatment of MRSA infection and colonization.

Higher isolation rates reported in studies from Mayo Hospital Lahore,[13] Military Hospital Rawalpindi[17] and DHQ Hospital Gujranwala[18] can be attributed to several factors. These include indiscriminate use of antibiotics,[21] lack of awareness and failure to observe simple yet effective infection control precautions like strict patient isolation[22] and frequent hand washing by health care personnel.[23] Moreover MRSA prevalence has also been linked to the socioeconomic status with higher rates in urban than in the rural population.[24] A low prevalence of 5.01% from Quetta[17] may be due to this socioeconomic disparity.

In our study maximum (57.69%) isolation of MRSA has been from endotracheal secretions and CV catheters. Rubeena et al[14] reported a similar highest yield of MRSA from endotracheal secretions.[18] Since most such samples came from intensive care unit (ICU) patients, our results coincide with the trend seen in European and US hospitals where MRSA infections are more prevalent in the critically ill patients.[25,26] A similar conclusion of greater isolation of MRSA from surgical ICU than surgical ward was derived by a study from Pakistan Institute of Medical Sciences Islamabad.[27]

The results of our study are not in agreement with studies conducted at Mayo Hospital Lahore[13] and Military Hospital Rawalpindi,[14] reporting maximum isolation of MRSA from pus and wound swabs. This again is a reflection of variation in the fre-

quency distribution of MRSA in different institutions.

The documented information from various hospitals of Pakistan shows that MRSA accounts for a considerable proportion of nosocomial infections in this region.[13-19] This parallels the situation in Europe and USA.[2] A European study demonstrated 50% of the infections morbidity in ICUs attributable to MRSA or coagulase negative staphylococci.[24] In the UK *S. aureus* is responsible for almost half of all the hospital acquired infections, with death toll attributed to MRSA lying in the area of 3000 per year.[28] The situation is not much different in USA hospitals where the proportion of hospital onset MRSA infections reached a high figure of 64.4% in 2003.[26]

It is apparent that MRSA infection has become a major health care associated problem. The challenge of unopposed invasion of MRSA in our hospitals can be met by implementation of stringent preventive and control strategies, aimed at breaking the transmission of MRSA. This should be backed by early laboratory diagnosis and susceptibility testing to ensure effective treatment of MRSA infections and judicious use of antibiotics. As a foresight future analysis should focus in developing simple and accurate methods for the detection of glycopeptide intermediate and resistant *S. aureus* to prevent such strains from gaining a foothold in our institutions.

In **conclusion** MRSA is emerging as a potential threat to our hospitals with a predilection for critically ill patients. Regular surveillance of hospital acquired infections, promotion of infection control precautions and formulation of definite antibiotic policy can be helpful in preventing MRSA infections from acquiring an alarming proportion.

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