

NOSOCOMIAL INFECTIONS DUE TO METHICILLIN RESISTANT *STAPHYLOCOCCUS AUREUS* IN HOSPITALIZED PATIENTS

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ABSTRACT

Objective: This study was carried out to find out the extent of MRSA in hospitalized patients in Military Hospital Rawalpindi.

Methodology: It is a prospective cross sectional descriptive study based on the records of admitted patients in Military Hospital Rawalpindi during June 2005 to September 2005. Non-consecutive non-duplicate clinical isolates of MRSA, isolated from different clinical samples of pus, pus swab, tissue, body fluids, blood, sputum, urine, catheter tips were included in the study. Clinical specimens were cultured on Blood and MacConkey agar for 24-48 hours at 37°C. *Staphylococcus aureus* isolates were identified by colony morphology, catalase, coagulase and DNase tests. Methicillin resistance was identified by modified Kirby-Bauer disk diffusion technique using 1µg oxacillin disk and confirmed by oxacillin screen agar test according to NCCLS guidelines.

Results: Out of 238 non-duplicate staphylococcal isolates recovered from different clinical samples of pus, tissue, body fluids, blood, sputum, urine and catheter tips. One hundred (42.01%) were found to be MRSA. MRSA were most frequently isolated from pus, pus swab, blood and urine.

Conclusion: The high frequency of MRSA in our study reflects a compromise in the state of aseptic techniques such as hand washing, use of gown and masks, isolation of MRSA patients, sterilization and disinfection. It also demands institution of effective infection control policies.

KEY WORDS: Staphylococcus, Nosocomial Infections, MRSA, Prevention.

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INTRODUCTION

Staphylococcus aureus continues to be one of the commonest pathogen encountered in clinical practice, causing a range of diseases including skin infections, osteomyelitis, food poisoning, endocarditis, pneumonia and toxic shock syndrome. Penicillin resistance to *S. aureus* was reported within few years after its introduction in 1941. During 1950's, resistance was reported to erythromycin, aminoglycosides and chloramphenicol. Newer β -lactamase resistant semisynthetic penicillins, introduced during the 1960's, provided a temporary respite, but again resistance emerged within a few years time.¹ These isolates called Methicillin Resistant *Staphylococcus aureus* (MRSA) became widespread during the 1980's and were also resistant to most of the other antibiotics, but

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remained universally susceptible to vancomycin.

Nosocomial infections are caused by different range of pathogens compared to community-acquired infections and these organisms are also more frequently resistant to common antimicrobial agents. Contributing factors include greater use of invasive, diagnostic and therapeutic medical procedures, prosthetic devices (such as artificial joints and heart valves) and broad-spectrum antimicrobial agents. Other risk factors include relatively immunocompromised states associated with old age, malnutrition, and alcohol and illicit drug use.¹ MRSA is one of the most common cause of nosocomial infections.² MRSA are usually penicillinase producers and frequently multi drug resistant. The percentage of a bacterial population that express the resistant phenotype varies according to the environmental conditions.³ The continued spread of MRSA poses a significant risk to patients and contributes to a substantial financial burden on healthcare resources. There is considerable variation in number of clinical infections among units, hospitals, countries and among individual strains.⁴ A few studies have been carried out to find the frequency of MRSA isolates in different specimens in hospitalized patients in our set up. This study was carried out to find out the extent of MRSA in hospitalized patients of Military Hospital Rawalpindi.

MATERIAL AND METHODS

The study was carried out on clinical samples received from admitted patients of Military hospital Rawalpindi who are found infected with *Staphylococcus aureus*. Clinical specimens were cultured on Blood and MacConkey agar for 24-48 hours at 37°C. Isolates were identified by colony morphology, catalase, coagulase and DNase tests. Non- consecutive non-duplicate clinical isolates of MRSA isolated from different clinical samples of pus, tissue, body fluids, blood, sputum, urine, catheter tips and tubes during June 2005 to September 2005 were included in the study.

S. aureus isolates were tested for methicillin resistance by modified Kirby-Bauer disk diffusion technique according to NCCLS guidelines using 1µg oxacillin disk and Muller-Hinton agar containing 4% NaCl.⁵ Zone of inhibition around the disk measuring <10mm after 24 hours of incubation at 33-35°C were interpreted as positive and further tested for methicillin resistance by oxacillin screen agar test.⁵ Bacterial suspensions matching 0.5 McFarland turbidity standard were inoculated on Muller-Hinton agar containing 4% NaCl and 6µg/ml oxacillin. Isolates showing visible growth after full 24 hours incubation at 33-35°C were identified as MRSA. Oxford strains of *S. aureus* NCTC 6571 sensitive to methicillin and *S. aureus* NCTC 12493 resistant to methicillin were used as control organisms. The details of the MRSA positive patients including the type of specimen ward or unit and clinical condition of patients were studied.

Duration of study: June 2005 to September 2005.

Sampling technique: Non probability, convenience

Sample size: Two Thirty Eight staphylococcal cultures yielding 100 consecutive non-duplicate clinical isolates of MRSA from different clinical samples. It was a non-interventional, descriptive study.

Inclusion criteria: All non-duplicate MRSA isolates from clinical specimens, irrespective of the age and sex of the patient from patients yielding MRSA after 72 hours of hospitalization were included.

Exclusion criteria: Already known or culture positive MRSA isolates and from MRSA outbreak were excluded.

Data Analysis: Frequency of the MRSA isolates from clinical specimens was calculated in percentage as total number of MRSA isolates out of total number of *Staphylococcus aureus* isolates.

RESULTS

Out of 238 staphylococcal cultures recovered from different clinical samples of pus, tissue, body fluids, blood, sputum, urine, catheter tips and tubes during June 2005 to September 2005 from hospitalized patients within 72 hours of

their admission in Military Hospitals Rawalpindi. One hundred (42.01%) were found to be Methicillin resistant. The distribution of MRSA in different clinical samples is shown in Figure-1. Most of the MRSA (68%) were isolated from pus.

DISCUSSION

Nosocomial infections have become more frequent over the past 2 to 3 decades and are now a significant cause of patient morbidity and mortality as well as rising health care costs.⁶ The most commonly encountered nosocomial infections involve the urinary tract, followed in frequency by skin and wound infections, hospital-acquired pneumonias and blood-stream infections.

The majority (perhaps 80%) of nosocomial infections is caused by a patient's own endogenous microbial flora present upon admission to the hospital. For example, staphylococci from the skin or gram-negative rod bacteria from the bowels may infect a wound following intra-abdominal surgery. Careful skin preparation preoperatively and use of topical antiseptics during dressing changes will minimize the number of such infections. Other nosocomial infections (perhaps 10% to 20%) develop following cross-colonization with microbial organisms, often via the hands or instruments of health care workers or contact with the hospital environment.⁷ Person-to-person spread of infections in the health care setting can occur via direct contact, droplet,

airborne, fecal-oral, and blood-borne routes, though this is relatively uncommon.⁸

A number of risk factors are associated with the development of nosocomial infections due to antibiotic-resistant pathogens. The most important perhaps is prior treatment with antibiotics, especially broad-spectrum agents. Such therapy suppresses the patients' normal (and relatively nonpathogenic) microbial flora and selects for microorganisms resistant to the antibiotics used.

Resistance to methicillin, semisynthetic penicillin, now exceeds 50% in *S. aureus* (MRSA or methicillin-resistant *S. aureus*) and coagulase-negative staphylococci (e.g. *Staphylococcus epidermidis*) in the hospital setting and is becoming more common in community-acquired infections.⁹

The frequency of MRSA (42.01%) in our study is more than that reported in study from PAF Hospital, Sargodha where 22.3% clinical isolates of Staphylococci were MRSA.¹⁰ Ashiq and Tareen from Karachi reported prevalence of MRSA to be 5%.¹¹ Ayaz et al reported 5.01% resistance in a study carried out in Quetta, Pakistan.¹² The same author has reported 13.87% MRSA in clinical infections in a study carried out in AFIP, Rawalpindi in 1991. The frequency of MRSA in different clinical samples is similar to that observed in our study (Figure-1). Maximum numbers of MRSA were isolated in pus (68%) and least frequent in ear swabs and in catheter tips (2%).

Over a period of years there is steady rise in number of MRSA isolates in *Staphylococcus aureus* in our setup due to frequent use of antibiotics in common infections. Bukhari et al in 2004 have reported 38.5% of their isolates as MRSA in a study carried out in King Edward Medical College, Lahore, Pakistan.¹³ Khatoon et al reported 38.5% prevalence of MRSA infections in a study carried out at Mayo Hospital Lahore during June 2000 to December 2000.¹⁴ The results of these studies are consistent with the findings of our study. The increase in the frequency of MRSA isolates in our study is similar to the studies reported from abroad where a high prevalence of MRSA has been

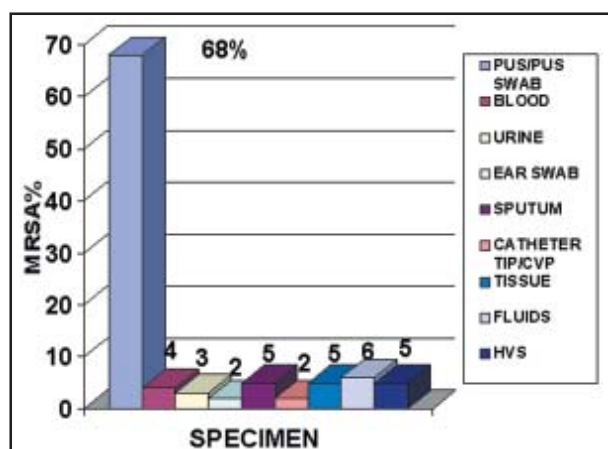


Fig-1: Distribution of MRSA in Clinical Specimens.

observed. Isolates collected in National Nosocomial Infections Surveillance Study showed an increase in MRSA from 2.5% to 29% in 1975 to 1991.¹⁵ Karakatsanis et al reported prevalence of 40% in Greece¹⁶ George et al reported a very high prevalence of 73 % MRSA.¹⁷

However, there has been decline in isolates of MRSA in western countries due to observation of strict aseptic techniques and infection control. Hand washing with plain soap and water can physically reduce the number of microorganisms present on the skin. However, reductions alone cannot match the results achieved with antiseptic agents.¹⁸ Hence it is important that Antimicrobial policy should also promote the rational use of antibiotics.

CONCLUSION

MRSA are frequent in hospitalized patients in our set up. These are more frequently isolated in pus in nosocomially infected wounds. Implementation of infection control policies such as hand washing, gloves, gowns, masks, isolation of MRSA patients and use of suitable disinfectants in clinical use are likely to reduce the spread of MRSA in our hospitalized patients

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